National Medical Standard for Maternal and Newborn Care

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National Medical Standard for Maternal and Newborn Care

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Executive Summary

Ending preventable maternal and newborn mortality is a priority of the Constitution of Nepal 2015, National Health Policy 2019, Nepal Health Sector Strategy (NHSS, 2015–2020), the Right to Safe Motherhood and Reproductive Health Act (RSMRHA), 2075 (2018) and the Nepal Reproductive and Safe Motherhood Road Map 2030. To translate these policies into practice, every pregnant woman and newborn should have access to evidence-based standardised Antenatal Care (ANC), safe labour and childbirth and Postnatal Care (PNC) delivered in a humane, respectful, non-discriminatory environment.

Globally, women often find mainstream maternal and newborn care unacceptable because of perceived lack of respect, privacy and confidentiality, fear of stigmatisation and discrimination, especially for vulnerable women. These women are vulnerable in terms of geography, ethnicity, wealth, education and disability and are less likely to attend institutional maternal and newborn care.

Current situation

According to the Nepal Demographic and Health Survey (NDHS) 2016, while 94 per cent of health facilities across all provinces offered ANC services, only 84 per cent of women who had given birth in the five years before the survey had received ANC from a skilled provider, a 25 per cent point increase since 2011. Sixty-nine per cent of women had had at least four ANC visits. The figures for care during labour and childbirth is further alarming. Only 50 per cent of health facilities nationwide provided normal vaginal delivery services (lowest in Province 2 (23%) and highest in Province 6 (83%)). Fifty-eight per cent of deliveries were conducted by Skilled Birth Attendants (SBAs), and 57 per cent of deliveries took place in a health facility. Only 57 per cent of both mothers and newborns received a PNC check within two days of delivery. Of total pregnancies, 81 per cent were live births, nine per cent were induced abortions, nine per cent were miscarriages, and one per cent were stillbirths.

Rationale for revision

The Government of Nepal (GoN), in commitment to international goals, aims to improve the quality of maternal and newborn care in all levels of health facility. The provision of standard protocols and job aids at service delivery sites could reduce risks and improve quality of care. In Nepal, there are many standards and protocols for Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCAH) services. However, several are outdated and do not fully align with other existing and emerging policies and strategies at the policy level. To ensure evidence-based high-quality care, standards for care must be regularly updated. The World Health Organization (WHO) Guideline Development Group (GDG) has recommended that standards, guidelines and protocols be revised at least every five years.

In Nepal, reproductive health care is delivered within the framework of the three volumes of National Medical Standards (NMS) on Reproductive Health Care. Volume I (1991) Contraceptive Services is designed to provide policy makers, district health officers, hospital directors, clinical supervisors and service providers with accessible, clinically oriented information to guide the provision of reproductive health services. The “National Medical Standard for Contraceptive Services” was first published in 1991. This was further reviewed and published in 1995 as “National Medical Standard for Reproductive Health Volume I: Contraceptive Services. It was again reviewed and published in 2001 and 2010 to accommodate new technology, and in the process of further revision in 2020.

"National Medical Standard for Reproductive Health Volume II: Other Reproductive Health Issues" is a continuum of "National Medical Standard for Reproductive Health Volume I: Contraceptive Services". It was endorsed in 8th January 2004. This volume serves as a standard reference document for essential clinical materials and tools that support patient care and service provision on other reproductive issues. However, to date, this volume has not been revised. Volume III, National Medical Standard (NMS) for Maternal and Newborn Care Volume III, was developed in 2007 and has once been revised, in 2009.

Since the development of the first revision of NMS Volume III in 2009, the international, regional and national legislative and policy landscape has changed. The past 25 years have seen many continuing and emerging issues shape the context of maternal and newborn care; over the next ten years, additional areas will emerge, in which these transformative innovations will likely have a deep impact, including the achievement of Sustainable Development Goals (SDGs), particularly SDG 3: to ensure healthy lives and promote well-being for all at all ages. Further, over the past two decades, maternal and newborn care has been increasingly recognised as an economic priority by the government of Nepal.

Moreover, with the promulgation of its Constitution in 2015, Nepal replaced a unitary government with a federal system of government. The country is administratively divided into 753 local government units, seven provincial governments and a central government. With the new federalism in place there are concerns regarding the need for clarity in marking out the authority of different layers of government with diverse economic and legislative potentials.

However, federalism presents an opportunity to attain wide coverage for maternal and newborn health care and for it to be endorsed in the health sector. Legislation and quality standards in support of this, together with sound financing, human resources and logistics, will facilitate, empower and strengthen the provincial government to work on Nepal's national health priorities.

Purpose and objectives

An important component of this work was revising standards of care for maternal and newborn health services. The revised standards formed the basis of operating procedures for maternal and newborn service delivery in Nepal to achieve best practices. To align with WHO's normative function a rigorous approach to revising standards has been followed: the existing published and grey literature has been reviewed and analysed, based on which a structure for WHO standards of care for mothers and newborns has been adopted.

Revision process

Under the leadership of the Family Welfare Division (FWD) an expert team of four consultants, comprising a gynaecologist/obstetrician and public health expert, paediatrician, anaesthesiologist, and nurse and midwife were involved for the revision process. A Technical Working Group (TWG) was identified. This was a joint effort by various stakeholders, partners and officials. The United Nations Children's Fund (UNICEF) provided technical assistance in coordination with DFID/Nepal Health Sector Support Programme (NHSSP) and the Simulation Society of Nepal (SSN). Peer review was done by the five professors from faculty of obstetrics and gynaecology, midwifery, paediatrics, and anaesthetics under the leadership of the Nepal Society of Obstetrics and Gynaecology (NESOG).

On 17 January 2020 the first meeting was held, under the chairmanship of FWD, with the team of consultants, UNICEF, DFID/NHSSP, and WHO, to discuss the revision process of the existing National

Medical Standard for Maternal and Newborn Care (NMS) Volume III 2009: Maternal and Newborn Care. The meeting agreed that:

- In order to ensure the quality of the NMS Volume III 2020, and that it both matches with international standards and is aligned with the country contextual needs and trends, the document requires re-writing rather than just updating. This might require an extension of the consultants' number of days and efforts
- A national standard be prepared that can be followed by local levels to prepare protocols as per their contextual needs
- Sections on septic abortion and sexual health be included in NMS Volume II as the current NMS Volume III 2009 does not cover this area
- Anaesthetic complications in obstetrics be included in NMS Volume III 2020, in addition to routine anaesthetic procedures/care in obstetrics
- A TWG be formed; a provisional schedule of first draft development, workshops with TWG members and submission of the final draft for peer review was decided
- In regard to international standards, there were discussions around the number of ANC visits, the Sexual and Reproductive Health Road Map, ANC/PNC guidelines etc.

Based on decisions taken at the second meeting, held the end of January 2020, the revised volume adopted:

A holistic approach to childbirth

This approach, which respects the normal processes of pregnancy and birth, while recognising the need for technological assistance whenever appropriate, is a paradigm shift in maternal and newborn services.

Standard definitions

Definitions are mainly adopted from sources such as the WHO library database, WHO library cataloguing-in-publication data, WHO catalogue, WHO TWG 2008, WHO positive pregnancy experience 2016, The Royal College of Obstetricians and Gynaecologists (RCOG), The International Federation of Gynecology and Obstetrics (FIGO), The American College of Obstetricians and Gynecologists (ACOG), American Academy of Pediatrics (AAP), World Federation of Societies of Anaesthesiologists (WFSA), and definitions from Oxford medical dictionary.

Standard references

Resources have been reviewed, analysed, synthesised and adopted, taking into account source reliability, authority (power to inspire belief or weight of testimony), validity (soundness and strength of argument), weightage (journals, WHO bulletins, factsheets, books, websites, conference proceedings), and applications (policy, programme, service). The American College of Obstetricians and Gynecologists (ACOG) grading was considered while choosing references. The references cited are mostly either graded A (At least one randomised controlled trial as part of a body of literature of overall good quality and consistency addressing the specific recommendation) or B (Requires the availability of well controlled clinical studies but no randomised clinical trials on the topic of recommendations).

WHO revised terminologies

“Antenatal” is to be used in place of “antepartum”: antepartum refers only the mother’s condition; antenatal is a broad term which considers the condition of both the mother and the foetus. Similarly, “visit” is to be replaced by “contact”. The Guideline Development Group (GDG) replaced the term “visit “with “contact”, as it implies an active connection between a pregnant woman and a health care provider.

Consultative meeting

Two workshops were conducted. The first consultative workshop was held on 22–23 of February, at which the consultants gave presentations on their respective areas, which were compiled into the draft document. This was followed by group work on six thematic areas; feedback was presented by each thematic group leader. The second TWG meeting was conducted by email and other electronic media, such as Skype, and Zoom because of the Coronavirus Disease 2019 (COVID-19) pandemic. After incorporating the TWG suggestions, the sNMS vol III was sent for peer review, which was completed in around two weeks.

Results of the revision

This review highlighted the need for not only extensive revision but also restructuring and rewriting of the existing NMS Volume III 2009. In a departure from the previous review (2009), a standard format was designed to categorise recommendations into three groups: recommended to all, context-specific recommendations and not recommended. This design made it easier to maintain the consistency throughout all designated chapters.

Many new chapters and topics were added to the maternal health care section so as to accommodate advances made in maternal health care. In addition, the unitary health system of Nepal has changed to a new federal health system with three levels of government. Three new chapters are added.

New chapters added

Chapter 1. The Principles and Standards for Maternal and Newborn Health Care

Chapter 2. Preconception, Birth Preparedness, Complication Readiness and Care of Vulnerable Women

Chapter 8. The Clinical Governance for Maternal and Newborn Care

Major changes regarding maternal health care (Chapters 3, 4 and 5):

Important topics have been added, for example: domestic violence, eliminating common discomforts in pregnancy, substance use, physical exercise during pregnancy and postpartum period, bleeding in early pregnancy – abortion care, prevention of preterm labour/management of preterm labour, pain management in labour, management of post-term labour and childbirth, management of malposition and malpresentation of foetus (occiput posterior position, brow presentation, face presentation, breech presentation, transverse lie), management of active-phase labour dystocia, management of uterine inversion in labour and childbirth, labour with a scarred uterus, management of sudden collapse during labour and childbirth, management of macrosomia in labour and childbirth, management of labour and childbirth for stillbirths, management of Gestational Diabetes Mellitus (GDM) in labour and childbirth, management of secondary Postpartum Haemorrhage (PPH), management of septic pelvic thrombophlebitis, management of postpartum septicaemia and management of heart failure in labour and childbirth.

Major changes regarding newborn care (Chapter 6):

In Chapter 6, several topics have been added and a few have been removed. The following topics have been added: recent demographic data; Essential Newborn Care (ENC), including breastfeeding, vitamin K 1 prophylaxis recommended to all newborns after one hour of birth to prevent haemorrhagic disease of newborn, keeping newborn warm, cord care; counselling on exclusive breastfeeding and immunisation; detailed newborn examination before discharge as standard of PNC; management of newborn of Human-Immunodeficiency-Virus- (HIV-) positive mother, including breastfeeding, revised according to recent national guidelines; adapted recent Helping Babies Breathe (HBB) and Neonatal Resuscitation Program (NRP) guidelines for initial and advanced neonatal resuscitation at birth; standards for post-resuscitation care; recent standards of management of preterm/low-birth-weight babies, including Kangaroo Mother Care (KMC); rational use of antibiotics; common birth injuries; and interventions for prevention of birth defects. Triaging is a new topic, included to prevent death of sick newborns after arrival in health facilities by identifying and managing babies that require urgent treatment for life-threatening conditions. Newborn triaging and standards for stabilisation of newborns with emergency signs have been added; importantly, different levels of newborn care have been recommended according to the level of complexity of care provided as applicable in new Federal system. This has been adapted from the Neonatal Health Strategy 2004, Nepal's Every Newborn Action Plan 2014 and the latest international recommendations. Similarly, newborn screening, which is an emerging topic, has been added: there is no official policy for newborn screening yet, but there is a need to implement a newborn screening programme in Nepal.

The following topics have been removed: Apgar score, as this is not used in decision-making in resuscitation; and neonatal tetanus, as neonatal tetanus has been eliminated from the region.

Major changes made for obstetric anaesthesia (Chapter 7):

In the component of care, use of the WHO safety checklist for the safety of patients and the importance of monitoring patients during transportation to the post-operative recovery area have been added. Epidural anaesthesia is considered the gold standard for labour analgesia. In the context of spinal anaesthesia for Caesarean Section (CS), it is recommended that the smallest possible spinal needle, i.e. 27-gauge (27G), instead of 25G, pencil-point spinal needle, be used to reduce Post-dural Puncture Headache (PDPH), and that oxytocin 3U to 5U Intravenous (IV) be given slowly over 15 to 30 seconds to decrease complications.

Another important recommendation is that the role of the anaesthesiologist be expanded from providing anaesthesia only during CS to taking an active part in the management of pain during labour. Anaesthesia assistant training should be for one year and anaesthesia assistants should work under the supervision of an anaesthesiologist trained as a Medical Doctor in General Practice (MDGP) and at government-designated Comprehensive Emergency Obstetric Newborn Care (CEONC) sites only. In early editions of the NMS, the duration of training was six months.

Organisation of chapters

Of the technical chapters, Chapters 2, 3, 4, and 5 are to be read by obstetricians, GPs and midwives, Chapter 6 by neonatologists, and Chapter 7 by anaesthesiologists working for all types of health institutions (government, private, Non-governmental Organisations (NGOs). Chapters 1 and 8 are must read by all maternal and newborn health care professionals and stakeholder.

Chapter 1. The Principles and Standards for Maternal and Newborn Health Care

This chapter lays the foundation and framework of the NMS Volume III 2020. First, it provides some agreed basic principles on human rights and a rationale for their application to maternal and newborn health services. It also explains the way in which human rights are implicated in the context of pregnancy, labour and childbirth, and postpartum care and affirms the basic inalienable rights of women and newborns, especially underprivileged and vulnerable women, through Respectful Maternity Care (RMC). The chapter illustrates the way the standards are applied for maternal and newborn health care. Chapter 1 should be read together with Chapter 8, a new chapter on Clinical Governance for Maternal and Newborn Health Care, by all maternal and newborn care providers.

Chapter 2. Preconception, Birth Preparedness, Complication, Readiness, and Care of Vulnerable Women

This chapter is also a new addition, designed to address the problem of cultural beliefs and lack of awareness inhibiting preconception care, preparation for delivery and seeking care. Such prevailing cultural beliefs are still in practice in many Nepali societies. As a result, complications occur in unprepared families because they lose time in trying to understand problems, getting organised, obtaining money, finding transport and reaching the appropriate referral facility. It is hoped, therefore, that the recommended standards in this chapter might resolve delays in decision-making, reaching health facilities and receiving care. This chapter also recommends appropriate maternity and newborn care for vulnerable women.

Chapter 3. Management of Antenatal Period

Antenatal care is the care provided to a pregnant woman by skilled health care professionals throughout pregnancy to ensure the best health conditions for both the pregnant woman and the growing foetus. ANC remains an essential tool in reducing maternal and newborn morbidity and mortality. Under this chapter, management of ANC is divided into uncomplicated and complicated pregnancy. Management of uncomplicated pregnancy is organised into primary prevention, including nutritional advice, immunisation, elimination of common discomforts in pregnancy and prophylactic use of micronutrients, such as folic acid, iron and calcium, and secondary prevention, with an emphasis on screening tests for maternal and foetal well-being in different trimesters. Antenatal foetal and maternal screening and prophylaxis are presented in secondary prevention. Likewise, complicated pregnancy management of hyperemesis gravidarum, bleeding in early pregnancy, bleeding in late pregnancy, abdomen pain in early pregnancy, abdomen pain in late pregnancy and medical disorders in pregnancy are included in tertiary prevention section.

Chapter 4. Management of Labour and Childbirth

The period of labour and childbirth refers to the time from the commencement of true labour through the first, second, third and fourth stages of labour, to one to two hours after delivery of the placenta. In Nepal, the majority of maternal deaths occur during this period. This chapter elaborates the management of the intrapartum period through foetal monitoring, evaluation of maternal well-being, pain management in labour and childbirth, active management of third-stage labour, management of operative delivery and intervention for management of complications in labour and childbirth, such as heart failure, HIV, GDM, labour with scarred uterus, preterm labour, Premature Rupture of Membrane (PROM), post-term pregnancy, abnormal position and presentation of the foetus (face, brow, breech, transverse) and multiple births.

Chapter 5. Management of Postnatal Period

The postnatal period is a critical phase in the lives of mothers and newborn babies: most maternal and infant deaths occur during this time. Yet this is the most neglected period for the provision of high-quality care. This chapter elaborates the management of both complicated and uncomplicated postnatal periods. The chapter is focused on the management of severe life-threatening complications, such as severe primary PPH, secondary PPH, pre-eclampsia and eclampsia, septicaemia and sudden collapse during postpartum period, for example, Amniotic Fluid Embolism (AFE), thromboembolism, septic thrombophlebitis, and uterine inversion.

Chapter 6. Newborn Care

The health and survival of newborns depend on the continuum of care provided to mother during pregnancy and childbirth and, most importantly, on the standard of care provided at the time of birth and throughout the neonatal period, with identification of those at high risk and timely provision of high-quality inpatient and supportive care. All newborns require basic care, also called ENC, which includes warmth, normal breathing, feeding (breastfeeding) and infection prevention. Some newborns requires advanced care in the management of various neonatal conditions, including perinatal asphyxia, respiratory distress, hypothermia, neonatal infections, hyperbilirubinaemia, congenital anomalies and birth injuries. Small and sick newborns require timely identification, immediate stabilisation and high-quality inpatient care to survive. This volume includes standard care statements of minimum expected service practices that are to be met to ensure the quality of normal and sick newborn care.

Chapter 7. Obstetric Anaesthesia

The role of anaesthesiologists in obstetric cases has expanded: they are not limited to providing anaesthesia during CS and can play an important part in providing painless delivery and managing obstetric complications. Since obstetric anaesthesia practices vary between different institutions and anaesthesiologists, certain minimum standards of practice are required to ensure the safety of the mother as well as the newborn. Therefore, this revision tries to incorporate and describe a minimum expected standard of care and practice that is to be met to ensure high-quality services at various levels of hospital in Nepal.

Chapter 8. The Clinical Governance for Maternal and Newborn Health Care

This is a new chapter, which describes the clinical governance for maternal and newborn health care. Clinical governance is a concept used to improve the management, accountability and provision of high-quality health care. For the provision and maintenance of quality of care, standards must be set and sustained, regarding: the structure and human workforce at each level of facility; equipment and supplies; logistics management; patient record keeping; and audit related to the care of mothers and newborns during pregnancy, labour and childbirth, and the postpartum period. This chapter primarily is focused on allowing the smooth implementation of NMS Volume III 2020 to achieve, at least, minimum standards of maternal and newborn health care.

Who should use NMS Volume III 2020?

The principal users of NMS Volume III 2020 might be: policy makers; programme managers and health planners at national, district and facility levels; maternal and newborn health professionals; NGOs, including private-sector health organisations, involved or interested in the provision of maternal and newborn health services; and community organisations interested in improving maternal and newborn health care practices.

Next revision

The next revision should commence within five years of the adoption of this standard.

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List of Abbreviations

3TC	Lamivudine
8ANC	Eight-contacts ANC
AABR	Automated Auditory Brainstem Response
AAFP	American Academy of Family Physicians
AAP	American Academy of Pediatrics
ABG	Arterial Blood Gas
ACOG	American College of Obstetricians and Gynecologists
AFB	Acid-fast Bacilli
AFE	Amniotic Fluid Embolism
AFI	Amniotic Fluid Index
AFLP	Acute Fatty Liver of Pregnancy
AHW	Auxiliary Health Worker
AIDS	Acquired Immunodeficiency Syndrome
ALSO	Advanced Life Support in Obstetrics
AMTSL	Active Management of the Third Stage of Labour
AFD	Amniotic Fluid Distribution
AFI	Amniotic Fluid Index
ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
APH	Antepartum Haemorrhage
ARDS	Acute Respiratory Distress Syndrome
ARI	Acute Respiratory Infection
ARM	Artificial Rupture of Membranes
ART	Antiretroviral Therapy
ARV	Antiretroviral
ASB	Asymptomatic Bacteriuria
AZT	Azidothymidine
β-hCG	Beta Human Chorionic Gonadotropin
BANC	Basic Antenatal Care
BCG	Bacille Calmette Guérin
BMI	Body Mass Index
BP	Blood Pressure
BPCR	Birth Preparedness and Complication Readiness
BPI	Brachial Plexus Injury
BPM	Beats per Minute
BPP	Biophysical Profile
CAC	Comprehensive Abortion Care
CAH	Congenital Adrenal Hyperplasia
CANC	Crisis-time Antenatal Care
CBC	Complete Blood Count
CB-IMNCI	Community-based Integrated Management of Neonatal and Childhood Illness
CCHD	Critical Congenital Heart Disease
CCS	Country Cooperation Strategy
CCT	Controlled Cord Traction
CDC	Centers for Disease Control and Prevention
CEDAW	Convention on the Elimination of All Forms of Discrimination against Women
CEOC	Comprehensive Emergency Obstetric Care
CEONC	Comprehensive Emergency Obstetric and Newborn Care
CFL	Compact Fluorescent Lamp
CH	Congenital Hypothyroidism

CHW	Community Health Worker
CLX	Chlorhexidine
CMF	Congenital Malformation
CNS	Central Nervous System
COVID-19	Coronavirus Disease 2019
CPAP	Continuous Positive Airway Pressure
CPD	Cephalopelvic Disproportion
CPR	Cardiopulmonary Resuscitation
CRP	C-reactive Protein
CRT	Capillary Refill Time
CS	Caesarean Section
CSE	Combined Spinal Epidural
CST	Contraction Stress Test
CT	Computerised Tomography
CTEV	Congenital Talipes Equinovarus
CTG	Cardiotocography
CVA	Cerebrovascular Accident
CVP	Central Venous Pressure
CVS	Cardio Vascular System
D&E	Dilatation and Evacuation
DBS	Dried Blood Spot
DIC	Disseminated Intravascular Coagulation
DM	Diabetes Mellitus
DNA	Deoxyribonucleic Acid
DOT	Directly Observed Therapy
DSPT	Deep Septic Pelvic Thrombophlebitis
EBM	Expressed Breast Milk
EBSS	Executive Board Special Session
ECG	Electrocardiogram
ECMO	Extracorporeal Membrane Oxygenation
ECV	External Cephalic Version
EDD	Estimated Date of Delivery
EFV	Efavirenz
EFW	Estimated Foetal Weight
ELBW	Extremely LBW
ELISA	Enzyme-linked Immunosorbent Assay
EONS	Early-onset Neonatal Sepsis
EPR	Electronic Patient Records
ETT	Endotracheal Tube
EVA	Electrical Vacuum Aspiration
EVT	Eliminate Vertical Transmission
FANC	Focused Antenatal Care
FAO	Food and Agriculture Organisation
FBGA	Foetal Blood Gas Analysis
FBS	Fasting Blood Sugar
FCHV	Female Community Health Volunteer
FFP	Fresh Frozen Plasma
FHR	Foetal Heart Rate
FHS	Foetal Heart Sounds
FIGO	International Federation of Gynecology and Obstetrics
FiO2	Fraction of inspired Oxygen

FHS	Foetal Heart Sound
FTC	Emtricitabine
FWD	Family Welfare Division
G	Gauge
G6PD	Glucose-6-phosphate Dehydrogenase
GA	General Anaesthesia
GANC	Group Antenatal Care
GBS	Group B Streptococcus
GBV	Gender-based Violence
GDG	Guideline Development Group
GDM	Gestational Diabetes Mellitus
GESI	Gender Equity and Social Inclusion
GoN	Government of Nepal
GPW	General Programme of Work
GTD	Gestation Trophoblastic Disease
GTN	Gestation Trophoblastic Neoplasia
H/O	History Of
HA	Health Assistant
HAV	Hepatitis A Virus
Hb	Haemoglobin
HbA1C	Haemoglobin A1C
HBB	Helping Babies Breathe
HBeAg	Hepatitis B e-Antigen
HBsAg	Hepatitis B surface Antigen
HELLP	Haemolysis, Elevated Liver enzymes, Low Platelet
HIC	High-income Country
HIE	Hypoxic-Ischaemic Encephalopathy
HIV	Human Immunodeficiency Virus
HMF	Human Milk Fortifier
HPE	Histopathological Examination
HPV	Human Papilloma Virus
HRBP	Human-rights-based Principle
IBT	Intrauterine Balloon Tamponade
ICCPR	International Covenant on Civil and Political Rights
ICESCR	International Covenant on Economic, Social and Cultural Rights
ICM	International Confederation of Midwives
ICPD	International Conference on Population and Development
ICT	Indirect Coombs Test
ICU	Intensive Care Unit
IGRA	Interferon Gamma Release Assay
IHI	Institute for Health Improvement
IHPC	Intrahepatic Cholestasis of Pregnancy
ILCOR	International Liaison Committee on Resuscitation
IM	Intramuscular
IMCI	Integrated Management of Childhood Illness
IMNCI	Integrated Management of Newborn and Childhood Illness
IMPC	Integrated Management of Pregnancy and Childbirth
Inj	Injection
iNO	Inhaled Nitrous Oxide
INR	International Normalized Ratio
IOL	Induction of Labour

IPT	Intermittent Preventive Treatment
IPV	Internal Podalic Version
ITN	Insecticide-treated Net
IUFD	Intrauterine Foetal Death
IUFR	Intrauterine Resuscitation of Foetus
IUGR	Intrauterine Growth Restriction
IV	Intravenous
KMC	Kangaroo Mother Care
L/S	Lecithin/sphingomyelin
LBW	Low Birth Weight
LCA	Life Course Approach
LED	Light-emitting Diode
LEEP	Loop Electrosurgical Excision Procedure
LEU	Leucovorin
LFT	Liver Function Test
LGA	Large for Gestational Age
LH	Luteinizing Hormone
LMA	Laryngeal Mask Airway
LMIC	Low- and Middle-income Country
LMP	Last Menstrual Period
LONS	Late-onset Neonatal Sepsis
LP	Lumbar Puncture
LUD	Left Uterine Displacement
MA	Medical Abortion
MAC	Minimum Alveolar Concentration
MAFA	Maternal Assessment of Foetal Activity
MAP	Mean Arterial Pressure
MAS	Meconium Aspiration Syndrome
MBPP	Modified Biophysical Profile
MCPC	Managing Complications in Pregnancy and Childbirth
MDG	Millennium Development Goal
MI	Medical Induction
Micro-ESR	Micro-erythrocyte Sedimentation Rate
MNT	Maternal and Newborn Tetanus
MRI	Magnetic Resonance Imaging
MRP	Manual Removal of Placenta
MSAF	Meconium-stained Amniotic Fluid
MTCT	Mother-to-child Transmission
MTSP	Medium-term Strategic Plan
MTX	Methotraxate
MUAC	Mid Upper Arm Circumference
NASG	Non-pneumatic Anti Shock Garment
NCCN	National Comprehensive Cancer Network
NCD	Non-communicable Disease
NDHS	Nepal Demographic and Health Survey
NEC	Necrotising Enterocolitis
NENAP	Nepal Every Newborn Action Plan
NERI	National Economic and Social Rights Initiative
NFT	Nitrofurantoin
NGO	Non-governmental Organisation

NHS	National Health Service
NHSS	Nepal Health Sector Strategy
NIBP	Non-invasive Blood Pressure
NICE	National Institute for Health and Care Excellence
NICU	Newborn Intensive Care Unit
NMS	National Medical Standard
NND	Neonatal Death
NPV	Negative Predictive Value
NRFHRT	Nonreassuring FHR Tracings
NRP	Neonatal Resuscitation Program
NS	Normal Saline
NSAID	Nonsteroidal Anti-inflammatory Drug
NST	Nonstress Test
NTD	Neural Tube Defect
NVP	Nevirapine
OAA	Obstetric Anaesthetists' Association
OAE	Otoacoustic Emission
OCP	Oral Contraceptive Pill
OG	Orogastric
OGTT	Oral Glucose Tolerance Test
OP	Occiput Posterior
OPD	Outpatient Department
ORC	Outreach
ORS	Oral Rehydration Solution
OVT	Ovarian Vein Thrombophlebitis
PA	Per Abdomen
PaCO2	Partial Pressure of Carbon Dioxide
PACU	Post-anaesthetic Care Unit
PAO2	Partial Pressure of Oxygen
PCR	Polymerase Chain Reaction
PDPH	Post-dural Puncture Headache
PEEP	Positive End-expiratory Pressure
PG	Plasma Glucose
PHC	Primary Health Care
PID	Pelvic Inflammatory Disease
PIH	Pregnancy-induced Hypertension
PIP	Peak Inspiratory Pressure
PNA	Postnatal Age
PNC	Postnatal Care
POC	Products of Conception
POG	Period of Gestation
PPH	Postpartum Haemorrhage
PPHN	Persistent Pulmonary Hypertension of the Newborn
PPI	Proton Pump Inhibitor
PPROM	Preterm Premature Rupture of Membranes
PPV	Positive Predictive Value
PrEP	Pre-exposure Prophylaxis
PROM	Premature Rupture of Membrane
PSBI	Possible Serious Bacterial Infection
PT	Prothrombin Time
PV	Per Vagina

R/M	Routine and Microscopy
RANZCOG	Royal Australian and New Zealand College of Obstetricians and Gynaecologists
RCOG	Royal College of Obstetricians and Gynaecologists
RDS	Respiratory Distress Syndrome
RDT	Rapid Diagnosis Test
Rh	Rhesus
RMC	Respectful Maternity Care
RMNCAH	Reproductive, Maternal, Newborn, Child and Adolescent Health
ROP	Retinopathy of Prematurity
RSMRHA	Right to Safe Motherhood and Reproductive Health Act
RT-PCR	Reverse Transcription Polymerase Chain Reaction
SA	Spinal Anaesthesia
SBA	Skilled Birth Attendant
SCI	Spinal Cord Injury
SCNU	Special Care Newborn Unit
ScvO2	Central Venous Oxygen Saturation
SDG	Sustainable Development Goal
SFH	Symphysio-fundal Height
SGA	Small for Gestational Age
SIDS	Sudden Infant Death Syndrome
SLE	Systemic Lupus Erythematosus
SMNH	Safe Motherhood and Newborn
SOFA	Sequential Organ Failure Assessment
SP	Sulfadoxine/pyrimethamine
SpO2	Oxygen Saturation
SPT	Septic Pelvic Thrombophlebitis
SSN	Simulation Society of Nepal
SSRI	Selective Serotonin Reuptake Inhibitor
STI	Sexually Transmitted Infection
SvO2	Mixed Venous Oxygen Saturation
Tab	Tablet
TB	Tuberculosis
TcB	Transcutaneus Bilirubinometry
Td	Tetanus-diphtheria-pertussis
TDF	Tenofovir Disoproxil Fumarate
TH	Therapeutic Hypothermia
TORCH	(T)oxoplasmosis, (O)ther Agents, (R)ubella), (C)ytomegalovirus, and (H)erpes Simplex
TPHA	Treponema Pallidum Haemagglutination Assay
TSB	Total Serum Bilirubin
TT	Tetanus Toxoid
TTN	Transient Tachypnea of the Newborn
TTTS	Twin-to-twin Transfusion Syndrome
TVS	Transvaginal Scan
TWG	Technical Working Group
TXA	Tranexamic Acid
U	Unit
UADV	Umbilical Artery Doppler Velocimetry
UCP	Umbilical Cord Prolapse
UMIC	Upper-middle Income Country
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS

UNICEF	United Nations Children's Fund
USG	Ultrasonography
UTI	Urinary Tract Infection
VAS	Visual Analogue Scale
VCT	Voluntary Counselling and Testing
VDRL	Venereal Disease Research Laboratory
VLBW	Very Low Birth Weight
VTE	Venous Thromboembolism
WFSA	World Federation of Societies of Anaesthesiologists
WHO	World Health Organization

Chapter 1: Principles and Standard for Maternal and Newborn Health Care

This chapter lays the foundation and framework for the NMS Volume III 2020. First, it details some agreed basic principles on human rights and the rationale for their application to maternal and newborn health services. It explains how human rights are implicated in the context of pregnancy, labour and childbirth and postpartum care. It also affirms the basic inalienable rights of women and newborns, especially underprivileged and vulnerable women, through Respectful Maternity Care (RMC). The chapter goes on to illustrate knowledge on standards and the application of standards for maternal and newborn health care.

1.1 Human-rights-based principle

The Human-rights-based Principle (HRBP) is chosen as a framework to develop the for NMS Volume III 2020, tailored to the needs of women attending all levels of health facilities in Nepal. The HRBP not just incorporates human rights principles and methodologies into government policy and practice, but also integrates mechanisms that promote accountability, transparency, participation, empowerment, (Human Rights Council, Technical Guidance, supra note 9, at para. 9), non-discrimination, universality and National Economic and Social Rights Initiative (NESRI, supra note 30).

Nepal is signatory to almost all international conventions on human rights, women's rights, and children's rights as well as to agreements on international goals regarding education, health and poverty eradication. and Convention on the Elimination of All Forms of Discrimination against Women (Adopted and opened for signature, ratification and accession by General Assembly resolution 34/180 of 18 December 1979 entry into force 3 September 1981, in accordance with article 27(1). The International Conference on Population and Development (ICPD) and ICPD+10 placed an emphasis on ensuring women's universal access to reproductive health as well as equal access to all other health services. Millennium Development Goals (MDGs) focused on achieving minimum educational, health, and poverty reduction targets and making sure that women and girls share benefits equally as these goals are achieved. The 2030 Agenda for Sustainable Development is focused on decision-making with particular reference to participation of vulnerable groups, such as women (Sustainable Development Goal (SDG) target 5.5).

Despite these positive steps, women in Nepal across all caste, ethnic, and socioeconomic groups continue to face discrimination and disrespect. Disrespect and discrimination in maternal and newborn health care is prevalent not only among underprivileged and vulnerable women of Nepal but also for global women (Bohren et.al. 2014). In Nepal, the right to be safe during delivery has been compromised for a large proportion of women. Only 58 per cent of deliveries are conducted by Skilled Birth Attendants (SBAs), 57 per cent of deliveries take place in a health facility, and 57 per cent of both mothers and newborns receive a postpartum care check within two days of childbirth (NDHS 2016). Likewise, women's rights to participate in decision making for their own health are not encouraging: only 23 per cent women make decisions on their own health issues; for 35 per cent women it is a joint decision, made with their husband; and in 29 per cent of cases only husbands made decisions for their wives. Thus, the human-rights-based principle would be an appropriate standard for maternal and newborn health care in Nepal.

1.1.1 Rationale of human-rights-based principle for maternal and newborn health

- Contained in international treaties and consensus documents
- There is an international consensus that maternal and under-five mortality is no longer simply an issue of public health but a human rights concern (United Nations (UN) General Assembly Human Rights Council 2013)

- This concern over a rights framework for maternal and child health is growing because a significant portion of maternal and under-five mortality is from preventable causes – an indication that avoidable maternal and child fatalities are potential violations of human rights, constituting social injustice (Levy et al. 2006)
- The UN Human Rights Council has recognised that applying a rights-based approach to the reduction of maternal and child mortality and morbidity is key to making meaningful progress in this area
- The World Health Organization (WHO) Eleventh General Programme of Work (GPW, 2006–2015) provides a global health agenda for the WHO's Member States, its Secretariat and the international community. It highlights seven priority areas for the international community, including promoting universal coverage, gender equality, and health-related human rights
- The integration of a human-rights-based approach is specifically addressed in Strategic Objective 7 of the WHO Medium-term Strategic Plan (MTSP) 2008–2013
- The strategic agenda for WHO cooperation, as reflected in the WHO Country Cooperation Strategy (CCS), should incorporate the human-rights-based approach to development and the commitment to gender equality adopted by the UN system (2008 CCS e-guide).

Recently, the WHO has reemphasised its foundational values with respect to human rights and social justice, social protection and social determinants to promote, in cooperation with other specialised agencies where necessary, improvement of nutrition, housing, sanitation, recreation, economic or working conditions and other aspects of environmental hygiene (WHO GPW 13). These foundational values are as important today as they were more than 70 years ago (Document EBSS/4/2). The WHO is committed to promote implementation of gender equality, equity and a rights-based approach to health that enhances participation, builds resilience, and empowers communities to realise their rights to health.

1.1.2 Fundamental rights-based principle applicable to maternal and newborn health

- The woman (or her family, if necessary) should give informed consent before the provider performs any procedure
- A woman (or her family, if necessary) has the right to decline any treatment or procedure offered
- Procedures should be conducted in an environment (e.g. labour ward) in which the woman's right to privacy is respected
- A woman has the right to determine how her health information is used and to whom her information is disclosed by health care providers
- A woman has the right to express her views about the services she receives
- A woman should be made to feel respected as much as possible when receiving care, especially during pregnancy, labour and childbirth and the postpartum period

Respectful maternity care

RMC refers to care organised for and provided to all women in a manner that maintains their dignity, privacy and confidentiality, ensures freedom from harm and mistreatment, and enables informed choice and continuous support during pregnancy, labour and childbirth and the postpartum period.

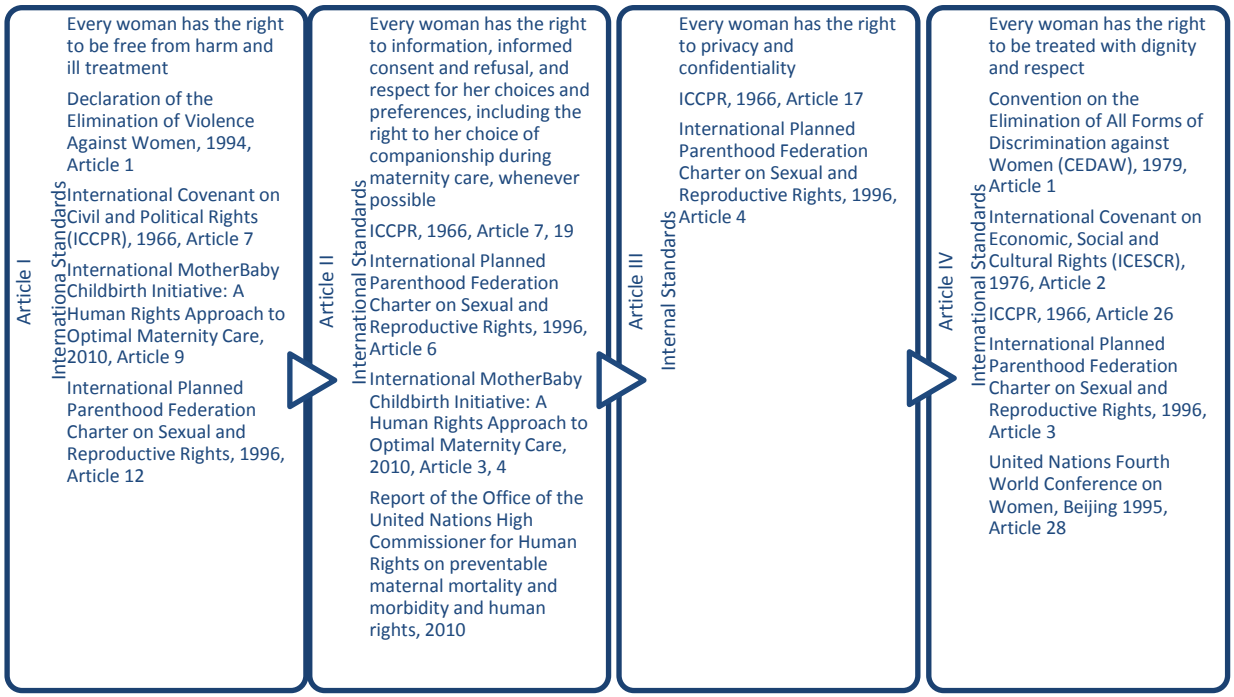
Disrespectful care, on the other hand, is recognised if any of the following behaviours is reflected in the given care: physical, sexual or verbal abuse, stigma and discrimination, failure to meet professional standards of care, or poor rapport between women and practitioners. The prevailing medicalised model of childbirth is one example of disrespectful maternity care. This model enables health care providers to control the birthing process and might therefore expose apparently healthy pregnant women to unnecessary medical interventions that interfere with the physiological process of childbirth (Tuncalp et

al. 2015). There is a dichotomy between 'traditional birthing' and 'modern medical obstetric care'. This dichotomy limits technical, social and cultural collaborative birthing practices between the many traditional birthing attendants and medical staff. Hence, for birthing within the holistic sphere, a culture of RMC must be established to halt the growing trend towards medicalisation of childbirth (Regmi et al. 2009).

To ensure RMC, the Government of Nepal (GoN) has adopted the provisions of the Constitution of Nepal (2015) on reproductive health care. The Constitution (2015) is a significant milestone for Gender Equity and Social Inclusion (GESI) and protects equal rights for women, the poor, Gender-based Violence (GBV) survivors, and other vulnerable and marginalised groups. Similarly, the Right to Safe Motherhood and Reproductive Health Act (RSMRHA), 2075 (2018) marks the first time that RMC has been included in national legislation and paves the way for the provision of high-quality, respectful care for mothers and newborns in public and private health facilities in the country. The Act articulates a human rights framework related to Family Planning (FP), pregnancy, labour and childbirth, and the postpartum period, which includes paid maternity leave, privacy and confidentiality, information and informed consent and prohibition of discrimination.

Every woman has the right to high-quality health care that is dignified, respectful, violence-free and free of discrimination described under the 'Seven Rights of Childbearing Women'. Abuse, negligence or disrespect during the process of childbirth constitute serious violations of fundamental human rights that are recognised internationally through various conventions, platforms and conferences.

1.1.3.1 Tackling disrespect and abuse (seven rights of childbearing women)



1.1.3.2 Tackling disrespect and abuse (seven rights of childbearing women)

Source: Bowser, D., and K. Hill. 2010. Exploring Evidence for Disrespect and Abuse in Facility-based Childbirth: Report of a Landscape Analysis. Bethesda, MD: USAID-TRAction Project, University Research Corporation, LLC, and Harvard School of Public Health.

The revised NMS Volume III 2020 has set evidence-based standards for maternal and newborn care to ensure the 'Seven Rights of Childbearing Women'.

1.2 Standard

A standard is something established as a measure or model to which other similar things should conform. The standards have been developed recognising that:

- High-quality maternity care is provided through services that help to foster interactions with women and their families
- It is important to work in collaboration with key stakeholders and service providers to deliver high-quality services while promoting and recognising the views of service users
- Timely feedback from service providers is necessary and a healthy learning culture should be promoted to investigate any critical incidents.

1.2.1 Aim

Standards regarding maternal and newborn care have been created to ensure a common structure, which, if adopted universally, will provide guidance to improve maternal and newborn health care services in government health care settings during pregnancy, childbirth and the postpartum period. However, they are equally applicable to facilities run by Non-governmental Organisations (NGOs) and those in the private sector.

1.2.2 Key elements of structure for standard

The standards share a common structure: for example, key actions, key indicators and guideline. These are general and qualitative in nature:

- Title: identifies the standard
- Standard statement: based on the best available evidence, feasibility and cost-effectiveness
- Aim: indicates the public health intent and goal of implementing the standard
- Requirements: indicates a checklist of conditions that need to be in place to implement the standard
- Application of the standard: briefly explains what the health provider or health manager must do to implement the standard
- Audit: suggested input, process and outcome indicators to be used to monitor correct implementation and impact of the standard
- Rationale: comprises two sections – first, burden of suffering of condition that the standard addresses; and second, efficacy and effectiveness, which describes the importance of the recommendations
- References: used to develop the standard – a list of links and additional readings, which will assist users in implementing the standards.

The titles in NMS Volume III 2020 correspond to the chapters. There are eight chapters in total: Chapter 1. The Principles and Standards for Maternal and Newborn Health Care; Chapter 2. Preconception, Birth Preparedness, Complication Readiness and Care of Vulnerable Women; Chapter 3. Management of Antenatal Period, Chapter 4; Management of Labour and Childbirth; Chapter 5. Management of Postnatal Period; Chapter 6. Newborn Care; Chapter 7. Obstetric Anaesthesia; and Chapter 8. The Clinical Governance for Maternal and Newborn Care.

1.2.3 Standard statement

Standard statements for maternal and newborn health services clearly express the commitment to and requirement of the delivery of evidence-based best practice for mother and newborn. So as to make the standard statements more practical and applicable, various resources have been reviewed, analysed, synthesised and adopted. These references are placed against each standard where applicable:

- WHO Integrated Management of Pregnancy and Childbirth Care (IMPAC), 2007
- Integrated Management of Pregnancy and Childbirth (IMPC): Managing Complications in Pregnancy and Childbirth: A guide for midwives and doctors, 3rd edition, WHO, 2015
- WHO recommendations on antenatal care for a positive pregnancy experience: WHO Library Cataloguing-in-Publication Data
- Nepal National Health Policy, 2076 (2019)
- Nepal Safe Motherhood and Newborn Health (SMNH) road map 2030
- Constitution of Nepal, 2015
- The Right to Safe Motherhood and Reproductive Health Act (RSMRHA), 2075 (2018)
- Advanced Life Support in Obstetrics (ALSO), 2017
- Clinical Updates in Reproductive Health, 2019.

These standard statements are grouped under two broad headings, i.e. universal/output standard statement and performance/input standard statement.

1.2.3.1 Universal/Output standard statements

Standard statement: Every woman and newborn receives evidence-based continuum of care from preconception, through birth preparedness and readiness, pregnancy, labour and childbirth to the postpartum period, irrespective of their social status (Annex I, II, & III)

- Standard: Women have access to at least eight ANC contacts
- Standard: Women receive skilled birth attendance at birth
- Standard: Women receive postpartum care immediately, with the first follow-up contact 24 to 48 hours after birth, the second follow-up contact after 7 to 14 days and the third after four to six weeks
- Standard: Newborns receive ENC immediately after birth. Intervention: ENC
- Standard: Measures to reduce social and cultural barriers to maternal care, particularly through working with Female Community Health Volunteers (FCHVs), are in place.

Standard statement: Every mother and newborn receives evidence-based care in response to complications during pregnancy, labour and childbirth and the postpartum period at each level of health facility, depending on the condition of mother and newborn:

- Standard: Mothers with mild complications will receive level-II care
- Standard: Mothers with moderate complications will receive level-II care
- Standard: Mothers with severe, life-threatening complications will receive level-III or -IV care
- Standard: Standard diagnosis criteria and responses to labour challenges will be implemented
- Standard: Newborns who are not breathing spontaneously will receive appropriate stimulation and resuscitation with bag-and-mask within one minute of birth, in accordance with WHO 2017 guidelines.

Standard statement: A system of clear referral pathways should be established so that women that require additional care because of pre-existing medical conditions or because of complications during the antenatal period, labour and childbirth, and postpartum period are cared for and treated by the appropriate multidisciplinary or specialist teams, including anaesthetic assessment when problems are identified, or properly referred if these facilities are not available (Annex IV & V):

- Standard: Every mother and newborn is appropriately assessed on admission and during labour and the early postpartum period, to identify the need for referral, and the decision to refer is made without delay (Biswas et al. 2018)
- Standard: Every mother and newborn needing referral will be referred in timely fashion
- Standard: Referral follows a pre-established plan that can be implemented without delay at any time
- Standard: Transportation support, timeliness of referral, and inter-facility transfer are arranged for every woman needing referral (Singh et al. 2016)
- Standard: For every mother and newborn referred within or between health facilities, there is appropriate information exchange and feedback to health care staff (Biswas et al. 2018).

1.2.3.2 Process/input standard statements

Standard statement: Provision of maternal and newborn care is respectful and in accordance with the human-rights-based principle to improve women's experience of pregnancy, labour and childbirth, and the postpartum period:

- Standard: All mothers have privacy around the time of labour and childbirth, and their confidentiality is respected (Crissman et al. 2013)

- Standard: No mother or newborn is subjected to mistreatment and disrespect, such as physical, sexual or verbal abuse, discrimination, neglect, detainment, extortion or denial of services (Rahmani et al. 2013)
- Standard: All mothers have informed choices in the services they receive, and the reasons for intervention or outcomes are clearly explained (Aguiar et al. 2013).

Standard statement: Effective communication and engagement among health care providers, health service managers, women and representatives of women's groups and women's rights movements is maintained to ensure women's needs and preferences in all contexts and settings (Epstein & Street 2007):

- Standard: All women will be given adequate time to communicate their needs and preferences to the health workforce
- Standard: All women and their families will be provided with coordinated care with clear and accurate information exchange between relevant health and social care professionals
- Standard: Highly reliable teams with better interprofessional communication are ensured for all women and newborns.

Standard statement: Ensure a respectful and dignified environment for both those receiving and providing care, acknowledging that staff may also experience disrespect and abuse in the workplace and/or violence at home or in the community (WHO 2018):

- Standard: No health care provider is denial for respectful working environment (WHO 2017)
- Standard: A respectful care to all women and newborns and a healthy working environment for health workforce is ensured.

Standard statement: The health facility has an appropriate physical environment with appropriately trained clinical and managerial personnel, utilities, medicines, supplies and equipment for routine maternal and newborn care and management of complications:

- Standard: Water, energy, sanitation, hand-washing and waste-disposal facilities should be functional, reliable, safe and sufficient to meet the needs of staff, women and their families (WHO 2017)
- Standard: A consultant should lead each maternal and newborn case, supported by consultant colleagues, a team of specialists and associate specialists/speciality doctors, a General Practitioner (GP), speciality trainees and nurses
- Standard: Where consultant support is geographically not possible a clinical network should be developed
- Standard: The consultant should be accredited in the respective council to ensure adequate quality of service provision, training, clinical governance and risk management across all three levels of service provision (Faculty of Sexual and Reproductive Healthcare (FSRH 2014)
- Standard: The SBAs and support staff have the appropriate competencies and skills mix to meet needs during labour and childbirth and the postpartum period (FSRH 2014)
- Standard: Every health facility has managerial and clinical leadership that is collectively responsible for creating and implementing appropriate policies and fosters an environment that supports facility staff to undertake continuous quality improvement (FSRH 2014)
- Standard: An adequate stock of medicines, supplies and equipment is available for routine care and management of complications (WHO 2016).

Standard statement: Record keeping in all services should be of a high standard, to ensure electronic collection, reporting and transfer of information regarding activity, performance and outcomes of care

that supports midwives and other clinical staff to have access to the relevant data to assess and improve outcomes:

- Standard: Every woman and newborn has complete clinical records, including relevant clinical findings; decisions made and actions agreed, who is making the decisions and agreeing the actions; information given to patients; any drugs prescribed or other investigation or treatment; and details of who is making records and when they are made throughout pregnancy, labour and childbirth (Wedad 2014)
- Standard: Every health facility has a mechanism in place for data collection, analysis and feedback, as part of its monitoring and performance-improvement activities around the time of childbirth. Accurate data on childbirth care is essential for monitoring progress (Bhattacharya et al. 2019)
- Standard: Clinical records must be kept confidential at all times. For those using paper notes these should be stored in a secure place as per the local guidelines (FSRH 2014)
- Standard: Adequate protection of Electronic Patient Records (EPR) should also be enforced (NHS England 2016).

Standard statement: All services continually monitor and evaluate themselves in order to maintain and improve performance:

- Standard: All providers should have a programme in place to regularly audit clinical service provision in terms of quality as well as access, process and outcome issues from a consumer viewpoint. This should include auditing complaints and near misses
- Standard: Results of audits should be acted upon to ensure appropriate improvements in service provision
- Standard: Commissioners and local authority providers for maternal and newborn health, together with specialist services, should establish structures and processes for the monitoring and evaluation of initiatives introduced to improve local sexual health care provision. These should include the identification of any inequality gaps that may exist within their local services through needs assessment
- Standard: User involvement is practised (Department of Health, Social Service and Public Safety 2008)
- Standard: All services should provide quarterly reports to the appropriate body in a timely manner (Public Health England 2015).
- Standard: Services should work to WHO standards for risk management (FSRH 2014).

1.2.4 Indicators to measure maternal and newborn health care standards

Measuring standard of maternal and newborn health is a challenging task. The progress and target indicators are recommended to measure maternal and newborn health care standards:

- Progress indicators: Provide the unit of measurement to monitor achievement of the standard. It should be used to determine baseline, set targets with partners and stakeholders and monitor changes towards that target

- Target indicators: Are specific, quantifiable targets that represent the quantifiable minimum below which the standard is not being met. Those targets should be reached as soon as possible, as falling short of the target will compromise the overall programme.

1.2.5 Readiness

- A national policy and locally adapted guidelines are in place that protect the rights of all women, regardless of their socioeconomic status or place of residence, to access good-quality maternal and newborn services
- National evidence-based guidelines exist detailing the essential minimum components of maternal and newborn care, in line with the country epidemiological profile and country priorities and based on recent WHO guidelines and recommendations
- The health system ensures that sufficient skilled attendants are recruited and deployed to be able to provide all women with good-quality maternal and newborn care
- Services and care are organised to ensure that maternal and newborn care is available and acceptable to all women in all levels of government service area, regardless of social, religious or ethnic background
- The health system ensures that all necessary equipment, supplies and drugs to provide essential maternal and newborn are in place and are in good working order
- Each pregnant woman receives an individual record card on which details of maternal and newborn care are given, including all action taken, advice and treatment given, the results of all tests and examinations and proposed plans for the actual birth; ideally, this record is held by the woman
- All skilled attendants are linked to, and have the capacity to refer any pregnant woman to, a facility capable of managing obstetric and newborn complications
- National or locally adapted evidence-based protocols and/or guidelines for the management of pregnancy-related complications are available and are widely distributed to all skilled attendants and other health care providers offering maternal and newborn care
- National and local health education activities and programmes are in place to promote the need for all women to access maternal and newborn care, and for all pregnant women, their partners and families to make a birth and emergency preparedness and readiness plan.

1.2.6 Application of standard

Recommended interventions are mostly based on available practices, backed up with reference as already mentioned in executive summary under the section standard references. Recommendations are presented into three categories:

- Recommended to all: This category indicates that intervention can be safely recommended
- Recommended only in specific contexts: This category indicates that the intervention or option is applicable only to the condition, setting or population specified in the recommendation, and should only be implemented in these contexts
- Not recommended: This category indicates that the intervention or option should not be implemented

1.2.7 Rationale

The rationale of standards for maternal and newborn care comprises two sections, namely the burden of suffering of the condition that the standard addresses, and the efficacy and effectiveness section which describes the importance of the recommendations and the evidence in support of the standard (IMPAC 2007).

Chapter 2: Preconception, Birth Preparedness, Complication Readiness and Care of Vulnerable Women

This chapter comprises the aim, approach, standard, and application of standard for preconception care, Birth preparedness and Complication Readiness (BPCR) and care of vulnerable women.

2.1. Preconception

Preconception care is defined as a set of interventions that are to be provided before pregnancy, to promote the health and well-being of women and couples, as well as to improve the pregnancy and child-health outcomes (WHO 2014).

2.1.1 Aim

To identify and modify biomedical, behavioural and social risks to the woman's health or pregnancy outcome through prevention and management.

2.1.2 Approach

The Life Course Approach (LCA) proposes that maternal and newborn health disparities are determined by the synergistic interaction of risk and protective factors over the life span of individuals (Lu MC 2010).

2.1.3 Standard statement, readiness and application

The preconception care package should be able to manage long-term health conditions (mental health issues, metabolic disorders and other chronic medical conditions—including obesity), assist in ceasing risky behaviours (counselling on smoking cessation, excessive alcohol intake and drug misuse) and promote healthy behaviours (regarding nutrition, folic acid and other supplements, vaccinations such as rubella, Sexually Transmitted Infection (STI) and cervical screening).

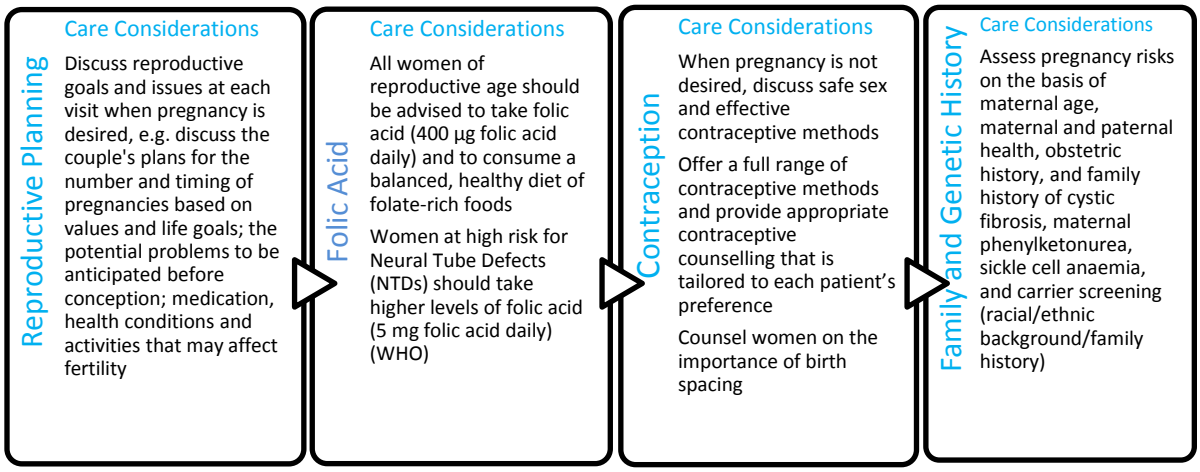
i. Readiness

- There should be national policies and protocols to support and emphasise preconception care
- Advocacy for policymakers, facility managers, providers, communities, families, and women should be carried out to develop preconception care culture
- There should be established links/referral pathways for reproductive medicine departments to discuss assisted reproduction in the context of medical illness if required

ii. Application of standard

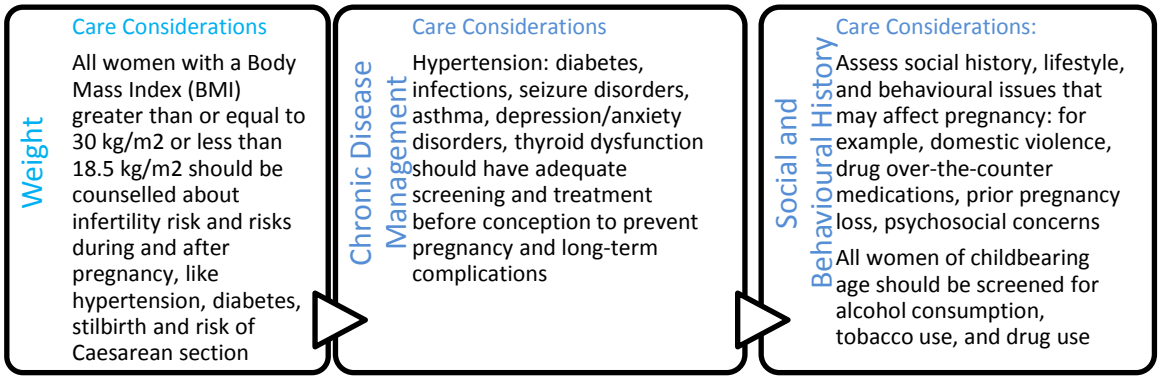
- Preconception care comprises a set of interventions that educates, counsels, and assesses the biomedical, behavioural, and social risks to the woman’s health

2.1.3.1 Standard for issues of reproductive health and genetic conditions



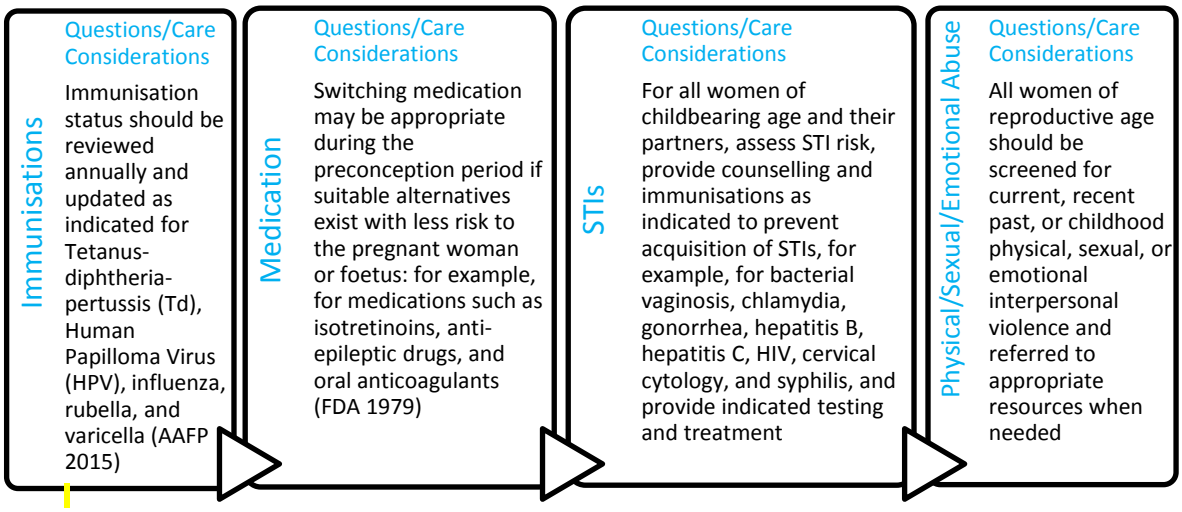
There is evidence that reproductive-life-plan-based information increased women's knowledge of reproduction, including folic acid intake to prevent NTDs, avoiding unwanted pregnancies, preserving fertility and understanding their own genetic conditions, to enhance preconception health.

2.1.3.2 Standard for chronic disease, and social and behavioural history



The preconception care package should be focused on issues such as poor food intake habits (problematic for weight gain), chronic and infectious diseases, psychosocial problems, domestic violence and substance use, which could adversely affect pregnancy outcomes.

2.1.3.3 Standard for immunisation, STI and physical sexual and emotional abuse



There is a relationship between infertility and physical, sexual and psychological violence and infertile women were more likely to encounter domestic violence. Numerous drugs or drug groups may cause birth defects in a developing foetus, so should be reviewed and pre-existing medical conditions (such as asthma, epilepsy, high Blood Pressure (BP), thyroid conditions or diabetes) must continue treatment with appropriate medications during pregnancy.

2.2 Birth Preparedness and Complication Readiness

BPCR is a strategy that helps women to consider all available maternal health care services during pregnancy and prepare for potential complications. There is evidence that promoting BPCR improves preventive behaviours, improves knowledge of mothers about danger-signs, and leads to improved care-seeking during obstetric emergency.

2.2.1 Aim

To increase use of skilled care at birth, and timely attendance at health facilities for obstetric and newborn complications.

2.2.2 Approach

A multi-disciplinary approach is appropriate in establishing roles of policymakers, facility managers, providers, communities, families, and women in ensuring that women and newborns receive appropriate, effective and timely care.

2.2.3 Standard statement, readiness and application

Standard statement

All pregnant women should have a plan for birth and dealing with unexpected adverse events, such as complications or emergencies that may occur during pregnancy, childbirth or the immediate postnatal period.

Readiness (IMPC 2006)

- National and local policies support all pregnant women having access to maternal and newborn health care, including referral care regardless of their socioeconomic situation or place of residence
- Health care system ensures that all health care providers that come into contact with pregnant women and their families have the capacities, including interpersonal communication and intercultural skills, to support the woman in preparing a birth and emergency plan
- Health care system ensures that all pregnant women are able to discuss and review their plan and emergency birth plan with a skilled attendant, ideally at each antenatal assessment but at least one month prior to the expected date of birth
- National and local health education activities are undertaken to promote the need for all women to access maternal and newborn health care, and for all pregnant women to make a birth and emergency plan during pregnancy
- National and local activities are in place to facilitate community action to participate in, or where necessary mobilise, local efforts to ensure the timely transfer of women and newborns with pregnancy- and birth-related complications, especially emergencies, to a facility that has the capacity to manage such complications or emergencies.

Application of the standards (IMPC 2015)

Preparing a birth plan

Health workers will provide information to help prepare a birth plan and can make suggestions as to where it would be best to deliver based on the health condition of the woman and foetus. Whether in a hospital, at a health centre or at home, it is important to deliver with a skilled attendant. At every visit to the health centre, the birth plan can be reviewed and discussed. The plan can be changed if complications develop.

When planning for delivery at home, consider:

- Who do you choose to be the skilled attendant for delivery?
- How will you contact the SBA to advise that you are in labour?
- Who will support you during labour and delivery?
- Who will be close by for at least 24 hours after delivery?
- Who will help you to care for your home and other children?

Prepare a clean and warm room or corner of a room and make sure that the following resources are available: the home-based maternal record; a clean delivery kit, which includes soap, a brush to clean under the nails, a new razor blade to cut the baby's cord, three pieces of string (about 20 cm each) to tie the cord and clean cloths of different sizes (for the bed, for drying and wrapping the baby, for cleaning the baby's eyes, and for mother to use as sanitary pads); warm covers for the mother and the baby; a warm spot for the birth to take place, with a clean surface or clean cloth; three bowls, two for washing and one for the placenta; plastic for wrapping the placenta; buckets of clean water and some way to heat it; water and soap for handwashing; a towel or cloth for drying the hands of the birth attendant; fresh drinking water; and fluids and food for the mother.

When preparing an emergency plan consider:

- Where should the woman go?
- How will she get there?
- Will she have to pay for transport to get there? How much will it cost?
- What costs will she have to pay at the health centre? How will she pay for this?

- Can she start saving for these possible costs now?
- Who will go with her to the health centre?
- Who will help to care for her home and other children while she is away?

When planning for delivery at a hospital or health centre consider:

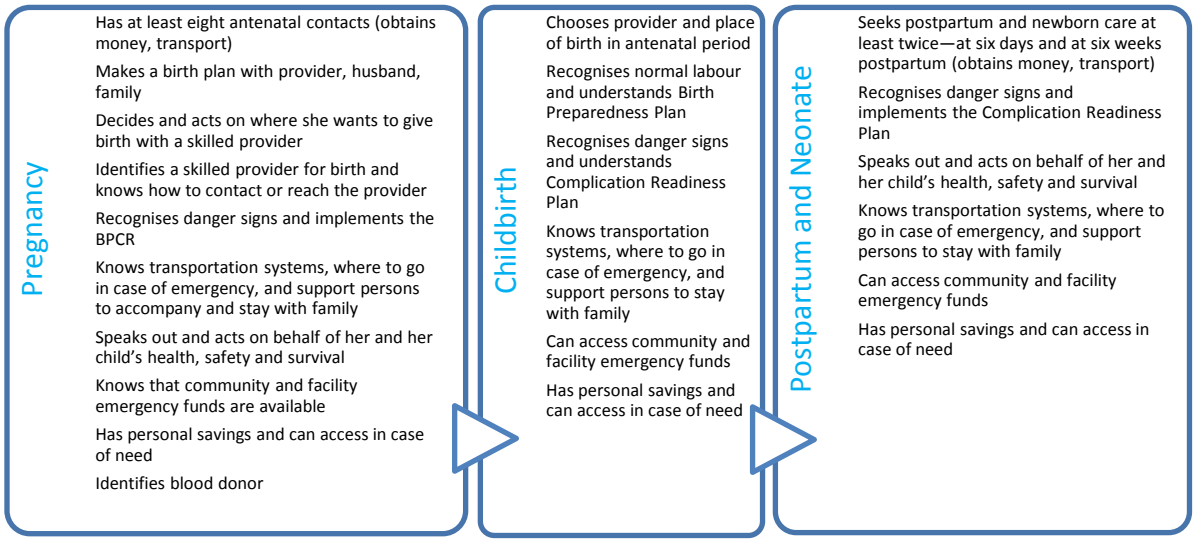
- How will the woman get there?
- Will she have to pay for transport to get there?
- How much will it cost to deliver at the facility? How will she pay for this?
- Can she start saving for these costs now?
- Who will go with her and support her during labour and delivery?
- Who will help her while she is away and care for her home and other children?

The woman should bring: her home- based maternal record; clean cloths of different sizes, for the bed, for drying and wrapping the baby, and for her to use as sanitary pads; clean clothes for her and the baby; and food and water for her and her support person.

The following matrix presents the standard for assessment of BPCR status, describing the respective roles of policy makers, facilities, providers and of the community, families, and women themselves. The proposed standard is a modified version of the matrix presented in the Maternal and Neonatal Health (MNH) Program, Birth Preparedness and Complication Readiness: A Matrix of Shared Responsibilities (Original BP/CR) Matrix Poster published in 2001. English introductory text revised in 2004).

The most important role in making pregnancy safer is that of the pregnant woman herself. Among preparations expected from mothers are as presented in the following table:

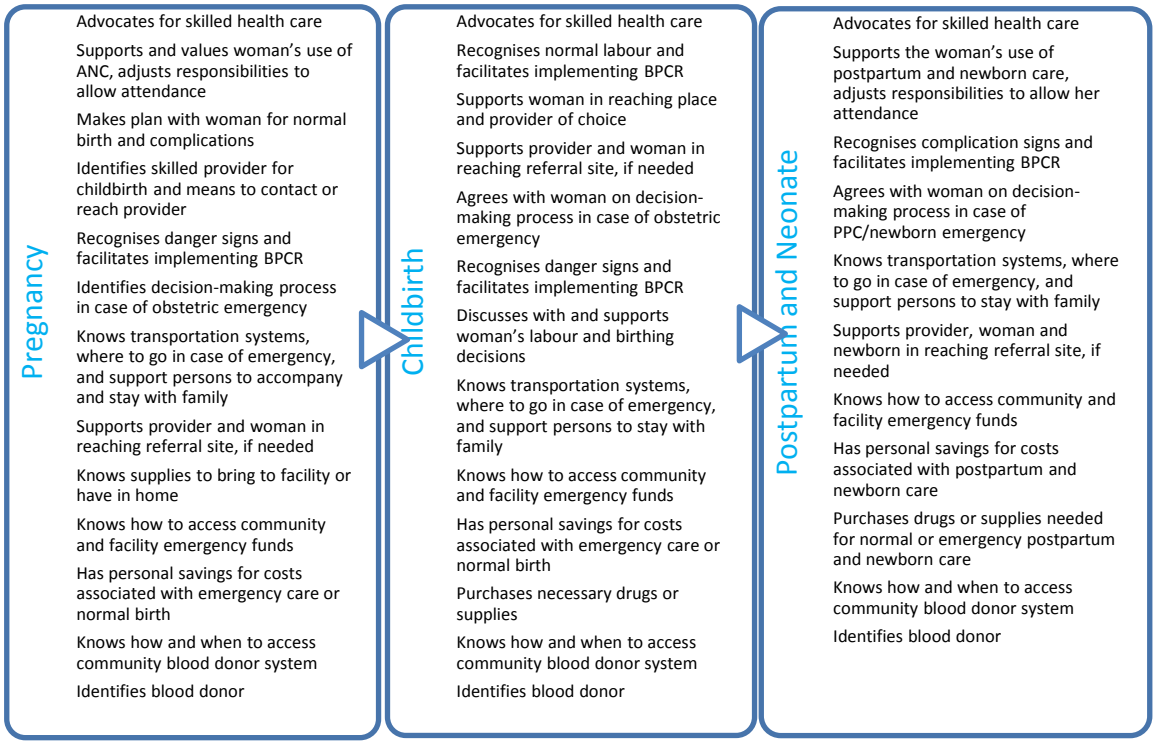
2.2.3.1 Standard for the assessment of BPCR status among women



BPCR can be measured by examining mothers' knowledge on identifying danger signs and the state of their preparations to take measures during emergency and normal obstetric care.

Family is the prime platform where safer pregnancy strategy starts. The dynamics between the male family member and the birthing woman has great influence on the woman's childbirth experience (Regmi et al. 2010). Family supports the pregnant woman to prepare her plans during pregnancy, childbirth and the postpartum period, and for the newborn.

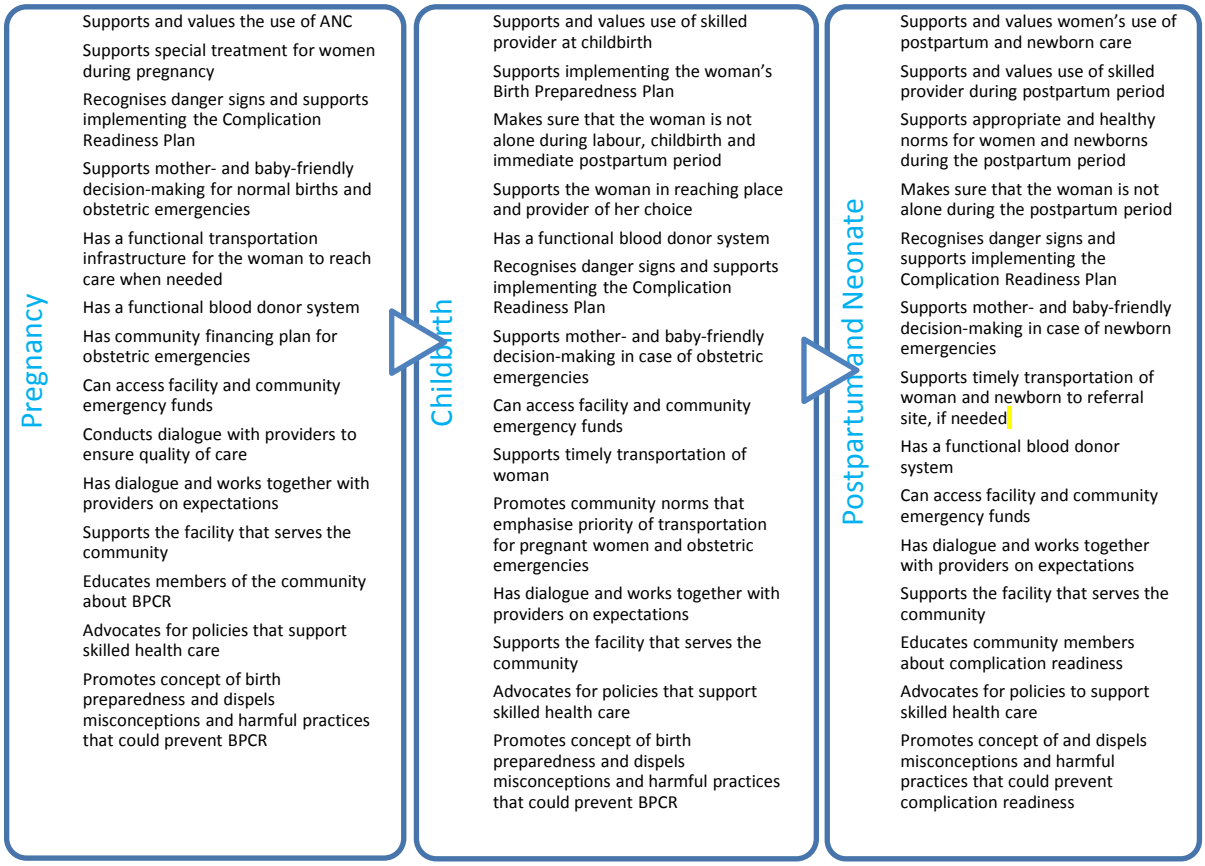
2.2.3.2 Standard for the assessment of BPCR status among family



When complications occur, the unprepared family wastes a great deal of time in recognising the problem, getting organised, getting money, finding transport, and reaching the appropriate referral facility. Detrimental delays in seeking care were mainly attributed to a lack of awareness of danger signs of complications during and after pregnancy or delivery among the pregnant woman and her family.

Various reviews and WHO guidelines have highlighted the standard of community participation for improved health (George et al. 2015). Involving communities in assessing their own needs and in developing strategies to meet those needs can increase intervention ownership and sustainability, while responsiveness to community needs in the planning and implementation of health programmes can help improve health equity, service delivery, and uptake of care (Marston et al. 2013).

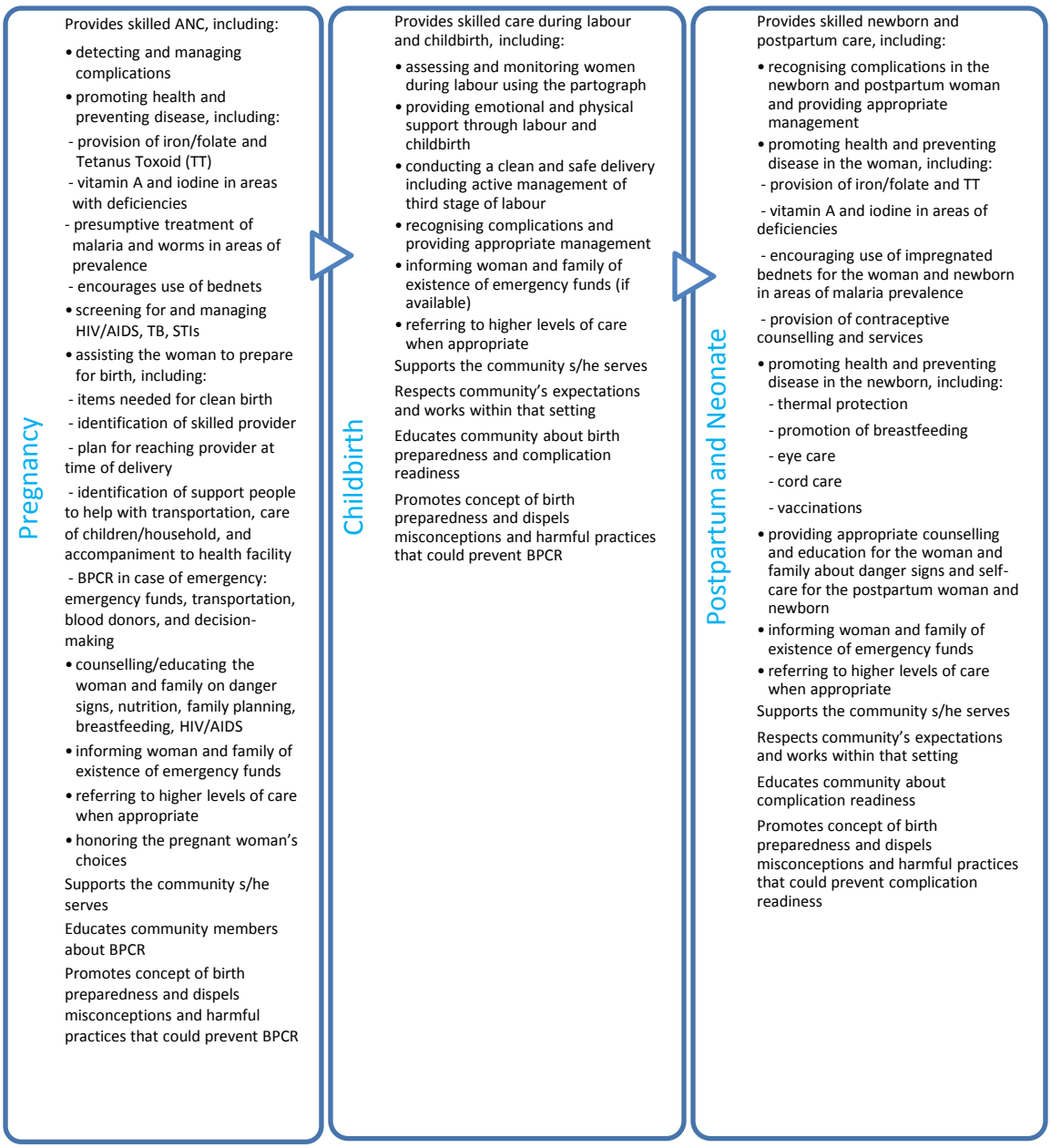
2.2.3.3 Standard for the assessment of BPCR status among the community



The SUMATA programme in Nepal, where the community mobilises advocates and counsels pregnant women and their families to be aware of and use local health services and to make arrangements for care at birth, is an example of a successful community empowerment programme to make pregnancy safer. Mobiliser used BPCR matrix for the evaluation of knowledge on birth preparedness and complication readiness among pregnant woman and her family.

Taking part in the preparation of BPCR may create a good opportunity for health professionals and health institutions to advise women to prepare for childbirth, make them aware of danger signs and encourage them to be attended by a SBA and to follow Postnatal Care (PNC).

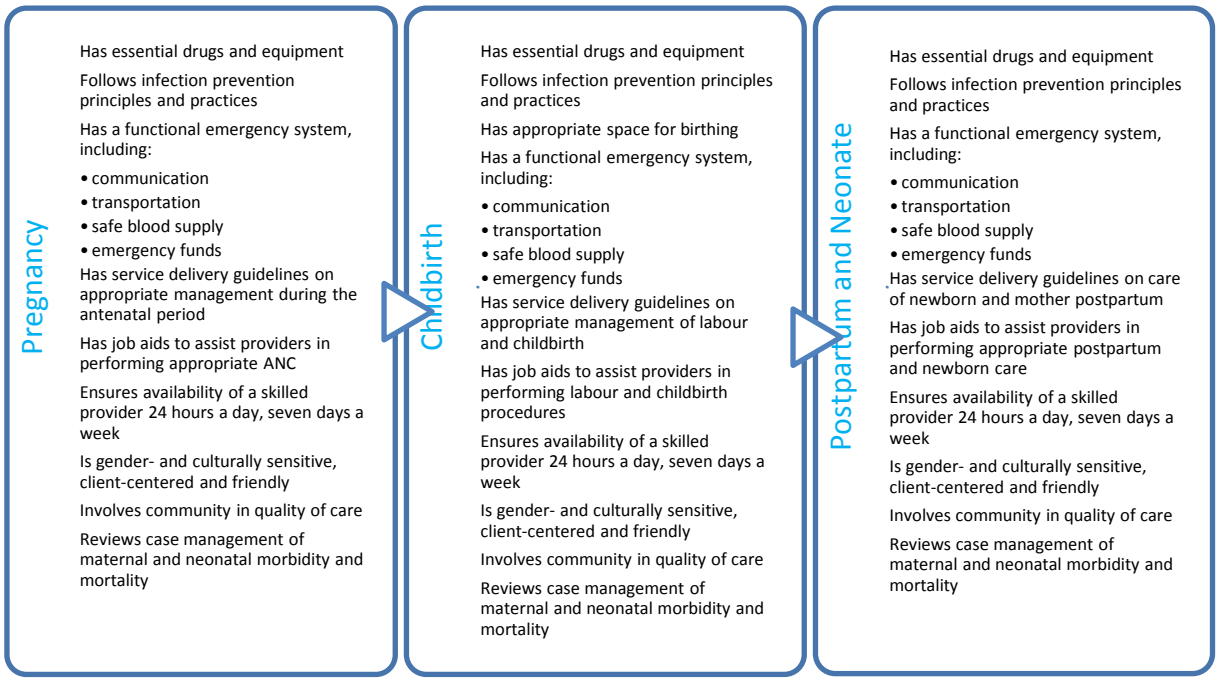
2.2.3.4 Standard for the assessment of BPCR status among service providers



Primary care providers play an important role in counselling teens on various aspects of reproductive and sexual health care; because sexual behaviours change during adolescence, continued discussions are needed to monitor these changes.

Health facilities need to be fully prepared to help women and families provide necessary facilities for safe pregnancy, labour and childbirth and the postpartum period in advance of their demands.

2.2.3.5 Standard for the assessment of BPCR status among facilities

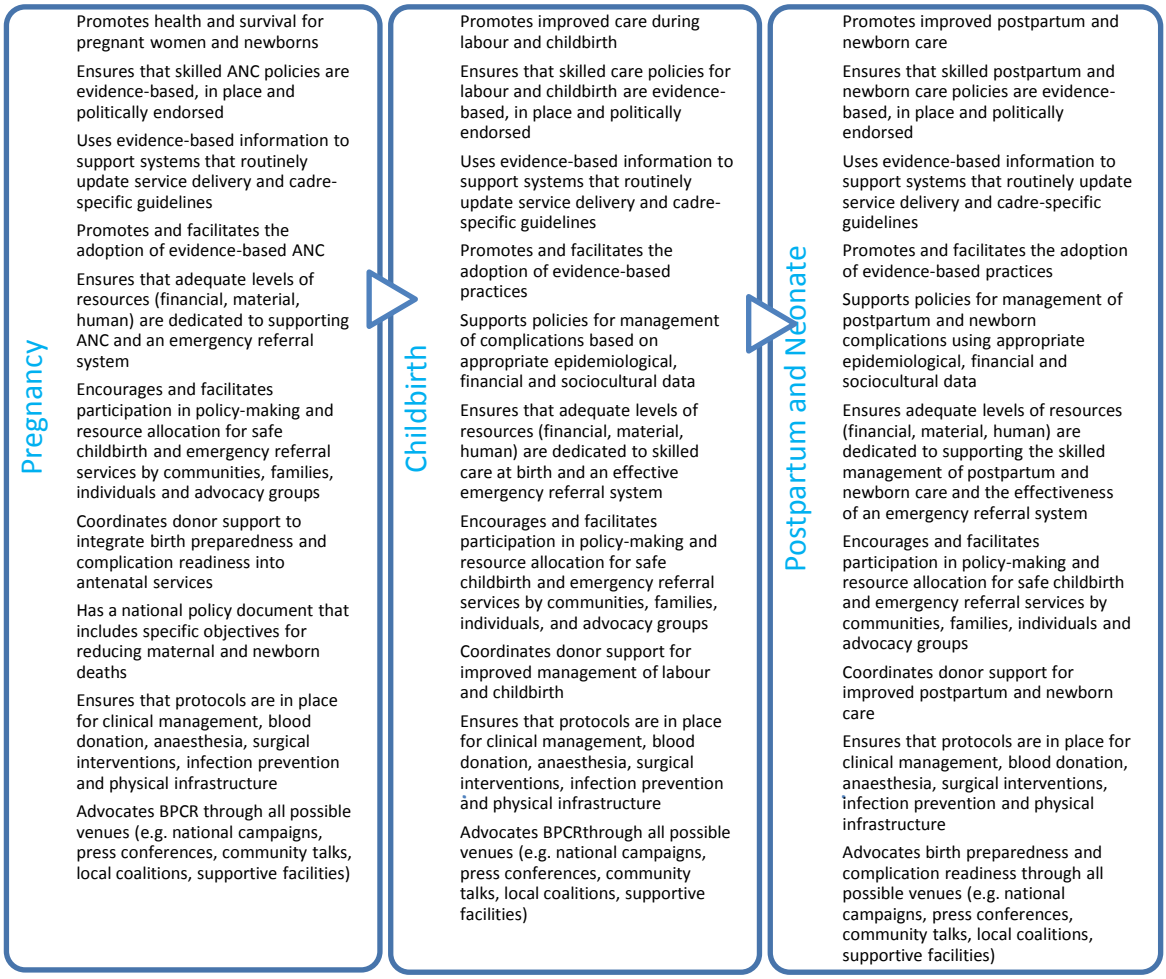


Standard in equipment, staff and management is crucial to help provide skilled care for pregnancy, childbirth and the newborn. The following list is adapted from proposed obstetric and newborn functions (Gabrysch et al. 2012):

- At least one nurse, midwife, general doctor, or obstetrician/gynaecologist at facility
- Functioning communication equipment (landline, mobile, or radio). This does not include private cell phones unless the facility reimburses the cost of phone calls
- Facility has a functioning motorised vehicle with fuel that is routinely available and can be used for emergency transportation, or access to a vehicle in near proximity that can be used for that purpose
- Facility routinely has electricity for lights and communication (at a minimum) from any power source during normal working hours; there has not been a break in power for more than two hours per day during the past seven days
- Toilet/latrine is classified using criteria: flush/pour flush to piped sewer system or septic tank or pit latrine; pit latrine (ventilated improved pit or other) with slab; composting toilet
- Improved water source, including the following: piped, public tap, standpipe, tubewell/borehole, protected dug well, protected spring and rain water
- Thermal protection: drying baby immediately after birth, skin-to-skin contact with mother, wrapping, no bath in first six hours
- Newborn intravenous fluid kit available in labour ward
- Newborn oxygen available in labour ward.

Policy makers must have in place a clear standard for the framework of an enabling environment to support the survival of pregnant women and newborns. The standard must demonstrate how policy makers affect the ability of women, families and communities, facilities and providers to prepare for normal birth and obstetric and newborn emergencies.

2.2.3.6 Standard for the assessment of BPCR status among policy makers



Based on behaviours and skills listed in the BPCR matrix, policy makers and program planners can develop appropriate programme interventions and activities to be adapted to local realities. Key interventions in the matrix can be made into checklists for evaluation.

2.3 Pregnancy, labour and childbirth and PNC for vulnerable women

The following section describes the background, aim, approach, and organisation of antenatal, labour and childbirth, and postpartum care for vulnerable women.

Approximately 11 per cent of women in their childbearing years are vulnerable. Vulnerable categories covered in NMS Volume III 2020 include: teenage pregnancy (<19 years at booking), substance abuse (alcohol or drugs), domestic violence, recent migrants, asylum seekers and refugees, learning disabilities, and physical disability (WHO 2015). Women living with disabilities struggle with social and environmental barriers related to maintaining health and well-being when compared with women who are not disabled (Iezzoni et al. 2013). Women with disabilities are not automatically considered high-risk, but certain medications, mobility limitations, and comorbidities may contribute to high-risk status (WHO 2011).

2.3.1 Aim

To ensure appropriate care during pregnancy, labour and childbirth and the postpartum period, taking into consideration both the health and social needs of vulnerable women.

2.3.2 Approach

A human-rights-based approach is the appropriate approach for maternal and newborn care for vulnerable women.

General considerations:

- Where a woman is undecided about continuing pregnancy, referral for advice and counselling about pregnancy choices (continuation or termination) may be appropriate
- For women who do not wish to continue with the pregnancy, there must be provision of safe abortion services
- To ensure a safe pregnancy and good-quality newborn health care, professionals should focus more on women's abilities than their disabilities (Smeltzer 2007)
- To ensure that maternity services address both the health and the social needs of women whose vulnerabilities have been identified, appropriate management and referral to specialist services are required
- Staff and other health care personnel should have adequate knowledge about the specific requirements of physically disabled women
- Enhancement in communication skills is desirable so as to provide better care to these women
- Maternal health provision is affected by social determinants and the health system, which together can perpetuate inequalities for disabled women
- Screening and other services that can improve vulnerable women's, lives should be accessible and free, regardless of their decision to become mothers or not (Breckenridge 2013)
- The vulnerability of migrants and other groups is exacerbated by other barriers, such as legal status, economic obstacles, language and cultural issues, as well as attitudes of health service providers
- Vulnerable groups are at greater risk of experiencing health disparities, including decreased access to high-quality care and lower rates of screening for both cervical and breast cancer, and are more likely to have unmet sexual and reproductive health needs (Iezzoni et al. 2015)
- Vulnerable women's living conditions make them more exposed to STIs and prone to mental health issues

- Availability of services, the extent of health care coverage, the need for health care insurance and the demand for out-of-pocket payment affect accessibility for vulnerable groups
- The opening hours of health care facilities may still be an issue for some women who need to be escorted, either for cultural reasons or because of impairments to their mobility
- Hospitals are fairly well equipped to cater to the needs of physically disabled women owing to availability of multidisciplinary care, functional elevators in hospital premises, accessibility of wards and Outpatient Departments (OPDs) to wheelchairs and hospital personnel being sensitive towards needs of these women
- Restrooms should be made accessible to wheelchairs and beds and examination tables should be of adjustable height and suitable for morbidly obese patients
- Audio facilities for visually challenged patients are needed. Information material in braille is required.

2.3.3 Standard statement, readiness and application

Standard statement

Care must be accessible, responsive and provided in partnership with women and their families, respecting their diverse health and well-being needs, preferences and choices; and in collaboration with other organisations whose services impact on family well-being.

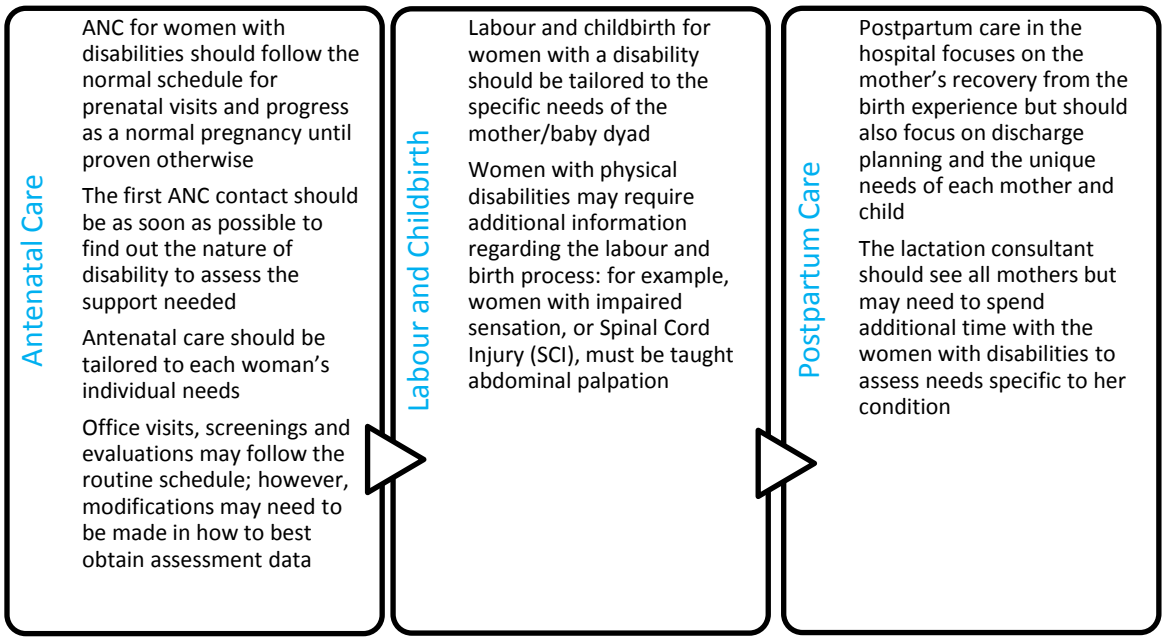
Readiness

- There should be a structure that addresses the requirements of the relevant vulnerability of women
- Legislation that includes safeguarding policies and collaboration with the relevant local networks should be in place
- There should be protocols on the content and format of written communication, in particular about transfer of care between professionals
- Trained health care personals should be present
- Infrastructure should be sufficient to address physical disability.

Application of standards

Care is provided in a chosen, comfortable, clean, safe setting that promotes the well-being of women, families and staff, respecting women's needs, preferences and privacy; and the physical environment supports normality and compassionate care.

2.3.3.1 Standard for ANC, labour and childbirth, and PNC for vulnerable women



Maternal health for vulnerable women needs urgent improvement with involvement of different actors and organisations. Midwives can play a crucial role in improving maternal care for vulnerable women as they provide holistic care which better serves their needs. They can function in both formal and informal settings and offer continuous and personalised care. A pregnant woman with disability should be linked with FCHVs throughout her pregnancy, labour, childbirth, and postpartum period.

Chapter 3: Management of Antenatal Period

ANC is the care provided to a pregnant woman by skilled health-care professionals throughout pregnancy to ensure the best health conditions for both the pregnant woman and the growing foetus. ANC remains an essential tool in reducing maternal and newborn morbidity and mortality. This chapter describes the aims, approaches, standard statements and application of standards of care for ANC.

3.1 Aim

The aim of ANC is to achieve a healthy mother and a healthy baby at the end of a pregnancy through evidence-based support and interventions to identify, prevent, reduce and manage risk.

3.2 Approach

Commonly practised approaches to ANC include: traditional ANC, Focused ANC (FANC), Basic ANC (BANC), Group ANC (GANC), Crisis-time ANC (CANC), and the new Eight-contacts ANC (8ANC) approach. We recommend the new WHO 8ANC approach and, of course, CANC as and when required.

i. The traditional approach

The traditional form of ANC has developed from the early 1900s (Dowswell et al. 2015). Traditional ANC consists of monthly visits from the first to the 28th week, fortnightly visits from the 28th to 36th week and weekly visits after the 36th week to delivery and from the 38th to the 42nd week.

ii. FANC model

Focused ANC was instituted in 2002 by the WHO in an attempt to overcome the challenges posed by the traditional antenatal model of care, such as classifying pregnant women into high risk or low-risk groups based on pre-identified criteria, and the possibility of the low-risk group developing complications at delivery (Kearns et al. 2017). This model includes four ANC visits occurring between eight and 12 weeks of Period of Gestation (POG), between 24 and 26 weeks, at 32 weeks, and between 36 and 38 weeks.

iii. BANC approach

BANC has been simplified to provide possible basic ANC services which can be provided by every Primary Health Care (PHC) clinic's midwife. Because BANC is a modified version of the FANC approach, it has many characteristics similar to FANC, i.e. focusing on early ANC attendance by all pregnant women and on limiting the total number of ANC contacts to four or five contacts per pregnancy for low-risk women (Pattinson et al. 2005).

iv. New WHO-recommended 8ANC

The 2016 WHO guidance recommendation on ANC contact schedules emphases to increase the number of ANC contacts from four to eight, based on the evidence that women were less satisfied with the four-visit approach.

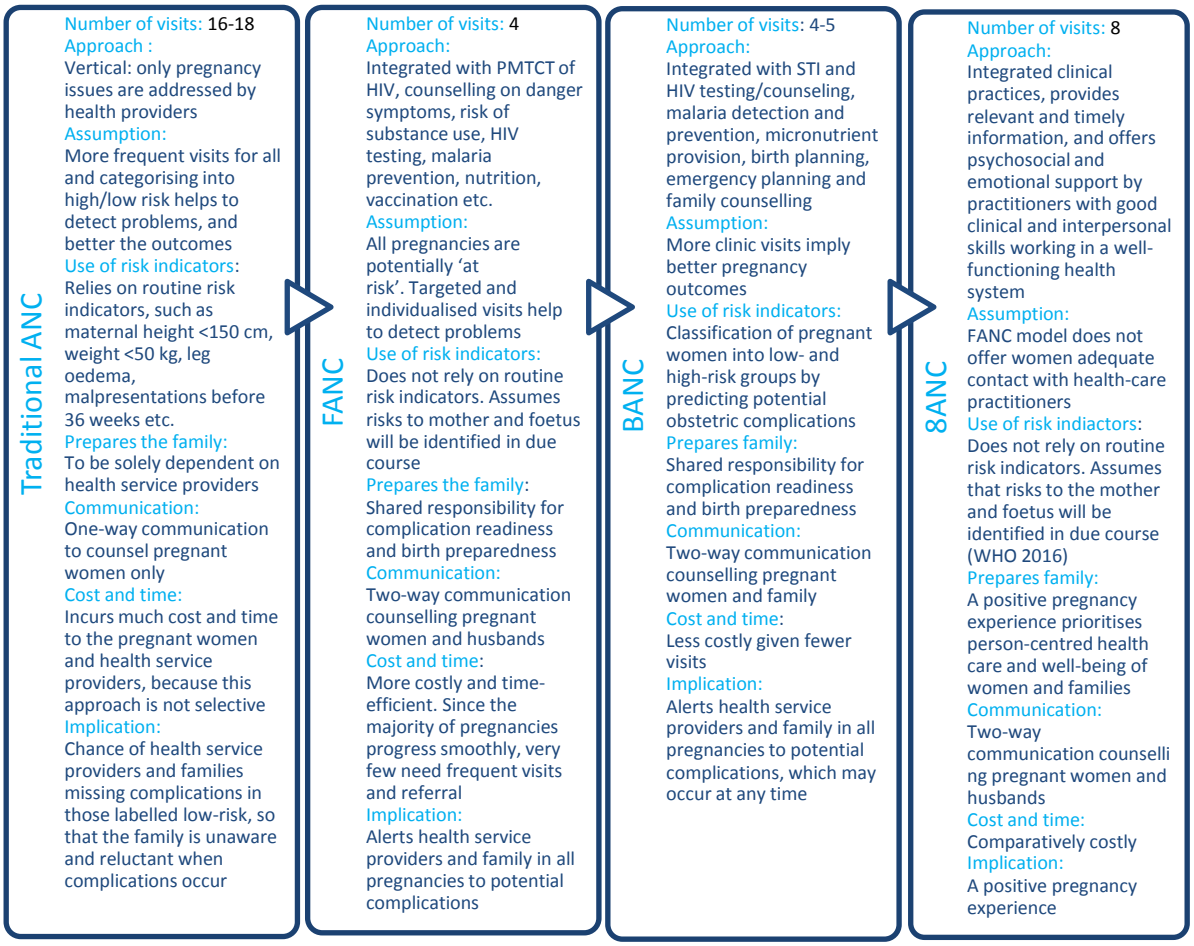
v. GANC approach

GANC is an new, emerging new concept whereby ANC is provided by qualified health care professionals and may be offered as an alternative to individual ANC for pregnant women in the context of rigorous research (WHO 2016), depending on a woman's preferences and provided that the infrastructure and resources for delivery of GANC are available.

vi. CANC approach

In crisis situations there should be a contingency health care model for safer reproductive care. In order to minimise disease transmission during outbreaks, to reduce potential risks during conflict, and to provide minimum care during disasters, an optimum number of ANC contacts has to be set based on the facilities available in a particular area. Contacts, mandatory tests and prescriptions should take place at the same contact time. Minimum steps would be comprised of: diagnosing and locating pregnancy; baseline and screening tests; foetal growth and well-being; maternal nutrition and health; and plan for safe delivery. During crisis situations, ANC should be customised according to the nature, severity and duration of the crisis.

3.2.1 Comparison of various approaches of ANC



We recommend the WHO eight-contact approach because evidence supports the view that an increased number of contacts helps the timely detection of problems. Frequent contact between pregnant women and health care practitioners is likely to build a good rapport, resulting into a positive pregnancy experience (WHO 2018). The recommended eight-contacts approach does not rely on routine risk indicators. While the risk-oriented approach often results in a tendency to focus on the risk conditions of women, the new eight-contact model assumes that risks to the mother and foetus will be identified in due course.

A high-risk pregnancy is one that threatens the health or life of the mother or her foetus. It often requires specialised care from specially trained providers. In this volume, a standard risk scoring format is used to identify risk:

Risk scoring

Prenatal Risk Assessment:		Low Score = Score 0-2; Medium Risk = 3-6; Extreme Risk = Score 7			
Reproductive History		Associated Conditions		Present Pregnancy	
Age Under 16 or Over 35	1…..	Chronic Renal Disease	2…..	Bleeding: <20 weeks	1…..
Parity 0 or Over 5	1…..	Diabetes: Gestational	2…..	After 20 weeks	1–3…..
Habitual Abortion	1…..	Class B or Higher	3…..	Anaemia Hematocrit <34	1…..
Infertility	1…..	Cardiac Disease	1–3…..	Prolonged Pregnancy >42 weeks	3…..
Postpartum Haemorrhage (PPH), Manual Removal of Placenta (MRP)	1…..	Major Gynaecological Surgery, Cone Biopsy	2…..	Hypertension, Pre-eclampsia	2–3…..
Previous Baby >4050 g	1…..	……	1–3…..	PROM	3…..
$<5^{1/2}$ lbs (2500 g)	2…..	……	1–3…..	Polydramnios	3…..
Previous Hypertension	1…..	……	1–3…..	Small for Dates	3…..
Previous Caesarean Section (CS)	3…..	Cigarette Smoking	1…..	Multiple Pregnancy	3…..
Previous Stillbirth/Neonatal Death (NND)	3…..	Teratogen/Drug Exposure	1–2…..	Breech >36 weeks	3…..
Prolonged Labour (>30 hours) or Difficult Delivery	1….	Significant Social problem……..	1–2…..	Rhesus (Rh) Negative. Sensitised?	1–3…..
……	1…..	Alcohol Use Screens	1–2…..	Excessive or inadequate weight gain	1–2…..
……	1…..	Domestic Violence…..	1-2…..	…….	1-3…..

However, risk scoring is not practised during ANC; rather, each pregnancy is cared for with equal attention. Some pregnancies become high-risk as they progress, while some women are at increased risk for complications even before they get pregnant for a variety of reasons. A careful obstetric history-taking helps diagnose the risk factors complicating current pregnancy as follows:

3.2.2 Standard for obstetric history-taking

Components of Obstetric History-taking
Presenting complaints: • Determine symptoms that bring the woman in History of presenting complaints: • Explore every symptom in chronological order from the time of their onset, their severity and aggravating or relieving factors • Relevant review system (Per Vagina (PV) bleeding, PV discharge, pelvic pain, dysmenorrhea, dyspareunia, foetal movements, contractions, headache, visual disturbance, epigastric pain, oedema) Menstrual history • Nature of menstrual cycle • Last Menstrual Period (LMP) Previous obstetric history • Each previous pregnancy in a chronological order with details such as attendance of ANC, place of delivery, period of gestation, type of labour, mode of delivery, indication of operative delivery, use of any anaesthesia or interventions during labour, presence of any complications at the time of labour or delivery • Details of each delivered baby, such as birthweight, Apgar score at birth, sex, time of birth, any complications, congenital anomalies, immunisations, history of breastfeeding. In case of stillbirth: fresh or macerated; in case of early NND: cause if known • Abortion: spontaneous or induced (medical or surgical); period of gestation; ectopic pregnancy, with type of management; molar pregnancy Medical history • Asthma

- Epilepsy
- Hypertension
- Congenital/valvular heart disease
- Diabetes – check if type 1 or type 2
- Systemic autoimmune disease, e.g. Systemic Lupus Erythematosus (SLE), rheumatoid arthritis
- Haemoglobinopathies: sickle cell anaemia, thalassaemias
- Blood-borne viruses: HIV, hepatitis B, hepatitis C
- Chronic infection, such as Tuberculosis (TB)
- Endocrine disorder, such as thyroid function
- Kidney/liver diseases
- Cystic fibrosis
- Any other significant illness

Treatment history

- History of any previous hospital admission
- Blood transfusion
- History of allergy to any drugs (specifically allergy to penicillin)
- History of immunisation against tetanus or administration of Rh immunoglobulins during her previous pregnancies
- Treatment for hypoglycaemic drugs, antihypertensive drugs, antiepileptic drugs or any long-term treatments

Surgical history

- Surgery in the past such as cardiac surgery, e.g. heart valve replacement; operations on the urogenital tract, e.g. CS, myomectomy, Loop Electrosurgical Excision Procedure (LEEP) or cone biopsy of the cervix, operations for stress incontinence and vesicovaginal fistula repair, any abdominal surgery etc.

Family history

- Diabetes
- Hypertension
- Genetic disorder/gross congenital anomaly
- Cancers specially of genital tract
- Chronic infections, TB in particular
- Psychiatric illness

Social history

- Employment/type of occupation
- Home circumstances
- Financial condition
- Domestic violence
- Marital status (current relationship with partner): single/married/separated/widow

Personal history

- History of behavioural factors (smoking or tobacco usage, alcohol usage, drug abuse, utilisation of prenatal care services etc.)

FP/contraceptive history

- Previous history of use of various contraception methods with details such as type of contraceptive devices used, duration of their use, date and reason of discontinuation, patient satisfaction, associated problems and complications

Nutritional history

- Dietary habits: vegetarian/non-vegetarian
- Food culture: food taboos/restrictions

Gynaecological history

- History of previous gynaecological problems, such as recurrent vaginal discharge, pelvic pain, Pelvic Inflammatory Disease (PID), fibroids, ovarian cysts, previous infertility etc.
- The clinician also needs to enquire if treatment (both medical and surgical) has been instituted for any of these problems

Summary of history

- This should include the woman's name, age, time since marriage, gravida, parity, any previous miscarriages, number of live children, weeks of gestation and any associated medical or surgical

diseases along with any other possible complications. This allows differentiation between a normal pregnancy and a high-risk pregnancy

It has been reported in literature that a thorough history can lead to correct diagnoses in about 75 per cent of cases; physical examination adds a further 12 per cent of diagnoses and investigations add another 11 per cent and also lead to cost-effective investigation (Bordage et.al. 1995; Schmitt et al. 1986; Peterson et al. 1992).

3.3 Standard statement, readiness and application

Standard statement

All pregnant women should have at least eight ANC contacts by or under the supervision of a skilled health professional. These should, as a minimum, include all interventions outlined in the new WHO (2016) 8ANC model and be spaced at regular intervals throughout pregnancy, starting as early as possible in the first trimester.

Readiness (IMPC 2006)

- A national policy and locally adapted guidelines are in place that protect the rights of all women, regardless of their socioeconomic status or place of residence, to access good-quality ANC services
- National evidence-based guidelines exist detailing the essential minimum components of ANC in the line with country epidemiological profile and country priorities and based on WHO guidelines and recommendations
- The health system ensures that sufficient skilled attendants are recruited and developed to be able to provide all women with good-quality ANC
- Services and care are organised to ensure that ANC is available, affordable and acceptable to all women in the service area, regardless of social, religious or ethnic backgrounds
- The health system ensures that all necessary equipment and drugs to provide essential ANC are available and in good working condition
- Each pregnant woman receives an individual record card on which details of ANC are noted, including details of history, physical examination, actions taken, advice and treatment given, the results of all investigations and proposed plans for the actual birth; ideally this record should be held by the woman
- All skilled attendants are linked to and have the capacity to refer any pregnant women to a higher-level facility capable of managing obstetric and newborn complications
- National or locally adapted evidence-based protocols and/or guidelines for the management of pregnancy-related complications are available and are widely distributed to all skilled attendants and other health care providers offering ANC
- National and local health education activities and programmes are in place to promote the need for all women to access ANC and for all pregnant women, their partners and families to make a birth and emergency preparedness plan.

Application of standards

ANC is the prevention of maternal and foetal discomfort and disease through a standard multidisciplinary directive comprising evaluation and appropriate medical and psychosocial support organised under:

- Primary prevention
- Secondary prevention
- Tertiary prevention.

While primary and secondary prevention are aimed at managing uncomplicated pregnancy, tertiary preventive management is designated for complicated pregnancy.

3.3.1 Primary prevention (management of uncomplicated pregnancy)

Primary prevention aims to prevent maternal and newborn discomfort and disease before it occurs, by:

- Preventing exposures to risk (educate to eat well, encourage regular exercise)
- Altering unhealthy unsafe behaviours (smoking, alcohol and drug abuse)
- Promoting maternal health (supplementation of nutrient-deficient diets, immunisation against infectious diseases).

Dietary counselling, education and advice

In low-income countries, maternal diets are often insufficient, and daily nutrient supplements are recommended to fill nutrient gaps.

Maternal and newborn outcome: Poor maternal diet leads to Intrauterine Growth Restriction (IUGR), Low Birth Weight (LBW), and increased risk of adult Non-communicable Disease (NCD). The significant relationship between energy and protein intake and birth outcome is one of the major causes of LBW and preterm delivery in Nepal (Acharya et al. 2016).

Diagnosis: Weight gain during pregnancy. The 2009 Institute of Medicine guidelines recommend a total weight gain of 6.8–11.3 kg (15–25 lb).

3.3.1.1 Standard for antenatal dietary education

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Dietary counselling	Counsel woman on healthy eating and recommend taking one extra meal during pregnancy and two extra meals during breastfeeding (Suaahara Project)	For undernourished populations: increasing daily dietary energy and protein to reduce the risk of low-birth-weight newborns	For undernourished populations: high-protein supplementation for pregnant women to improve maternal and perinatal outcomes

Fundamental aspects of healthy dietary behaviours during pregnancy include: consuming foods that contain optimal amounts of energy as well as macro- and micronutrients, achieving appropriate weight gain, adhering to general and pregnancy-specific food safety recommendations and avoiding alcohol, tobacco and illegal drug (Cook et.al. 2016).

Micronutrient supplement advice

The increased requirements of the mother and developing foetus mean that iron folate, calcium, and vitamin A are commonly deficient during pregnancy.

i. Iron and folate

Iron deficiency anaemia is extremely common, particularly in the developing world. Iron deficiency accounts for 75 per cent of cases of non-physiological anaemia in pregnancy, and the incidence of iron deficiency anaemia during pregnancy world-wide is about 41.8 per cent (Horowitz et al. 2013).

Maternal and newborn outcome: Perinatal infection, pre-eclampsia, bleeding, IUGR, prematurity, and LBW (Milman 2012).

Diagnosis: Haemoglobin (Hb) estimation, peripheral blood smear

3.3.1.2 Standard for antenatal iron and folic acid supplementation

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Iron and folic acid	Daily 60 mg of oral elemental iron and 400 mcg (0.4 mg) of folic acid to prevent maternal anaemia, puerperal sepsis, LBW, and preterm birth (WHO 2012)	Intermittent higher dose of oral iron and folic acid supplementation once a week: if daily iron is not acceptable due to side-effects; or in populations with anaemia prevalence among pregnant women of less than 20%, to improve maternal and newborn outcomes	Iron along with multiple micronutrient supplementation to improve maternal and perinatal outcomes (Haider et al. 2015)

Some women have a higher chance of having a NTD. For those women, a higher dose of 5 mg of folic acid each day is advised until 12 weeks of pregnancy.

ii. Calcium

Calcium supplementation has the potential to reduce adverse gestational outcomes, particularly by decreasing the risk of developing hypertensive disorders during pregnancy (Hofmeyr et al. 2012).

Maternal and newborn outcome: Preterm birth, IUGR, LBW and poor foetal mineralisation (WHO 2013).

Diagnosis: Serum level

3.3.1.3 Standard for antenatal for calcium supplementation

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Calcium supplementation	WHO and the Food and Agriculture Organisation (FAO) of US recommended a dietary intake of 1200 mg/day of calcium (WHO 2013) and, in addition, 1.5g of calcium supplementation	Populations with low dietary calcium intake increase dose/day divided into three doses to reduce the risk of pre-eclampsia, from 20 weeks until the end of pregnancy (WHO 2013)	

Determination of the dietary calcium intake of an individual woman is a complex task.

iii. Vitamin A

Vitamin A deficiency remains a significant public health concern worldwide, especially in portions of Africa and Southeast Asia. Indeed, 19 million pregnant women are thought to be affected by this nutritional deficiency (McGuire 2011).

Maternal and newborn outcome: Important for immune function and foetal growth and development

Diagnosis: Serum level

3.3.1.4 Standard for antenatal vitamin A supplementation

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Vitamin-A supplementation		In area where vitamin A deficiency is a severe public health problem, vitamin A should be supplemented and continued for a minimum of 12 weeks during pregnancy until delivery (McGuire 2011)	Current evidence indicates that vitamin A supplementation in normal pregnancy does not reduce the risk of illness or death in mothers or their infants

Although pregnant women are susceptible to vitamin A deficiency throughout gestation, susceptibility is at its highest during the third trimester of pregnancy owing to accelerated foetal development and the physiological increase in blood volume during this period.

Vaccination

Vaccination during pregnancy directly protects the foetus and infant via transferred antibodies from the mother to the foetus. It is a cost-effective strategy to improve pregnancy outcomes, specifically for developing countries like Nepal. Vaccination during pregnancy also serves to boost immunity and increase the duration of protection in those pregnant women who had not received the full set of recommended booster doses.

i. Tetanus

Maternal and Newborn Tetanus (MNT) has been among the most common life-threatening consequences of unclean deliveries and umbilical cord care practices, and serves as an indicator of inequity in access to immunisation and other maternal, newborn, and child health services (WHO/UNICEF 2018).

Maternal and newborn outcome: Generalised muscle spasm, respiratory compromise, and autonomic dysfunction.

Diagnosis: Clinical presentation and examination

3.3.1.5 Standard for antenatal Td vaccination

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended

Td vaccination	Td-1: On first contact with the health care system or as soon as possible during pregnancy Td-2: At least four weeks after Td-1 Td-3: Six months to one year after Td-2 or during the following pregnancy Td-4: One to five years after Td-3 or during the following pregnancy Td-5: One to ten years after Td-4 or during the following pregnancy	If previously fully immunised give only Td-1 after one month If pregnancy occurs within three years of last pregnancy and two Td doses were received, give only Td-Booster	

The Td vaccine is a combination of tetanus and diphtheria, with a lower concentration of diphtheria antigen (d). To avoid the threat of diphtheria outbreaks, WHO (1998) has recommended that all countries replace TT with Td for vaccination of women of reproductive age (and/or pregnant women as per national immunisation target), older children and adolescents to improve protection against diphtheria.

ii. Hepatitis

Viral hepatitis is caused by hepatitis A, B, C, D and E viruses. Hepatitis A, B or C, do not seem to influence the course of pregnancy. Hepatitis E infection in the third trimester, especially with genotype 1, is associated with more severe infection and might lead to fulminant hepatic failure and maternal death (Centers for Disease Control and Prevention (CDC 2006). Mother-to-infant transmission of hepatitis A seems to be very uncommon. The majority of Hepatitis-B-surface-Antigen- (HBsAg-) positive and Hepatitis-B-e-Antigen- (HBeAg-) positive mothers can transmit the disease vertically. Timing of transmission is predominantly peripartum.

Maternal and newborn outcome: Miscarriage, stillbirth, preterm labour, abruptio placentae and Premature Rupture of Membrane (PROM). In rare cases mother-to-foetus transmission occurs, resulting in foetal ascites, meconium peritonitis, newborn icteric Hepatitis A Virus (HAV) infection, and distal ileum perforation (Motte et al. 2009).

Diagnosis: Serological testing for a virus-specific diagnosis and by biochemical assessment of liver function

3.3.1.6 Standard for antenatal hepatitis vaccination

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
Hepatitis A vaccination		Decision based on risk vs. benefit: at high risk for exposure to HAV, give two doses, 6–12 months apart; it is safe during pregnancy (Motte 2009)	
Hepatitis B vaccination		Pregnant women who are identified as being at risk for HBV infection during pregnancy (e.g. having more than one sex partner during the previous six months, being evaluated or treated for an STI, recent or current injection drug use, or having had an HBsAg-positive sex partner): give three doses, usually over six months. Safe to continue vaccine series during pregnancy too (CDC 2011)	
Hepatitis E			Regarding safety

vaccination			during pregnancy, currently licensed hepatitis E vaccine there are no data on vaccine immunogenicity (Wu T et al.2012)

The safety of hepatitis A vaccination during pregnancy has not been determined; however, because the hepatitis A vaccine is produced from inactivated HAV, the theoretical risk to the developing foetus is expected to be LBW. Available vaccines contain non-infectious HBsAg and should cause no risk of infection to the foetus (CDC 2006); however, safety for Hepatitis E Vaccination has not been sufficiently established so not recommended at this time.

iii. HPV

Infection during pregnancy is not well studied; however, there has not been any association with an increased risk of birth defects (Griffin 2020).

Maternal and newborn outcome: Chorioamnionitis, hypertensive disorders of pregnancy, and Gestational Diabetes Mellitus (GDM), preterm deliveries, foetus Small for Gestational Age (SGA) (Narducci et al. 2012).

Diagnosis: Novel HPV biomarkers (HPV Deoxyribonucleic Acid (DNA) test)

iv. Influenza

Influenza vaccination is an essential element of preconception, antenatal and postnatal care because influenza can result in serious illness, including a higher chance of progressing to pneumonia, when it occurs during the antenatal or postpartum period. In addition to hospitalisation, pregnant women with influenza are at increased risk of intensive care unit admission and adverse perinatal and newborn outcomes (Fell 2017).

Maternal and newborn outcome: Miscarriage and preterm birth.

Diagnosis: A rapid influenza antigen test confirmed by Reverse Transcription Polymerase Chain Reaction (RT-PCR). Confirm either by RT-PCR or culture.

3.3.1.7 Standard for antenatal Human papilloma and influenza vaccination

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
HPV vaccination		If a woman is found to be pregnant after initiating the vaccination series, the remainder of the three-dose series should be delayed until completion of pregnancy (CDC 2015)	
Influenza vaccination		At any time throughout pregnancy, during the influenza season, for pregnant women who are at higher risk for severe illness and complications from influenza (CDC 2013)	Live attenuated influenza vaccine (CDC 2013)

Guidelines on pregnancy and HPV vaccine are based on limited data regarding inadvertent vaccination during pregnancy or during the periconceptional period. Pregnancy testing is not needed before vaccination for papilloma. If a vaccine dose has been administered during pregnancy, no intervention is

needed. In the case of influenza, data from safety reporting systems have demonstrated the safety of influenza vaccination during pregnancy (Omer et al. 2012).

Management of common discomforts in pregnancy

In most women common discomfort can be managed with simple dietary and lifestyle advice and reassurance that it will not have an adverse effect on pregnancy. However, some women may require pharmacological treatment. Common discomforts in pregnancy are:

- Nausea: A combination of hormonal, psychological, and neurological factors may have a causal effect on nausea and vomiting during pregnancy
- Heartburn: Heartburn is a common complaint during pregnancy and usually resolves soon after delivery (Juan 2015)
- Constipation: Decreased gastrointestinal motility, prolonged transit time, and displacement of the intestines upward and outward predispose the pregnant patient to constipation
- Oedema: Several mechanisms result in oedema during pregnancy. Pregnant women experience peripheral arterial vasodilation with a resultant decreased filling of arterial circulation

Maternal and newborn outcome: Mild maternal discomfort

Diagnosis: Signs and symptoms and biochemistry

3.3.1.8 Standard for management of common discomforts during pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
Nausea	Dietary and lifestyle changes	If not resolved with lifestyle changes, use complementary treatments like ginger, antihistamines and anti-emetic medications	
Heartburn	Lifestyle advice to prevent and relieve symptoms of heartburn includes avoidance of large, fatty meals and alcohol, cessation of smoking, and raising the head of the bed to sleep (WHO 2016)	Antacids, but should not be taken within two hours of iron and folic acid supplements as they may impair absorption of other drugs	
Leg cramps	Magnesium, calcium or non-pharmacological treatment options can be used for the relief of leg cramps in pregnancy, based on a woman's preferences and available options (WHO 2016)		
Constipation	Dietary modification	Wheat bran or other fibre supplements can be used to relieve constipation in pregnancy if the condition fails to respond to dietary modification, based on a woman's preferences and available options (WHO 2016)	

Varicose vein and oedema	Compression stockings, leg elevation and Sitz baths help reduce varicose veins and oedema		

Physiological changes occur in pregnancy to nurture the developing foetus and prepare mother for labour and delivery. Some of these changes influence normal biochemical values while others may mimic symptoms of medical disease. Thus, it is important to differentiate between normal physiological changes and disease pathology.

Substance abuse

Prenatal substance abuse is a critical public health concern that is linked with several harmful maternal and foetal consequences. The toxic effect of substance (tobacco, alcohol, and drug) use adversely affects the quality and quantity of proper nutrient supply and energy intake throughout pregnancy and the postpartum period (Giorgia 2018). Lack of essential nutrients results in both maternal and newborn suboptimal health outcomes (Young 2014).

i. Tobacco exposure

Tobacco use among women is more prevalent in Nepal than other South-East Asian countries. The adverse effects of its use are not limited to the pregnant women, but also compromise the health of the growing foetus (Barakoti et al. 2017).

Maternal and newborn outcome: Increased risks for ectopic pregnancy, PROM, abruptio placentae, placenta previa, miscarriage, stillbirth, preterm birth, LBW, SGA, Congenital Malformation (CMF) such as cleft lip and risk of Sudden Infant Death Syndrome (SIDS) (CDC 2017).

Diagnosis: History

ii. Alcohol use

Evidence suggests that a substantial proportion of women consumed alcohol during pregnancy and the postpartum period with high consumption frequency, as it is a cultural practice of some ethnic groups of Nepali women (Aryal et al. 2016).

Maternal and newborn outcome: Spontaneous abortion, stillbirth, preterm birth, IUGR and LBW, and can result in lifelong cognitive, behavioural and neurodevelopment disabilities for the child (O'Leary et al. 2012).

Diagnosis: History

iii. Drug use

Using illegal drugs early in pregnancy can cause birth defects and miscarriage. During later weeks of pregnancy, illegal drug use can interfere with growth of the foetus and cause preterm birth and foetal death. The most commonly misused drug is opioid.

Maternal and foetal outcome: Opioid use in pregnancy is correlated with a greater risk of LBW, respiratory problems, third trimester bleeding, toxaemia and mortality (Patrick et al. 2012).

Diagnosis: History, and signs and symptoms

3.3.1.9 Standard for antenatal screening for substance use

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Tobacco exposure screening	Ask all pregnant women about past and present exposure to second-hand smoke as early as possible in the pregnancy and at every ANC, as there are benefits of quitting before the 15th week. of pregnancy (Diamanti et al. 2019)		Prescribing medicine, as there is little evidence to support the use of pharmacological interventions
Alcohol use screening	Ask all pregnant women about past and present alcohol use as early as possible in the pregnancy and at every ANC contact, as the foetus is most vulnerable to structural damage due to the effects of alcohol exposure in the first trimester (Diamanti et.al. 2019)		
Drug use screening	Ask all pregnant women about their past and present use of drugs as early as possible in the pregnancy and at every ANC contact (Diamanti et al. 2019)		

Health care providers should employ a flexible and harm reduction approach to care of pregnant women who use alcohol, tobacco or drugs. Pregnant women at risk of problematic substance use should be offered brief interventions and referral to community resources for further psychosocial interventions (Alice et al. 2017).

Physical exercise during pregnancy

Physical activity is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (Hailemariam et al. 2020).

Maternal and newborn outcome: Mild exercise helps reduce fatigue, stress and anxiety, depression, excessive gestational weight gain and conditions such as GDM, pre-eclampsia, preterm birth, varicose veins and deep vein thrombosis.

3.3.1.10 Standard for physical activity and exercise during pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Physical activity and exercise	Normal activity and several types of physical exercise can be practised by pregnant women (ACOG 2015) Aerobic exercises aiming at gaining strength and involving more expressive Cardio Vascular System (CVS) adaptations and resistance exercises under close supervision are recommended Within aerobic exercise, bicycle ergometer pedalling, swimming, dancing, using an arm ergometer, walking, and climbing stairs (Parther et al. 2012)		With obstetric complications: cervical incompetence, cerclage, multiple gestation pregnancy with risk of preterm delivery, persistent bleeding in the second and third trimesters, placenta previa before 26 weeks of gestational age, preterm labour during the current pregnancy, hypertensive disorder. Heavy exercise (Evenson et al. 2014)

Women get numerous benefits from physical activity during pregnancy. However, due to physical changes that occur during pregnancy, special precautions are needed.

Domestic violence

Violence against women has a devastating effect on women's sexual and reproductive health and also affects the health of their newborns and children (WHO 2016). This phenomenon is a serious health and development concern, in addition to being a violation of a woman's human rights.

Maternal and newborn outcome: Maternal ill health because of poor nutrition, inadequate weight gain, increased prevalence of depression. Adverse newborn outcome comprises LBW, preterm birth and SGA and even maternal and newborn death (Alhusen et al. 2015).

Diagnosis: History and physical examination

3.3.1.11 Standard for antenatal screening for domestic violence

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
Screening for domestic violence	Should be strongly considered at ANC contacts when assessing conditions that may be caused or complicated by domestic violence in order to improve clinical diagnosis and subsequent care and to provide a supportive response	Referral when where appropriate (WHO 2016)	

Effects of domestic violence on maternal and newborn outcomes are multifaceted and largely preventable. Reproductive health care providers should be able to recognise and respond to violence and a structure should exist to refer patients on for appropriate support and follow-up.

3.3.2 Secondary prevention (management of uncomplicated pregnancy)

Secondary prevention aims to evaluate antenatal maternal and foetal well-being (through screening and diagnostic laboratory tests and imaging) that could be threatened by possible occurrence of various conditions (anaemia, Asymptomatic Bacteriuria (ASB), GDM, TB, HIV, syphilis), and use of prophylaxis to reduce the impact and recurrence of these conditions.

a. Antenatal evaluation of the mother and maternal well-being

i. Anaemia

The prevalence of anaemia among pregnant women in developing countries averages 56 per cent, with a range of 35 per cent to 100 per cent in various regions of the world. The prevalence of anaemia among pregnant women in Nepal was reported to be 40% in 2016, according to the World Bank collection of development indicators, compiled from officially recognised sources.

Maternal and newborn outcome: Increased risk of PPH, Pregnancy-induced Hypertension (PIH), placenta previa, cardiac failure, LBW and IUGR.

Diagnosis: Complete Blood Count (CBC) and serum ferritin level. A serum ferritin concentration <30 mcg/L together with Hb concentration <11 g/dL during the 1st trimester, <10.5 g/dL during the 2nd trimester, and <11 g/dL during the 3rd trimester is diagnosis for anaemia during pregnancy (Api et al. 2015). Classic laboratory findings of iron deficiency anaemia include a decrease in the Hb level, serum iron concentration, serum transferrin saturation, and serum ferritin level, an increase in total iron-binding capacity and microcytic-hypochromic blood picture.

ii. ASB

ASB refers to the presence of bacteria in urine. It is a condition in which urine culture reveals significant growth of pathogens, that is $>10^5$ bacteria/mL, but without any symptoms of Urinary Tract Infection (UTI) (Gilbert et al. 2005). ASB occurs in two to seven per cent of pregnant women (Nicolle et al. 2019). Antibiotic treatment for women with significant bacteriuria likely reduces the incidence of pyelonephritis and LBW (Wingert et al. 2019).

Maternal and newborn outcome: PIH, anaemia, preterm delivery, IUGR and LBW are commonly associated with pyelonephritis (Radha et al. 2017). Without treatment, as many as 20–35 per cent of pregnant women with ASB will develop a symptomatic UTI (Smail et al. 2019).

Diagnosis: Culture of midstream urine, and or urine culture. One positive midstream urine sample is diagnostic for ASB in pregnancy, whereas non-pregnant women require two.

iii. GDM

Hyperglycaemias first detected at any time during pregnancy should be classified as either GDM or diabetes mellitus in pregnancy (American Diabetes Association 2018). Diabetes mellitus in pregnancy differs from GDM in that hyperglycaemia is more severe and does not resolve after pregnancy as it does with GDM (ACOG 2018).

Maternal and newborn outcome: Preterm birth, pre-eclampsia, macrosomia, shoulder dystocia and increased chance for surgical delivery (Tan et al. 2009).

Diagnosis: GDM in pregnancy should be diagnosed at fasting plasma glucose level of 5.1–6.9 mmol/L (92–125 mg/dL). Otherwise, 1-hour plasma glucose level of 10.0 mmol/L (180 mg/dL), or 2-hour plasma glucose level of 8.5–11.0 mmol/L (153–199 mg/dL) following a 75 g oral glucose load recorded at any time.

Diabetes mellitus in pregnancy should be diagnosed at fasting plasma glucose level of 7.0 mmol/L (126 mg/dL), or 2-hour plasma glucose level of 11.1 mmol/L (200 mg/dL) following a 75 g oral glucose load or random plasma glucose level of 11.1 mmol/L (200 mg/dL) in the presence of diabetes symptoms (WHO 2016).

iv. TB

According to the World Bank, case detection rate (all forms) in Nepal was reported at 75 in 2018. Initiating TB treatment early is associated with better maternal and infant outcomes than late initiation (WHO 2016).

Maternal and foetal outcome: Increased risk of preterm birth, perinatal death and other pregnancy complications.

Diagnosis: Acid-fast Bacilli (AFB) smear microscopy. Test report to be a false positive or a false negative is common.

3.3.2.2 Standard for antenatal screening for anaemia, ASB, GDM, and TB

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommend
Screening for anaemia	Blood grouping and Rh typing, CBC, serum iron concentration, serum transferrin saturation, serum ferritin level, total iron-binding capacity, peripheral blood smear	In settings where CBC is not available, on-site Hb testing with a haemoglobinometer over the use of the Hb colour scale	
Screening for ASB	Urine culture	In settings where urine culture is not available, on-site midstream urine for Gram-staining preferred over the use of dipstick tests	
Screening for GDM	Fasting plasma glucose 5.1–6.9 mmol/L (92–125 mg/dL), 1-hour plasma glucose 10.0 mmol/L (180 mg/dL) following a 75 g oral glucose load 2-hour plasma glucose 8.5–11.0 mmol/L (153–199 mg/dL) following a 75 g oral glucose load at 24 to 28 weeks		
Screening TB		Exposure to known risk factors and in settings where prevalence of TB in the general population is 100/100,000 population or higher; systematic screening for active TB should be considered as part of ANC (WHO 2016)	

Physiological changes of pregnancy may unmask or worsen the picture of anaemia, ASB, and GDM; hence, early diagnosis and management of these conditions is important to improve maternal and newborn outcomes. The TB skin test and Interferon Gamma Release Assays (IGRAs) are safe in pregnancy.

v. HIV

According to the World Bank report (2017), the prevalence of HIV in Nepal (total percentage of the population aged 15–49) is 0.1 per cent; the number of estimated deaths caused by AIDS (Joint United Nations Programme on HIV/AIDS (UNAIDS) estimates) was 910 in 2018 in Nepal (Ministry of Health Nepal 2016).

Maternal and newborn outcome: Anaemia, preterm delivery, LBG, and IUGR.

Diagnosis: CDC recommended the opt-out approach to testing for pregnant women and rapid test in labour.

vi. Syphilis

Syphilis is a bacterial STI caused by Treponema pallidum that results in substantial morbidity and mortality.

Maternal and newborn outcome: Most untreated primary and secondary syphilis infections in pregnancy result in severe adverse pregnancy outcomes.

Diagnosis: Screening blood test by Venereal Disease Research Laboratory Venereal Disease Research Laboratory (VDRL) test and confirmed by Treponema Pallidum Haemagglutination Assay (TPHA) (WHO 2017).

3.3.2.3 Standard for antenatal screening of HIV (counselling)

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Counselling	During 1st contact, reasons for testing and the schedule of testing should be discussed with women Take woman's consent for the test	If agreed, keep patient's record and perform test If result is negative but has a positive partner, discuss of having Pre-exposure Prophylaxis (PrEP). Next test in 3rd trimester, preferably before 36 weeks if the pregnant woman is known to be at high risk for acquiring HIV If the report is reactive, schedule appointment to discuss results and refer to HIV specialists (The Clinician's Guide to Routine HIV Testing During Pregnancy 2019) Partners of pregnant women should also be encouraged to undergo HIV testing when their status is unknown (CDC 2018)	

No woman should be tested without her knowledge; however, no additional process or written documentation of informed consent beyond what is required for other routine prenatal tests is recommended for HIV testing. If a woman declines an HIV test, this should be documented in the patient record; continue to recommend an HIV test at the following visit and document in the patient record. However, hospital protocol should be followed in any surgical procedure when required.

3.3.2.4 Standard for antenatal screening of HIV and syphilis

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommend
Opt-out approach	During 1st contact, and as early in pregnancy as possible, reasons for testing and the schedule of testing should be discussed with women	Repeat HIV testing in 3rd trimester, preferably before 36 weeks, for those who had initial negative HIV antibody tests and are known to be at high risk of acquiring HIV infection	
Opt-in approach	HIV test should be offered in line with other ANC blood tests, as a matter of routine checkup		
Voluntary Counselling and Testing (VCT)	Conducted in health facilities/community-based settings/people's homes (Guidance		

	on provider-initiated HIV testing and counselling in health facilities), nevertheless maintaining privacy		
Rapid test		Women with undocumented HIV status at the time of labour (CDC 2018) Women who were not tested earlier in pregnancy or whose HIV status is unknown If a rapid HIV test result in labour is reactive, start Antiretroviral (ARV) prophylaxis immediately while waiting for supplemental test results	
Syphilis	All pregnant women during the 1st ANC contact should have VDRL test (WHO 2017)		

Evaluation of specific STIs, for example, HIV and syphilis, during pregnancy has been a longstanding public health recommendation. If the diagnosis of HIV infection is established, the woman should be linked into ongoing care with a specialist in HIV care during labour and delivery or during immediate postpartum period management (ACOG 2018).

b. Antenatal evaluation of foetus and foetal well-being

i. Maternal Assessment of Foetal Activity (MAFA)

Assessment of foetal activity is required when mother perceives a diminution in foetal movement. Mother counts foetal "kicks" as a means of antenatal foetal surveillance. The optimal number of movements and ideal duration for counting movements have not been determined; however, numerous protocols have been reported and appear to be acceptable.

Interpretation: Women who report decreased foetal movement have an incidence of stillbirth that is 60 times higher than women without this complaint (Gabbe et al. 2007). Maternal Assessment of Foetal Activity had 85.7 per cent sensitivity, 76.8 per cent specificity, 42.1 per cent positive predictive value and 96.5 per cent negative predictive value (Jones et al. 2008).

ii. Symphysio-fundal Height (SFH) measurement

SFH measurement is a commonly practised method of foetal growth assessment that uses a tape to measure the SFH. It also has the potential to detect conditions related to Large for Gestational Age (LGA), such as multiple pregnancy, macrosomia, polyhydramnios, and SGA, such as IUGR, intrauterine foetal death and oligohydramnios.

Interpretation: For foetuses growing normally, SFH measurement (from 24 weeks onwards) in centimetres should correspond to the number of weeks of gestation, with an allowance of a two-week difference either way (WHO 2016).

3.3.2.6 Standard for antenatal foetal activity evaluation through clinical assessment

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
Abdominal palpation	Palpate the abdomen by using the physical landmarks of the xiphisternum, the umbilicus and the symphysis pubis to: Assess fundal height, foetal lie, presentation and position; and Detect macrosomia, multiple pregnancy and SGA		
Maternal assessment of foetal movement		If mother complains of a decrease in foetal movement, use the count-to-ten method where the woman is instructed each day to count and record the time at which she feels the 10^{th} foetal movement (Winje et al. 2011) Applicable after 28 weeks of pregnancy; if <10 movements within 12 hours during the day, advised to visit nearby health facility	Preterm labour or certain patients at high risk of preterm labour, PROM, history of uterine surgery or classic CS delivery, known placenta previa
SFH measurement		IUGR, oligohydramnios	SFH replacing obstetrical abdomen palpation

Current evidence does not indicate whether the palpation or SFH measurement method is superior for detection of abnormal foetal growth (Japaraj et al. 2012). SFH measurement has great implications for low-income countries with limited access to serial Ultrasonography (USG) assessment of the foetus. It is also important in high-income countries as SFH measurement is still efficient as a screening tool to detect IUGR.

iii. USG

Ultrasound is the most accurate screening tool; however, it is expensive and not widely available in Low- and Middle-Income Countries (LMICs) (Robert 2014).

Interpretation: As per cases

iv. Modified Biophysical Profile (MBPP)

Assessment of amniotic fluid volume can be used to evaluate long-term utero-placental function. MBPP combines Nonstress Test (NST) with Amniotic Fluid Index (AFI), which is the sum of measurements of the deepest cord-free amniotic fluid pocket in each abdominal quadrant, as an indicator of long-term function of the placenta.

Interpretation: MBPP is considered normal if the NST is reactive and AFI is >5 cm and abnormal if the NST is nonreactive or AFI is ≤5 cm. False-negative rate of this antenatal testing protocol is 0.8 per 1000

women with an abnormal antenatal test but no evidence of foetal compromise. However, the false-positive rate is high: 60 per cent of those delivered (Miller 1996).

v. Biophysical Profile (BPP)

The five components of biophysical profile are:

Gross body movements	At least three discrete movements in 30-minute period
Rate (NST)	At least two accelerations >15 Beats per Minute (BPM) of 15 seconds duration in 30-minute period
Amniotic fluid	At least 1 pocket measuring 2 cm in two perpendicular planes
Breathing movements	At least 1 episode >30 seconds in 30-minute period
Tone	At least 1 episode of active extension in 30-minute period

Interpretation: Each component is given a score of 2 (normal or present as defined previously) or 0 (abnormal, absent or insufficient). A composite score of 8 or 10 is normal, a score of 6 is equivocal and a score of 4 or less is abnormal (ACOG 2014). In presence of oligohydramnios, further evaluation is warranted regardless of composite score. False-negative rate of BPP is 0.07 per cent (Manning et al. 1987).

Umbilical Artery Doppler Velocimetry (UADV)

UADV has been adapted as a foetal surveillance technique because it is believed that flow velocity waveforms in the umbilical artery of foetuses with normal growth differ from those of foetuses with growth restriction.

Interpretation: Umbilical flow velocity waveform of a normally growing foetus has high-velocity diastolic flow, while in cases of IUGR the umbilical artery diastolic flow is diminished. With extreme IUGR, flow may be absent or even reversed. The odds ratio for perinatal mortality in IUGR complicated by absent diastolic flow is 4.0. With reversed diastolic flow, the odds ratio for mortality is increased to 10.6 (Karsdrop 2014).

Other sites of Doppler study would be: Uterine artery, Doppler may reflect the placental blood flow; and Middle cerebral artery, Doppler reflects blood flow to foetal brain.

3.3.2.7 Standard for imaging for antenatal evaluation of foetal well-being

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
USG	First scan at 1st trimester before 24 weeks to estimate gestational age, detection of foetal anomalies and multiple pregnancies (WHO 2016)	Subsequent scans as and when indicated for high-risk pregnancy	
MBPP		Post-term Oligohydramnios AFI >25 cm	
BPP		If MBPP abnormal or AFI <5 cm NST is non-reactive	
UADV		UADV in IUGR, pre-eclampsia, Diabetes Mellitus, reduced foetal	Pregnant women to improve maternal and perinatal

		movement, Rh-isoimmunisation	outcomes

Sometimes a modified BPP is used first, involving the Cardiotocography (CTG) trace and the amniotic fluid volume only. If this indicates a possible abnormality, then the full BPP is used.

vi. Foetal serial amniocentesis

Amniocentesis, whereby a sample of amniotic fluid is obtained, is another very important prenatal diagnostic technique for lung maturation and to detect other pathological conditions like Rh-isoimmunisation.

Interpretation: Lecithin/sphingomyelin (L/S) ratio: Before 34 weeks lecithin and sphingomyelin are present in amniotic fluid in equal concentrations (1:1). At about 35 weeks lecithin concentration rises, so the L/S ratio is ≥2:1; with this ratio the risk of respiratory distress is minimal.

Phosphatidyl glycerol: Its detection in the amniotic fluid indicates lung maturity. It is more reliable than L/S ratio as it is not detected in blood, meconium or vaginal discharge so the contamination of samples with any of these does not confuse interpretation.

3.3.2.8 Standard for antenatal evaluation of foetal lung maturation

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Foetal Serial Amniocentesis		For foetal lung maturation until 34–42 weeks: Estimation of bilirubin in amniotic fluid: Indications of amniocentesis High antibody titre (>1:8) Previous Severely affected baby At 30–32 weeks and repeat in 3–4 weeks >10 weeks prior	

No known single method of assessment can predict with absolute certainty sudden events (cord accident or placental abruption), which are frequent causes of foetal death. Thus, it is important for clinicians to keep these limitations in mind when evaluating the merits of an antenatal test of foetal well-being.

c. Antenatal maternal prophylaxis for preexposure
   i. Asymptomatic bacteriuria
   ii. Rh incompatibility

Rh incompatibility is a condition that occurs when a woman with Rh-negative blood type is exposed to Rh-positive blood cells, leading to the development of Rh antibodies provided that this antigen was initially absent (Adeyemi et al. 2016). Risk of sensitisation depends largely upon the volume of transplacental haemorrhage, extent of the maternal immune response and concurrent presence of ABO incompatibility (Roman 2013).

Maternal and foetal outcome: Adverse foetal outcome could range from mild anaemia, hyperbilirubinemia to hydrops, and even demise.

Diagnosis: Indirect Coombs Test (ICT):

If positive: perform antibody titre of maternal anti-Rh IgG (critical level: >1:16).

If antibody titre is high, then repeat monthly – sudden rise is significant.

If negative at 12th week: Primigravida, repeat at 28th and 36th week; multigravida, repeat at monthly intervals from 24th week onwards.

iii. Worm infestation

Preventive anti-helminthic therapy is an important part of a comprehensive package to eliminate morbidity due to soil-transmitted helminths in at-risk populations (Salam et al. 2015).

Maternal and newborn outcome: Maternal worm infections co-exist with several important potential confounders, such as maternal under-nutrition (Hack 1998).

Diagnosis: Microscopy stool examination

iv. Oral HIV PrEP

Oral HIV PrEP is a promising new biomedical prevention approach in which HIV-negative individuals are provided with daily oral ARV medication for primary prevention of HIV-1 (McMahon et al. 2014).

3.3.2.9 Standard for antenatal prophylaxis for Rh isoimmunisation, helminthes, HIV

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Prophylaxis antibiotic for ASB	A 7-day antibiotic for all pregnant women with ASB to prevent persistent bacteriuria, preterm birth and LBW (WHO 2016)		
Prophylaxis Anti-D immunoglobulin	At 1st ANC, obtain ICT titer <1:16 repeat after every 2 weeks If delivery at normal time no anti-D prophylaxis needed	ICT negativeve, repeat every 4 weeks. Give anti-D prophylaxis at 28 to 32 weeks Repeat anti-D within 72 hours of birth if newborn is Rh-positive	
Prophylaxis anthelminthic		Single-dose albendazole or mebendazole, after 1st trimester, living in areas: Where both baseline prevalence of hookworm and/or T. trichiura infection is ≥20% among pregnant women, and Where anaemia is a severe public health problem, with a prevalence of ≥40% among pregnant women, in order to reduce the worm burden of hookworm and T. trichiura infection (WHO 2016)	
Oral PrEP		Truvada, a single pill that is a combination of ARVs tenofovir and emtricitabine, as an additional prevention choice for pregnant women at substantial risk of HIV infection, is used as a part of combination prevention (WHO 2015)	

Antenatal maternal prophylaxis for preexposure to HIV, Rh isoimmunisation and worm infestation is helpful for improving the health of both mother and newborn. Long-term solutions to soil-transmitted helminth infestation need to address many factors, including improvements in water, sanitation and hygiene.

3.3.3 Tertiary prevention (management of complications in pregnancy)

Tertiary prevention aims to soften the impact of complications in pregnancy, which, if untreated, would adversely affect the pregnancy outcome, for example: hyperemesis gravidarum, bleeding in early pregnancy, bleeding in late pregnancy, abdomen pain, and medical disorders in pregnancy.

i. Hyperemesis gravidarum

Nausea and vomiting are common in pregnancy, affecting from 70 to 85 per cent of pregnant women (ACOG 2004). Onset of symptoms is usually early in the first trimester at around four to six weeks and peaks at nine to ten weeks. Vomiting subsides in 90 per cent of cases by 20 weeks but may persist beyond 20 weeks in 13 per cent of cases (Jueckstock et al. 2010). Approximately one to five per cent of patients with hyperemesis need hospitalisation (Simon et al. 1999).

Maternal and newborn outcome: Severe dehydration, muscle wasting, hyponatraemia, hypokalaemia, ketonuria, low serum urea level, and weight loss of more than five per cent of body weight (Nelson 1998), potential risk of cognitive impairment, behavioural dysfunction, emotional stress, sleep disorders, and severe depression (London 2017). Foetal anomalies are IUGR, preterm birth.

Diagnosis: Clinical picture and exclusion of other causes of nausea and vomiting in pregnant woman. Electrolyte and other biochemical markers help diagnose the severity of the condition.

3.3.3.1 Standard for supportive management of hyperemesis gravidarum

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Hospitalisation	Nil orally until anti-emetics are effective	Dehydration, ketotic, co-existing conditions (i.e. diabetes) worsen despite conservative home treatment	
Biochemistry evaluation	Urea, creatinine, electrolytes, Liver Function Test (LFT), amylase, CBC, mid-stream urine for acetone and routine/microspic, culture/sensitivity if needed; Arterial Blood Gas (ABG) test for metabolic acidosis		
Imaging evaluation USG	Initial to rule out multiple or molar pregnancies		
Serial USG	Monitor foetal growth if severe nausea and vomiting continue to late 2nd or 3rd trimester		

Fluid and electrolyte balance		If unable to tolerate oral fluids, ketotic, start IV Normal Saline (NS) with additional KCl with administration guided by daily monitoring of electrolytes	Too quick correction of low Na, K levels or too rapid correction causes osmotic demyelination syndrome
Thromboprophylaxis	All admitted women unless specific contraindications, e.g. active bleeding Discontinue on discharge		

For women with severe hyperemesis gravidarum, all causes (medical/surgical) other than pregnancy should be excluded and treated accordingly. Support from a multidisciplinary team (midwives, nurses, dieticians, pharmacists, endocrinologists, nutritionists and gastroenterologists, and a mental health team, and psychiatrist) may be required.

3.3.3.2 Standard for medical management of hyperemesis gravidarum

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Thiamine (B1) supplementation	Either oral or IV all women admitted with prolonged vomiting, before administration of dextrose or parenteral nutrition		
Anti-emetics		If vomiting does not stop, antihistamines (H1 receptor antagonists) and phenothiazines Metoclopramide or ondansetron	Before 12 to 14 weeks, possible detrimental effects to foetus (Nelson 1998)
Histamine H2 receptor/antagonists/proton pump inhibitor		If gastro-oesophageal reflux disease, oesophagitis or gastritis: ranitidine, pantoprazole	
Corticosteroids		Reserved for cases where standard therapies failed	
Enteral or parenteral treatment		When all other medical therapies have failed	
Psychosocial support		For physical symptoms and psychological distress	
Termination of pregnancy		All therapeutic measures should have tried before offering termination of a wanted pregnancy if progressive weight loss, jaundice, or persistent	

		tachycardia occurs despite treatment	

Source: RCOG (2012) Green-top Guideline No. 69

In considering medication, it is very important to weigh risks and benefits. Some drugs may have adverse effects on mother or the developing foetus.

ii. Bleeding in early pregnancy

Vaginal bleeding during pregnancy is not uncommon, ranging from light spotting to heavier bleeding. The heavier form is associated with a greater risk of pregnancy loss (Aslih et al. 2011). The most common causes of early pregnancy bleeding are abortion, ectopic pregnancy and molar pregnancy.

Abortion

Nearly 25 per cent of pregnant women have some degree of vaginal bleeding during the first two trimesters, about 50 per cent of which progress to abortion. Abortion is classified as threatened, inevitable, incomplete and complete (Deutchman et al. 2009). There are three modalities of management: expectant, medical, or surgical. Mode of management is determined by gestational age, type of abortion, maternal haemodynamic stability and the presence of infection as well as patient preference (WHO 2012). However, supportive care remains the same for all types of abortion.

3.3.3.3 Standard for supportive management of abortion care

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Counselling	Comprehensive contraceptive counselling on post-abortion risk and rest, informing woman that ovulation/conception may occur as early as 8th day, giving advice for contraception		
Pain management	Analgesia (Nonsteroidal Anti-inflammatory Drugs (NSAIDs), ibuprofen), anxiolytics/sedatives (diazepam) or adjuvant medications If indicated, >12 weeks POG in addition to NSAIDs, offer oral, Intramuscular (IM) or IV opioids		
Antibiotics		Unsafe or septic abortion	
Anti-D Ig		High prevalence of Rh-negative	
Contraception	Choice of contraception to all women receiving abortion care		

Women who have access to Comprehensive Abortion Care (CAC) have the opportunity for other reproductive health services: for example, tetanus prophylaxis or booster, treatment for STIs, cervical cancer screening, and education on contraceptive knowledge to make suitable choices.

Threatened abortion

WHO defines threatened pregnancy as pregnancy-related bloody vaginal discharge or frank bleeding without cervical dilatation. It can occur during the first half of pregnancy with lower abdominal pain and/or vaginal bleeding that subsides and pregnancy continues.

Maternal and newborn outcome: Pre-eclampsia/eclampsia or PIH, Antepartum Haemorrhage (APH), Preterm Premature Rupture of Membranes (PPROM), LBW, IUGR, and CMF (Deborah et al. 2011).

Diagnosis: Clinical and USG finding shows closed cervix, and there is a live intrauterine gestation.

Complete abortion

Complete abortion is characterised by complete passage of product of conception.

Diagnosis: History, PV examination. Conformation by USG, which shows empty uterine cavity and remaining endometrial thickness <15 mm.

Inevitable abortion

Inevitable abortion is a condition characterised by vaginal bleeding, lower abdominal pain or leaking of amniotic fluid; and dilated cervical os.

Maternal outcome: Infection and the consequences of profuse bleeding, such as shock and anaemia.

Diagnosis: Clinical history, examination and USG if needed

3.3.3.4 Standard for management of threatened, inevitable and complete abortion

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Expectant management for threatened abortion		Monitor, bed rest and repeat pelvic USG weekly until viable pregnancy is confirmed, or Excluded threatened abortion, or In case of complete abortion observe for bleeding and infection	Hormones (oestrogens or progestins) or tocolytic agents (salbutamol or indomethacin), for threatened abortion as they will not prevent abortion
Evacuation for inevitable abortion		If pregnancy <12 wks: Termination is done by vaginal evacuation or suction evacuation MVA under paracervical block or IV anaesthesia If pregnancy >12 wks: Tab misoprostol buccal or sublingual 200–400 mcg 4-hourly can be given or Oxytocin 10–20 units is given by intravenous infusion to expel the uterine contents If the placenta is retained it is removed by MVA under paracervical block or IV anaesthesia	Measures to preserve pregnancy

Presence of bleeding and cramping pain is common in threatened and inevitable abortion; however, the management modality differs as in threatened abortion the aim is to continue pregnancy and in inevitable abortion to expedite expulsion.

Incomplete abortion

Incomplete abortion is the incomplete expulsion of Products of Conception (POC).

Maternal outcome: Excessive vaginal bleeding, shock, anaemia, infection, probable long-term problems such as infertility as a result of infection and blockage of fallopian tubes.

Diagnosis: History of abdomen pain, vaginal bleeding along with partial passage of fleshy mass or POC. Vaginal examination reveals open cervical os, POC at os, uterus size less than gestational age. Ultrasonographic appearance is variable, ranging from a mass of mixed echogenicity in first trimester to visible foetal parts or placental tissue in second trimester.

3.3.3.5 Standard for medical and surgical management of incomplete abortion

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Medical method Medical Abortion (MA) in first trimester and Medical Induction (MI) in second trimester)		Medical method for induced abortion in first trimester (haemodynamically stable ectopic pregnancy is excluded: Pregnancy: 7 weeks. Misoprostol and mifepristone Pregnancy: up to 9 weeks. Mifepristone 200 mg followed after 1–2 days by misoprostol 800 mcg vaginal/buccal/sublingual Pregnancy: 9 to 12 weeks. Mifepristone 200mg followed after 1–2 days by misoprostol 800 mcg vaginal, buccal or sublingual every 3 hour, up to 5 doses Pregnancy: >12 wks (MI). Mifepristone 200mg followed after 1–2 days by misoprostol 400mcg vaginal, buccal or sublingual then every 3 hours until expulsion	Previous allergic reaction to one of the drugs involved inherited porphyria, chronic adrenal failure, known or suspected ectopic Attempt at 1st or 2nd trimester abortion by untrained/ unlisted service provider in unlisted service site
MVA		Incomplete abortion of <12–14 weeks	
Dilatation and Evacuation (D&E) (only for 2nd trimester abortion)		Pregnancy: >12–24 weeks. Induced abortion or inevitable/incomplete abortion in second trimester. Cervix must be prepared by misoprostol 3 hours prior to D&E	Attempt by untrained/unlisted provider in unlisted service site without special instruments

Self-medication, over-the-counter use and prescription by unlisted service providers should be discouraged and reported, and the need for follow-up, and for services to be received at a listed health facility, should be emphasised. As abortion is a stigma in many cultures in Nepal, privacy, confidentiality and the behaviour of a support person designated for them would greatly contribute to patient satisfaction with services. Maximising patient satisfaction is necessary for quality improvement but will be challenging (Regmi et al. 2009).

Ectopic pregnancy

Implantation of a developing blastocyst anywhere outside the endometrial lining of the normal uterine cavity is known as ectopic pregnancy. The most common site is the ampulla of fallopian tube, but it could be implanted on the ovary, broad ligament, cervix or abdomen. It has been reported that 1.3–2.4 per cent of all pregnancies are extrauterine.

Maternal outcome: Depends upon site, ruptured/unruptured, haemorrhage, shock, anaemia.

Diagnosis: History, urine pregnancy test, serum Beta Human Chorionic Gonadotropin (β-hCG), USG. With the advent of high-resolution Transvaginal Scan (TVS), cases can be diagnosed earlier before rupture. Ectopic pregnancy should be suspected if TVS shows no intrauterine gestational sac, β-hCG level >1500 mIU per mL (1500 IU per L) or if the serial β-hCG level plateaus or fails to double in 48 hours.

3.3.3.6 Standard for supportive management of ectopic pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Laboratory tests	CBC, Renal Function Test (RFT), LFT, blood-group and Rh typing, and serial serum β-hCG level must be rechecked before initiation of treatment		
Counselling	Patient treated with Methotraxate (MTX) should be counselled about the risk of ectopic pregnancy rupture; and not becoming pregnant again until resolution has been confirmed Discuss and advise on future fertility and post-ectopic reliable contraception use at least for 3 months		
Rh anti-D		Rh- anti-D immunoglobulin is provided to Rh-negative women	
Iron supplementation	Oral ferrous fumarate 60 mg daily for 3 months		

Depending upon patient condition, site, and preference for future fertility, the management of ectopic pregnancy is either medical or surgical. However, supportive care remains same for all types and condition.

3.3.3.7 Standard for medical management of ectopic pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Single drug MTX IM		If β-hCG <5000 IU/L, rising β-hCG level in 48 hours, normal CBC and RFT, liver enzymes, diameter of gestational sac <4 cm, and unruptured Single dose 50mg/m2	Intrauterine pregnancy, immuneosuppression, hypersensitive a rising β-hCG level within 48 hours, a gestational sac of <4 cm in diameter, β-hCG level >5000 IU/L, clinically significant hepatic dysfunction
Multi-dose MTX		IM or IV MTX 50 mg/m2, 2nd dose at day 4, IM or IV MTX 50 mg/m2	
Multi-drug MTX/Leucovorin		MTX 1.0 mg/kg IM on days 1, 3, 5 and 7	

(LEU) IM		LEU 0.1 mg/kg IM on alternate days 2, 4, 6 and 8	
Follow-up	Weekly β-hCG measurement until normalisation	Persistent extrauterine pregnancy/trophoblastic tissue: Repeat MTX Surgery as indicated	

Medical management has become increasingly popular in the treatment of ectopic pregnancy. Given its convenience, for many it is used as a first-line treatment, but this is not always the optimal choice for the patient. Serum β-hCG should drop by >15 per cent on days 3 and 7 to consider medical management as successful. It is important to understand options for medical treatment and when it is appropriate to treat a particular patient with medical management, or when one should opt for surgical management.

3.3.3.8 Standard for surgical management of ectopic pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Laparoscopy	The gold standard in haemodynamically stable patients		
Laparotomy		Performed only if laparoscopy is not possible for technical, logistic, or medical reasons: indicated for rupture, haemodynamic instability, symptoms (e.g., pain), diagnosis laparoscopy, suspected heterotopic pregnancy	Defer surgery until blood arrangement and full recovery from shock
Salpingostomy		Remains the definitive treatment of unruptured ectopic pregnancy in patients who are haemodynamically stable and wish to preserve fertility with less damaged tube	
Salpingectomy		Where salpingostomy is not feasible or recommended, e.g. repeat or severe rupture of the tube, massive haemoperitoneum, patients not desiring future pregnancy, adhesions, failed salpingostomy	

Medical treatment requires extended follow-up of patients, which can be cumbersome and difficult for some patients. It is necessary to follow patients clinically until the serum β-hCG is undetectable, which requires multiple visits and takes valuable time from both patient and clinician. In comparison, surgical management is safe, effective and often requires fewer follow-up visits; however, preference depends on clinical presentation of the patient and patient choice.

Gestational Trophoblastic Disease

The most common form of Gestation Trophoblastic Disease (GTD) is hydatidiform mole, also known as molar pregnancy. Mole could be either complete or partial. Complete molar pregnancy could be either low-risk or high-risk, based on scoring of various factors, signs and symptoms of marked trophoblastic proliferation at the time of evacuation, i.e. β-hCG >100,000 mIU/Ml; largest tumour size including uterus; theca-lutein ovarian cyst >6 cm in diameter; older maternal age; antecedent pregnancy, site of spread and a history of previous molar pregnancy (Modified WHO Prognostic Scoring System as Adapted by the International Federation of Gynecology and Obstetrics (FIGO), 2019).

Maternal outcome: Excessive vaginal bleeding, shock, anaemia, infection, malignant transformation of the GTD.

Diagnosis: Clinically with history of amenorrhea followed by bleeding PV or passage of grape-like products PV, USG, often can diagnose molar pregnancy before 12 weeks, showing a fine vascular or honeycomb appearance. In case of complete mole, it is characteristically described as having a snowstorm appearance of mixed echogenicity, representing hydropic villi and intrauterine haemorrhage. In partial mole, the foetus may be still viable, but may show signs consistent of triploidy, such as unusually early growth restriction or developmental abnormalities.

3.3.3.9 Standard for supportive management of molar pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Counselling	Before and after the procedure, counsel and advise on prognosis for fertility and importance of follow-up		
Rh anti-D		Rh-immunoglobulin is routinely provided to Rh-negative women after evacuation of mole	
Contraception advice	After first normal β-hCG result: Oral Contraceptive Pill (OCP) preferred as it suppresses endogenous Luteinising Hormone (LH), which may interfere with the measurement of β-hCG at low levels OCP does not increase the risk of postmolar GTN Barrier method when OCP is contraindicated		Oestrogen-containing until level returns to normal

There is a need for early diagnosis, prompt and proper treatment and, if required, timely referral for this condition. When medical treatment remains ineffective, surgical management is indicated.

3.3.3.10 Standard for surgical management of molar pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Abdominopelvic USG, chest X-ray[a], quantitative serum β-hCG assay, CBC, LFT, RFT, thyroid function test, blood	If test report normal, initial treatment: Suction evacuation		

group type and serology screen and Histopathology Examination (HPE) of evacuated tissue	(preferably under USG guidance if available) [b,c] Hysterectomy[d]		
Monitoring	One month after initial treatment: thorough history and physical examination β-hCG assay every 1 to 2 weeks until negative for 3 consecutive tests		
Findings and additional evaluation[a,b,c,d,e,f]		β-hCG assay twice at 3-month interval If 3 consecutive assays: Normal, disease free If level plateaus or rises, this indicates post-molar GTN or persistent post-molar GTN	
Staging H&P Doppler pelvic USG[e] Chest X-ray[f]		No extrauterine disease: consider repeat D&C or hysterectomy If extrauterine disease, consider chemotherapy as in GTN	

Source: NCCN Guideline Version 2. 2019 Gestation Trophoblastic Neoplasia

[a]If chest X-ray positive for metastases, manage as GTN after initial uterine evacuation
[b]Use uterotonics after initiating evacuation of uterus. Oxytocin receptors may be absent
[c]Prophylactic chemotherapy with MTX or dactinomycin may be considered at the time of evacuation of Hydatid mole for the patient at high risk for post-molar GTN (age >40yrs, β-hCG>100,000 mIU/Ml, excessive uterine enlargement, and theca lutein cysts >6 cm) when β-hCG follow-up is unavailable or unreliable (Wang et al. 2017).
[d]Hysterectomy may be considered as initial treatment for H mole in patients who are older or do not wish to preserve fertility
[e]Doppler pelvic USG to confirm absence of pregnancy, measure uterine size, and determine volume and vasculature of tumour within the uterus
[f]If the chest X-ray is normal no further imaging is indicated before commencing treatment. If chest X-Ray shows metastases, a Computerised Tomography (CT) scan of the abdomen/pelvis and Magnetic Resonance Imaging (MRI) of the brain are indicated.

Gestation Trophoblastic Neoplasia (GTN)

Women with GTN may be treated either with single-agent or multi-agent chemotherapy. Treatment used is based on the National Comprehensive Cancer Network (NCCN) Guidelines Version 2.2020 for GTN, following assessment at the treatment centre. Fifteen per cent of women will require chemotherapy after a complete mole and 0.5 per cent after a partial mole. Development of postpartum GTN requiring chemotherapy occurs at a rate of 1/50,000 births. Cure rate for women with a score ≤ 6 is almost 100 per cent; the rate for women with a score ≥ 7 is 95 per cent. (RCOG Green-top Guideline No. 38, 2010).

Prognostic factor	Risk score			
	0	1	2	4
Age (years)	<40	≥40	..	..
Antecedent pregnancy	Hydatidiform mole	Abortion	Term pregnancy	..
Interval from index pregnancy (months)	<4	4–6	7–12	>12
Pre-treatment hCG β (IU/L)	<103	103 to 104	104 to 105	≥ 105
Largest tumour size, including uterus (cm)	<3	3-5	>5	
Site of metastases	Lung	Spleen, kidney	Gastrointestinal tract	Brain, Liver
Number of metastases identified	0	1–4	5–8	>8
Previous failed chemotherapy	..	..	Single drug	Two or more drugs
Total score	..	..	..	..

- The total score for patient is obtained by adding the individual scores for each prognostic factor
- FIGO Prognostic Score
- Low risk:<7
- High risk: ≥7

iii. APH (bleeding in later pregnancy)

APH complicates 3–5 per cent of pregnancies (Workalemahu et al. 2018). The most important causes are abruptio placenta, placenta previa, and ruptured uterus.

Abruptio placentae

Abruptio placentae is a leading cause of life-threatening bleeding during late pregnancy, accounting for about 30 per cent of cases. It may occur at any time but is most common during the 3rd trimester (Calleja et al. 2006).

Maternal and newborn outcome: Preterm birth (spontaneous or iatrogenic termination), shock, anaemia, Disseminated Intravascular Coagulation (DIC), increased chance of operative delivery.

Diagnosis: Clinically, USG. However, the sensitivity of USG in visualising placental abruption is low. During acute phase of placental abruption, haemorrhage is isoechoic or similar to surrounding placental tissue. Therefore, visualisation and differentiation of concealed haemorrhage associated with placental abruption from surrounding placental tissue are difficult (Saphier & Kopelman 2014).

Management depends on the class of abruption:

Class 0 Asymptomatic: discovery of a blood clot on the maternal side of a delivered placenta, diagnosis is made retrospectively.

Class 1 Mild: no sign of vaginal bleeding or a small amount of vaginal bleeding, slight uterine tenderness, maternal blood pressure and heart rate WNL, no signs of foetal distress.

Class 2 Moderate: no sign of vaginal bleeding to moderate amount of vaginal bleeding, significant uterine tenderness with tetanic contractions, and change in vital signs: maternal tachycardia, orthostatic changes in blood pressure, evidence of foetal distress, clotting profile alteration: hypofibrinogenemia

Class 3 Severe: no sign of vaginal bleeding to heavy vaginal bleeding, tetanic uterus/board-like consistency on palpation, maternal shock, clotting profile alteration: hypofibrinogenemia and coagulopathy, and foetal death.

Class 0 or 1 is usually associated with a partial, marginal separation, whereas, class 2 or 3 is associated with a complete or central separation (Masselli et al. 2011).

3.3.3.11 Standard for expectant management of abruptio placentae

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Expectant management		Class 0 and 1, at pregnancy <37 weeks admitted to the obstetric unit for close monitoring of maternal and foetal status, IV access and laboratory tests Maternal-foetal monitoring continues until change in condition or foetal maturity is reached	Digital examination unless USG excludes placenta previa (Chilaka et al. 2000)

Onset of placental abruption is often unexpected, sudden and intense and requires immediate treatment. Pre-hospital care for the patient with a suspected placental abruption requires advanced life support and referral to a hospital with a full-service obstetric unit and a Newborn Intensive Care Unit (NICU).

Placenta previa

Placenta previa refers to the placentation at the lower segment of the gravid uterus. A placenta is termed low-lying when the placental edge does not touch or cover the internal os but is within 2 cm of it. Incidence of placenta previa is 1/250 deliveries. If placenta previa occurs during early pregnancy, it usually resolves by 28 weeks as the uterus enlarges.

Maternal and foetal outcome: PPH, preterm delivery, foetal malpresentation, PROM, IUGR, vasa previa, and velamentous insertion of umbilical cord.

Diagnosis: Sign and symptoms, and USG localisation of placenta.

3.3.3.12 Standard for expectant management of placenta previa

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Expectant management		If mother is in good health (i.e. Hb >10 g/dL; haematocrit >30%, duration of pregnancy <37 weeks, no active vaginal bleeding, foetal well-being assured by	

		USG) Advise bed rest and corticosteroids to improve foetal lung maturity and reduce respiratory distress until birth of the baby or heavy bleeding occurs	
Restore volume	Infusing IV fluids (NS or Ringer's lactate)		
PV examination			PV exams
Corticosteroids		For women who did not receive a previous course of ANC corticosteroids for any obstetric indications at any point during pregnancy, administer 48 hours before scheduled CS at <37 weeks	
Rh anti-D		Rh-negative mothers	
Cerclage			Absence of high-quality evidence of efficacy and safety

Most women who initially present with symptomatic placenta previa respond to supportive therapy, as described above. However, decision-making for optimal timing of delivery across late preterm and early-term period requires balancing the probability and severity of maternal haemorrhage at each.

Ruptured uterus

Uterine rupture in pregnancy is a rare and often catastrophic complication with high incidence of foetal and maternal morbidity and even mortality if not addressed timely. Eighty-seven per cent of cases occur in women who have had previous CS (Zwart et al. 2008). It may occur in grand multipara and in cases of obstructed labour/malpresentations, and after injudicious use of uterotonics like misoprostol, dinoprostone or oxytocin.

Maternal and newborn outcome: Abdominal pain, vaginal bleeding, shock or even death if not rapidly treated. Newborn bradycardia and repetitive variable or late decelerations or stillbirth is common.

Diagnosis: History, clinical examination and USG. Ultrasound can predict uterine rupture in cases of previous CS. A uterine wall thickness of greater than 4.5 mm has negative predictive value of 100 per cent but unfortunately the positive predictive value of thickness less than 3.5 mm is poor, at only 11.8 per cent (Guise et al. 2010). Intrauterine pressure catheters are sometimes used but may fail to show loss of uterine tone or contractile patterns following uterine rupture.

3.3.3.13 Standard for management of ruptured uterus in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Stabilisation/ Resuscitation	Restore blood volume by infusing IV fluids (NS or Ringer's lactate) before surgery		

Laparotomy	Perform emergency laparotomy to deliver the baby and placenta and repair uterus if possible	In case of extensively ruptured and irreparable uterus, hysterectomy may be needed. Always look for rupture of bladder too	
Ligation of the ipsilateral hypogastric artery		In cases of lateral rupture involving lower uterine segment and uterine artery where haemorrhage and haematoma obscuring operative field, may be needed to stop bleeding	
Subtotal hysterectomy		If uterus cannot be repaired	
Total hysterectomy		Tear extends through the cervix and vagina	
Contraception	As there is an increased risk of rupture with subsequent pregnancies, discuss permanent tubal ligation contraception after emergency/crisis is over		

Early diagnosis and immediate preoperative resuscitation are of great importance in ruptured uterus. A senior/experienced obstetrician must be involved for the antenatal and intrapartum care of pregnant women with associated risk factors for ruptured uterus.

iv. Acute abdomen in early pregnancy

The term acute abdomen refers to any serious acute intra-abdominal condition accompanied by pain, tenderness, and muscular rigidity, requiring emergency surgery. Acute abdominal pain in pregnancy can be due to obstetric as well as non-obstetric aetiologies. About 0.5–2 per cent of all pregnant women require surgery for non-obstetric acute abdomen (Augustin et al. 2007). Ovarian cyst and appendicitis are the most common non-obstetric causes of acute abdomen in pregnancy.

Ovarian cyst

Signs and symptoms of ovarian cyst are nonspecific. Incidence of adnexal masses during pregnancy is estimated to be 0.2–2 per cent, contingent on week of gestation. Malignancy rate is 1–6 per cent, leaving the vast majority benign (Hoover et al. 2011). Functional cyst is the most common benign cyst. Most of these cysts resolve after the first 14–16 weeks of gestation but some, like theca-lutein cysts can persist until after delivery. Masses persisting even after 16 weeks of gestation could be predominantly non-functional (Hoffman 2020). Most ovarian masses are asymptomatic in pregnant women. Some cause pressure or chronic pain, and acute abdominal pain may be due to torsion, rupture or haemorrhage.

Maternal and newborn outcome: Risk of threatened abortion and preterm labour, increased rate of CS and the risk of thrombosis. Prematurity is only a significant risk in women with malignant ovarian tumours (Nazer et al. 2015).

Diagnosis: Ultrasound examination and abdominal MRI. Increased vascularisation, presence of papillary protrusions inside the adnexal wall and disturbance of adnexal architecture on colour Doppler are the signs of malignancy (Sayasneh et al. 2015). MRI can be safely used during the 2nd and 3rd trimester of pregnancy. During pregnancy, elevations of tumour markers are mostly associated with normal

physiological changes of pregnancy and presence of obstetric complications like miscarriage, pre-eclampsia and Haemolysis, Elevated Liver enzymes, Low Platelet (HELLP) syndrome.

3.3.3.14 Standard for management of ovarian cyst in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Reassurance		Asymptomatic adnexal mass presenting as a simple cyst of <5 cm with unequivocal benign features is very likely to resolve by itself	
Follow-up		Asymptomatic cyst between 5 and 10 cm, diagnosed in 2nd trimester	
Immediate laparotomy		Severe pain, suspect torsion or rupture	
Unilateral oophorectomy or adnexectomy with appropriate staging		Early stage (IA to IIC) malignancy at 16th–20th gestational for foetal preservation	
Standard surgical procedure (hysterectomy, bilateral adnexectomy, omentectomy, cytology, biopsies and lymphadenectomy) (Pat J 2014)		If the cancer is in an advanced stage, often the treatment should go on as if there were not a pregnancy involved.	
Chemotherapy/radiation therapy		Chemotherapy is only given in the 2nd or 3rd trimesters, and if possible, postponed until after birth. Radiation therapy is considered to be dangerous at any time during pregnancy	

Ovarian cysts or masses during pregnancy should be accurately evaluated to identify which patients need surgical interventions and which can follow a 'wait-and-see' strategy. Due to daily physiological and hormonal changes during pregnancy, all tumour markers are increased, so tumour markers are not generally taken as screening test. Ultrasound and MRI are safe diagnosis tools to distinguish between benign and malignant lesions.

Appendicitis

Reported incidence of acute appendicitis in pregnant women is between 0.04 per cent and 0.2 per cent (Choi et al. 2011). It is the most common cause for non- obstetrical surgical intervention performed during pregnancy, accounting for 25 per cent of the non-obstetric surgical interventions during pregnancy (Mourad et al. 2000). A pregnant patient may present with heartburn, constipation, diarrhoea, urinary symptoms or just general malaise.

Maternal and newborn outcome: Increase in CS delivery and preterm delivery prior to 37th week, IUGR, Respiratory Distress Syndrome (RDS), and newborn death (Shields et al. 2018).

Diagnosis: Clinically and USG. Sensitivity for USG in diagnosis of appendicitis in pregnancy is 67–100 per cent with specificity of 83–96 per cent, the variability being due to issues such as gestational age, BMI and USG error (Williams et al. 2007). CT scanning for appendicitis in pregnancy (not recommended) has

a sensitivity of 86 per cent and specificity of 97 per cent; the values for MRI are 91 per cent and 98 per cent respectively. MRI should be reserved for inconclusive USG (American College of Radiology 2013).

3.3.3.15 Standard for management of appendicitis in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Antibiotics	A combination of antibiotics before surgery, continuing until postoperative and fever-free for 48 hours		
Tocolytic drugs			Before surgery as general anaesthesia itself is uterine relaxant (Liu et al. 1985)
Analgesics		If the woman is in severe pain, give morphine 0.1 mg/kg body weight IM	
Surgery		Refer for surgical consultation if conservative management fails	

In terms of treatment, recent research explores a conservative, non-operative, antibiotic treatment approach as an option, but this practice is not widely accepted and may lead to recurrent appendicitis (Society for Surgery of the Alimentary Tract 2017).

v. Abdominal pain during late pregnancy

The most common causes of abdominal pain during late pregnancy are abruptio placenta, ruptured uterus (as described above), and preterm uterine contraction.

Preterm uterine contraction

Preterm contraction is defined as uterine contractions at >20 and <37 completed weeks. It is one of the common obstetric problems (Catov et al. 2017). Inflammation appears to be a common mechanism underpinning multiple aetiologies (Keelan 2017).

Maternal and newborn outcome: Increased risk of RDS, newborn sepsis, PPROM, chorioamnionitis.

Diagnosis: TVS measurement of length of cervix in mid-pregnancy shown to be able to predict preterm labour with clinically useful reliability. For preterm labour prediction, sensitivity of a cervical length of <25 mm in women with a singleton gestation (no prior preterm birth) is 40 per cent, with a negative predictive value of 97 per cent. Risk of preterm labour increases as cervical length decreases; in women with a cervix length of <15 mm the risk of preterm birth approaches 50 per cent (Markham et al. 2016). Preterm labour has a sensitivity of 80 per cent and a negative predictive value of 95 per cent (Kim et al. 2017).

3.3.3.16 Standard for management of preterm uterine contraction

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Progesterone		Progesterone preference over	

		cerclage in preventing preterm uterine contraction in high-risk women with a singleton pregnancy (Jarde et al. 2017). Vaginal route more effective than IM (Pirjani 2017)	
Tocolytic agents		Conditional recommendation based on very- low-quality evidence (WHO 2015)	Tocolytic treatments (acute and maintenance treatments) are not recommended for women at risk of imminent preterm birth for the purpose of improving newborn outcomes (WHO 2015)
Group B Streptococcus (GBS) prophylaxis		Positive GBS culture at 36 weeks or above (unless CS before labour starts with intact membrane) GBS at any period of gestation Amniotic membrane ruptured >18 hrs or temperature >104^0F Known GBS positive in previous pregnancy	Routine antibiotic administration for women in preterm labour with intact amniotic membranes and no clinical signs of infection (WHO 2015)
Corticosteroids		No clinical evidence of maternal infection Availability of newborn resuscitation, thermal care, feeding support, infection treatment and safe oxygen	
Repeat a single corticosteroid		If birth does not occur within 7 days after the initial course of corticosteroids If subsequent clinical assessment demonstrates that there is a high risk of preterm birth in the next 7 days	
Tocolytic nifedipine	Loading and maintenance		>48 hours, combination of tocolytic agents as there is no additional benefit, PPROM, chorioamnionitis, placental abruption, and cardiac disease
Tocolytic $MgSO_4$		As per Crowther (2014)	

Management of preterm uterine contraction should be directed towards establishing the cause, ensuring delivery under optimal conditions, and consideration of pros and cons of delaying delivery to increase gestational age. In practice, this means that women admitted with preterm uterine contraction should be appropriately assessed to determine the optimal time for delivery.

vi. Medical disorder in pregnancy

Prevalence of medical problems in pregnancy is increasing because of a complex interplay between demographic and lifestyle factors, and developments in modern medicine (Narayan et al. 2017). The

most common medical disorders in pregnancy are iron deficiency anaemia, hypertensive disorder, malaria, diabetes, respiratory diseases, and HIV.

Iron deficiency anaemia

Iron deficiency anaemia continues to be the commonest aetiology of anaemia in pregnancy. WHO has defined the cut-off value for anaemia in pregnancy as Hb concentration of <11 g/dL during the 1st and 3rd trimester, whereas in the 2nd trimester, Hb concentration is further decreased by approximately 0.5g/dL (WHO 2012).

Maternal and newborn outcome: Preterm birth, IUGR, placental problems, a decrease in newborn iron storage, risk of a decrease in maternal blood reserves (Savajols et al. 2014). Risk of maternal mortality significantly decreases for every 1 g/dL rise in Hb; however, the association becomes less clear at Hb levels above 8–9 g/dL (Murray 2012). With respect to newborn birth weight, both Hb level >11 g/dL and < 9 g/dL are associated with two to three times increased risk of SGA newborns. Ideal Hb values with respect to prevention of prematurity and LBW lie between 9 and 11.5 g/dL (Breymann 2015).

Diagnosis: Serum ferritin level should be measured together with the Hb. A serum ferritin level <30 mcg/L during pregnancy should require treatment.

Dose of parenteral iron therapy calculation: Required iron dose (mg) = (2.4) × (target Hb-actual Hb) × pre-pregnancy weight (kg)) + 1000 mg for replenishment of stores (Adamson 2008).

3.3.3.17 Standard for treatment of iron deficiency anaemia in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Iron and folic acid therapy		Established mild to moderate anaemia, at <30–32 weeks, and those who respond to a trial of oral iron; continue treatment Repeat Hb test after 4 weeks of oral iron; if normal Hb, prophylactic daily iron supplementation for at least 6 months during pregnancy and continue until 6 months postpartum	
Parenteral iron carboxymaltose (Ferinject)		For pregnancy above 2nd trimester administer carboxymaltose (Ferinject) (Christian et al. 2010), as this can be given in high dose avoiding repeat transfusion Stop oral iron at least 24 hrs prior to therapy to avoid toxic reaction	History of anaphylactic reactions to parenteral iron, 1st trimester pregnancy, chronic liver disease, active infection

Iron therapy is not sufficient in case of severe anaemia detected in late pregnancy. Sometimes women may require urgent blood transfusion.

3.3.3.18 Standard for blood transfusion in iron deficiency anaemia in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Blood transfusion		Pregnancy < 36 weeks, with Hb < 4 g/dL with or without signs of cardiac failure or hypoxia, 5–7 g/dL with presence of impending heart failure, haemodynamic instability or acute haemorrhage Pregnancy > 36 weeks with Hb < 7 g/dL even without signs of cardiac failure or hypoxia, severe anaemia with decompensation or acute haemorrhage with decompensation, haemoglobinopathy/bone marrow failure syndromes or malignancy (Tandon et al. 2018)	

Blood transfusion may be a life-saving procedure, but it is not without risk. Recipients may rarely develop transfusion-transmitted infections or suffer immunological sequel such as red cell alloimmunisation or other transfusion hazards.

Hypertensive disorder in pregnancy

Hypertensive disorders of pregnancy might be chronic hypertension, gestational (pregnancy-induced) hypertension (pre-eclampsia/eclampsia), or superimposed pre-eclampsia in setting of chronic hypertension (ACOG 2013). Chronic hypertension is defined when a blood pressure is 140/90 mmHg or more on two separate occasions at least two hours apart occurring before pregnancy or developing less than 20 weeks into pregnancy (Roberts et al. 2013). Gestational hypertension occurs after 20 weeks of pregnancy (Roberts et al. 2013).

Pre-eclampsia

Pre-eclampsia is diagnosed if woman has hypertension after 20 weeks of pregnancy with proteinuria greater than 300 mg in a 24-hour urine collection or a urinary protein/creatinine ratio ≥0.3 (Roberts et al. 2013).

Maternal and newborn outcome: HELLP syndrome, liver haematoma, liver failure, renal failure, Cerebrovascular Accident (CVA), IUGR, abruptio placentae, stillbirth (Sibai et al. 1994).

Diagnosis: Clinical feature specially severe headache, blurring of vision, epigastric pain and biochemical marker including creatinine level over 90 µmol/L, uric acid level >5.6 mg/dL, platelet <100,000/cmm is a marker of severe disease, or sufficient evidence of organ dysfunction to diagnose pre-eclampsia in the presence of hypertension even without proteinuria (Tranquilli et al. 2014).

3.3.3.19 Standard for management of pre-eclampsia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Home visit ANC		Mild pre-eclampsia: weekly visit – measure BP proteinuria and foetal movement and Foetal Heart Sounds (FHS). If gestational age is >37 complete weeks, and favourable cervix hospitalised for	

		Induction of Labour (IOL)	
Hospital admission continuous monitoring		Severe pre-eclampsia and eclampsia, monitor BP, pulse, FHS, urine output, and urine albumin	
Antihypertensive		Depending on the severity of hypertension single or combination of nifedipine, labetalol, methyldopa or hydralazine	
Prophylaxis for seizure		$MgSO_4$ as per (IMPAC 2015)	

There is no known way to prevent pre-eclampsia. Close surveillance of patients with either mild or severe pre-eclampsia is warranted because either type may progress to fulminant disease. Particularly severe form of pre-eclampsia is HELLP syndrome.

Eclampsia

Superimposed convulsion in pre-eclampsia occurs in 0.5 per cent of patients with mild pre-eclampsia, and in 2–3 per cent of those with severe pre-eclampsia (Lindheimer et al. 2009).

Maternal and newborn outcome: Preterm birth (iatrogenic termination), IUGR, stillbirth and increased maternal and newborn morbidity and mortality.

Diagnosis: Clinical sign and symptoms: High blood pressure, seizures, proteinuria

3.3.3.20 Standard for management of eclampsia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Control of seizure		$MgSO_4$ as per IMPAC 2015	Diazepam
Monitoring		Vitals, urine output, Hb level, platelet count, uric acid, urea, creatinine, electrolytes, coagulation profile, liver function test, and Urine Routine and Microscopy (R/M). Intensive monitoring of all parameters should be continued, especially for the first 24–48 hours of the postpartum period	

The Confidential Enquiry into Maternal Deaths has recommended that treatment of all women with eclampsia and severe pre-eclampsia should be in a regional centre (Osama 1999). However, transfer of an undelivered woman with eclampsia is both difficult and dangerous.

Jaundice in pregnancy

Jaundice is a clinical manifestation of increased serum levels of bilirubin, either direct or indirect. When serum bilirubin is >2 mg/dL, it is clinically manifested as jaundice. Causes are Intrahepatic Cholestasis of Pregnancy (IHCP), viral hepatitis, HELLP syndrome, severe hyperemesis, Acute Fatty Liver of Pregnancy (AFLP), surgical conditions of obstructive jaundice, liver diseases, thalassaemia, sickle cell anaemia, and hereditary spherocytosis.

Maternal and newborn outcome: Depends upon cause of jaundice and severity.

Diagnosis: Clinical manifestation and biochemical markers.

3.3.3.21 Standard for management of jaundice in pregnancy

Intervention	Recommended in NMS Volume III 2020		
	Recommended for All	Context-specific	Not Recommended
Prophylaxis	Improvement in sanitation, supply of safe drinking water, adequate care of personal hygiene, use of disposable syringe, screening of blood donors for HBsAg (where available)		
Supportive management	Complete bed rest, fat-free carbohydrate-rich diet, drinking plenty of glucose water, supplements with Vitamin B complex and Vitamin C		

In a woman's first pregnancy the differential diagnosis of IHCP from viral hepatitis and other conditions causing jaundice may be difficult. It might be possible to perform a diagnostic test after delivery.

Malaria in pregnancy

Malaria infection during pregnancy is a significant public health problem with substantial maternal and newborn risks.

Maternal and newborn outcome: LBW, IUGR, premature delivery, miscarriage, stillbirths, maternal acute lung injury, severe hypoglycaemia and coma.

Diagnosis: Microscopy of stained blood smears, point-of-care testing, Rapid Diagnosis Tests (RDTs), Polymerase Chain Reaction (PCR) (Britton et al. 2016).

3.3.3.22 Standard for prevention of malaria in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Precaution	Women planning pregnancy should be discouraged to travel to malaria endemic areas. If travel cannot be avoided prophylaxis should be given Use of Insecticide-treated Net (ITN) by pregnant women Other essential preventive interventions: spraying of insecticides in mosquito		

	breeding areas		
Intermittent Preventive Treatment (IPT)	In malaria prevalence area, start as early as possible in the 2nd trimester as Directly Observed Therapy (DOT) (WHO 2013)		Sulfadoxine/pyrimethamine (SP) should be given to women receiving co-trimoxazole prophylaxis due to a higher risk of adverse events

IPT of malaria in pregnancy is a full therapeutic course of antimalarial medicine given to pregnant women at routine ANC contacts, regardless of whether the recipient is infected with malaria.

3.3.3.23 Standard for treatment of Malaria in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Chloroquine	Chloroquine is considered safe in all 3 trimesters of pregnancy		
Sulfadoxine/pyrimethamine	Uncomplicated chloroquine-resistant P. falciparium parasites, 3 Tab SP therapy		Allergic to sulphonamides
Loading quinine dihydocholride	Complicated 20mg/kg body weight in IV fluids (5% dextrose, NS or Ringer's lactate) over 4 hours		If it is known that woman has taken adequate dose of quinine (1.2g) within preceding 12 hours
Maintenance dose of dihydocholride	After 4 hours of loading dose		

If severe malaria is strongly suspected but a laboratory diagnosis cannot be made at that time, blood should be collected for diagnosis testing as soon as it is available and parenteral antimalarial drugs should be started.

HIV in pregnancy

An estimated 1.5 million women living with HIV give birth each year (UNAIDS 2014). With improved scientific knowledge in Antiretroviral Therapy (ART) obstetric care and infant feeding practices, it is now possible to achieve and sustain satisfactory maternal health and prevent perinatal transmission. Application of these strategies has resulted in substantial reduction in perinatal transmission risks (<2 per cent) in developed countries.

Maternal and newborn outcome: Abortion, premature delivery, IUGR, and LBW newborns. Most newborns born to HIV-positive mothers will not get HIV if mothers are treated during pregnancy and delivery, and if newborns are treated in the first few weeks after birth. Treatment will also improve the health of mother.

Diagnosis: Enzyme-linked Immunosorbent Assay (ELISA), western blot, and PCR.

General principles of care

- Providing empathetic, non-judgemental care to women living with HIV and their children in the spirit of professionalism (Powderly et al. 2001)

- Addressing early and systematically the need for social support, with at least one interview with a social worker (Forbes et al. 2012)
- Aim of the comprehensive assessment by a social worker is to determine the woman's needs and to propose culturally relevant support and follow-up if required
- Maintaining confidentiality, including with relatives (Powderly et al. 2001)
- Encouraging the testing of partners and previous children if their HIV status is unknown (Brubaker et al. 2011)
- Medical and psychological needs of the partners should be addressed, and the men referred to other health care providers if necessary (Baggaley et al. 2000)
- Advising on the use of, and facilitating access to, condoms for the purpose of preventing the transmission of HIV and other STIs (Weller et al. 2002)
- If both members of the couple are living with HIV, they should be informed of the possible
- risk of superinfection associated with unprotected sex (Waters et al. 2012)
- Respecting the wishes of a mother who refuses antenatal Combination Antiretroviral Therapy (cART) after being fully informed and counselled
- A plan for care of newborns should be prepared prior to delivery (Powderly et al. 2001).

3.3.3.24 Standard for ART for HIV infection in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Prevention of Mother-to-child Transmission (PMTCT)	Maternal ART is a critical component of PMTCT during antenatal, labour and childbirth and the postpartum period, including breastfeeding (WHO 2019)		
ART	ART should be initiated as early as possible in all pregnant women with HIV and continued lifelong Women already taking ART should continue further A once-daily fixed-dose combination of Tenofovir Disoproxil Fumarate (TDF) + Lamivudine (3TC) (or Emtricitabine (FTC)) + Efavirenz (EFV) is the first-line ART in pregnant and breastfeeding women, including pregnant women in the 1st trimester of pregnancy and of childbearing age (WHO 2019)		

The benefits of ART in decreasing Mother-to-child Transmission (MTCT) of HIV infection are largely undisputed. Current practice has adopted the use of highly active ART in an attempt to suppress Viral Load (VL) below detection, to minimise MTCT of HIV (WHO 2012). After childbirth, the mother should be linked to an ART clinic.

UTI during pregnancy

Urinary tract infection (UTI) is a common occurrence during pregnancy with an estimated incidence of approximately 20 per cent. Three clinical types of pregnancy-related UTI are distinguished: ASB, cystitis, and pyelonephritis. Escherichia coli, the most common pathogen, is associated with both symptomatic and asymptomatic bacteriuria. If ASB is untreated, up to 30 per cent of mothers develop acute pyelonephritis. Group B streptococcal vaginal colonisation is known to be a causative organism in UTIs in approximately five per cent of patients (McKenzie et al. 1994).

ASB (Already discussed under antenatal maternal evaluation)

Cystitis

UTIs are the most common type of infection during pregnancy, affecting up to 10 per cent of pregnant women. It is a distinct clinical entity characterised by lower urinary tract symptoms, the absence of systemic symptoms, and a positive urine culture.

Acute pyelonephritis

Acute pyelonephritis is most common in late pregnancy, with 80–90 per cent of cases occurring in the second and third trimester (Archabald et al. 2009). It is usually a consequence of undiagnosed or inappropriately treated lower UTI, or untreated ASB. Overall incidence of pyelonephritis reaches up to two per cent of all pregnancies compared to less than one per cent in the general population (Jolley et al. 2010).

Maternal and newborn outcome: Maternal sepsis, stillbirth labour and premature delivery.

Diagnosis: Symptoms and urine culture: Fever >38°C, lumbar pain, skeletal and joint pains, nausea/vomiting with or without accompanying dysuria, polyuria $\geq 10^5$ CFU/mL in mid-stream urine specimen (Hooton 2010). Recurrences of pyelonephritis, observed in six to eight per cent of pregnant women, pose a significant problem.

3.3.3.25 Standard for treatment of UTI

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Antibiotics	ASB and cystitis: Oral amoxicillin or Nitrofurantoin (NFT) Pyelonephritis: Hospitalisation for parenteral antibiotics Mild to moderate: Ceftriaxone, cefepime, amoxicillin with clavulanic acid, aztreonam Severe: Ticarcillin with clavulanic acid, piperacillin with tazobactam, meropenem, ertapenem, doripenem for at least 48 hours and then switch to oral		NFT at term (may increase newborn kernicterus) and 1st trimester possible foetal anomaly
Repeat blood and urine Caesarean Section	In case fever persisting for >48 hours		

Mechanical and hormonal changes occurring during pregnancy increase the frequency with which UTI is seen in pregnant women over their non-pregnant counterparts. Treatment failure is a common problem

during pregnancy. Perirenal abscess, lithiasis, congenital or acquired structural changes within the urinary tract could be the possible cause of treatment failure.
Respiratory tract infection in pregnancy

Diseases of the respiratory system caused by acute infections are among the most common maternal diseases during pregnancy. Respiratory infections that complicate pregnancy are encountered frequently, and they encompass a broad range of disorders.

Pneumonia

Pneumonia is the most common cause of fatal non-obstetric infections in pregnant patients (Mehata et al. 2015). In a patient with a classic presentation of pneumonia, the most likely pathogens are Streptococcus pneumonia and haemophilic influenza. In a patient with an atypical presentation of pneumonia, Mycoplasma pneumonia and Chlamydia pneumonia are frequently encountered (Tang et al. 2018). Bacterial pneumonia complicates 1 in 600 pregnancies (Cunningham et al. 2001).

Maternal and newborn outcome: Preterm delivery, LBW, IUGR, asphyxia, severe pre-eclampsia, Acute Respiratory Distress Syndrome (ARDS), septic shock, multiorgan failure, even death.

Diagnosis: Symptoms of dyspnoea, fever and cough, when present, help point to the correct diagnosis. A firm diagnosis of pneumonia can only be made with the aid of a chest radiograph.

3.3.3.26 Standard for treatment of respiratory tract infection

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Antibiotics		In severe bacterial pneumonia, for three weeks. However, there is foetal concern as Trimethiprim-sulfamethoxazole, pentamidine or diaminodiphysulfone are category three drug (Cunningham et al. 2001)	
Antifungal	Fungal pneumonia: Amphoterican B		
Antiviral	Viral pneumonia		

Most treatments for viral pneumonia are considered safe to use during pregnancy; catching pneumonia at an early stage is important to cure the illness.

Bronchial asthma

Asthma is a common co-morbidity during pregnancy and its prevalence is increasing in the community.

Maternal and newborn outcome: Exacerbations are a major clinical problem during pregnancy with up to 45 per cent of women needing to seek medical help, resulting in poor maternal and newborn outcomes. Women who have exacerbations of asthma during pregnancy are at three times the risk of LBW compared with women without asthma exacerbations in pregnancy.

Maternal and newborn outcome: Common maternal problems are APH, placenta previa, GDM, gestational hypertension, pre-eclampsia, PROM, IUGR, LBW, and SGA.

Diagnosis: clinical symptoms and X-ray of chest.

3.3.3.27 Standard for management of bronchial asthma in pregnancy

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Bronchodilators	If bronchospasm occurs, give salbutamol or aerosol		
Corticosteroids		If no response to bronchodilators	
Antibiotics		If there are signs of infection (bronchitis), give ampicillin 2 g IV every 6 hours	
Inhaled bronchodilators and inhaled corticosteroids	After acute exacerbation: continue treatment with inhaled bronchodilators		Prostaglandins

Asthma severity during pregnancy is similar to severity in the year before pregnancy, provided patients continue to use their prescribed medication. If women discontinue medication, even mild asthma is likely to become significantly more severe.

Chapter 4: Management of Labour and Childbirth

This chapter describes the aims, approaches, standard statements and application of standards for care for women and foetus during labour and childbirth. The labour and childbirth period refers to the period from the commencement of true labour through the first, second, third and fourth stages of labour, which continues until one to two hours after delivery of the placenta (Lowdermilk et al. 2012).

4.1 Aim

The aim of care during labour and childbirth is to prevent complications and manage emergencies with minimal possible intervention while maintaining the mother and newborn's physical and emotional health.

4.2 Approach

A holistic approach is the dictum of care during labour and childbirth. The holistic approach considers all aspects of the individual, including the body, mind and spirit. It trusts natural progression, and in case of complications, starts with least invasive approach before progressing to the full possible range of interventions.

4.3 Standard statement, readiness and application

Standard statement

A focus on the needs, preferences and values of a woman and her family, along with her and her newborn's safety and respect, are central to care in labour and childbirth. Endorsing supportive care is of equal or greater value than technical care.

Readiness (WHO 2006):

- Each birth setting has protocols based on clinical, organisational and system needs
- Each birth setting has clear role profiles for clinical leadership, promoting good practice and multiprofessional communication
- A robust and transparent clinical governance framework is in place, which is applicable to each birth setting
- Effective multidisciplinary working team functions to deliver services efficiently
- Safe staffing levels of all professionals and support staff as recommended are maintained, reviewed and audited annually for each birth setting
- Core responsibilities of midwives, obstetricians, anaesthetists and newborn practitioners are clearly defined
- Each birth setting has a policy that all professional staff have the opportunity and support for continuing professional development, including agreed mandatory education and training sessions.

Application of standard

Care during labour and childbirth is focused on intrapartum management of women who are expected to have a normal birth and on application of appropriate interventions to manage complications.

4.3.1 Management of uncomplicated labour and childbirth

WHO recommends good practices for conduct of labour and childbirth, with the aim of improving the quality of labour and childbirth care. Good practices are based on human rights principles, i.e. RMC. Management of uncomplicated labour and childbirth is comprised of supportive care for mother,

intrapartum evaluation of foetal and maternal well-being and prevention of probable complication of 1st, 2nd and 3rd stages of labour.

a. Supportive care for mother during labour and childbirth

i. Admission to maternity ward
ii. Oral fluid and foods
iii. Vaginal and perineal area cleansing
iv. Mobility and position
v. Positioning
vi. Pushing.

4.3.1.2 Standard for supportive care of mother during labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Admission to maternity ward	For healthy pregnant women presenting in spontaneous labour, after the onset of active 1st stage (WHO 2018)	Early admission for pregnant woman from remote area (WHO 2018)	
Oral fluid and foods	Encourage to eat and drink. If the woman has visible lethargy during labour, ensure proper feeding Nutritious liquid drinks are important, even in late labour (Managing Complications in Pregnancy and Childbirth (MCPC) 2017)	High-risk pregnant women have high probability of operative vaginal delivery or CS	Restriction of oral fluid or IV fluid
Vaginal and perineal area cleansing	Wash vulva and perineal areas with NS		Routine vaginal cleansing with Chlorhexidine (CLX)
Perineal/pubic shaving/enema/ urinary bladder catheter			Routine perineal/pubic shaving prior to vaginal birth (WHO 2018)
Mobility and position	Encourage to move, walk and use comfortable positions during 1st stage for women at low risk, as it significantly shortens 1st stage of labour (Lawrence et al. 2013)		Restricted to supine or dorsal position
Position	Discourage from lying supine or semi-supine but encourage adopting any other position that is most comfortable, preferably upright position as it facilitates physiological birth, and ensure her comfort in this position (MCPC 2017)	Once the cervix is fully dilated and the woman is in the expulsive phase of the 2nd stage (woman has the urge to push), encourage her to assume the position she prefers	
Pushing	Support to push with contractions and should be	For mother with epidural anaesthesia, in expulsive phase	Early pushing

	guided by her own urge to push (National Institute for Health and Care Excellence (NICE 2017)	of 2nd stage of labour delay pushing for one to 2 hours after full dilatation until mother regains sensory urge to bear down	

Women in labour continue to be subjected to a few controversial routine measures. Based on available evidence, it is recommended that the routine use of measures be abandoned unless medically indicated or a woman prefers them.

vii. Pain management in labour

In traditional obstetric practice, women were denied analgesics in labour, as labour pain was thought to be an integral part of childbirth and enduring pain was considered as women's purity and strength. However, in modern obstetric practice, offering choice between various types of non-pharmacological and pharmacological pain management techniques is in accordance with the woman's human rights.

4.3.1.3 Standard for non-pharmacological pain management in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Relaxation techniques for pain management	Muscle relaxation, breathing techniques, a warm bath or shower, music, other techniques (Smith et al. 2018)		
Manual technique	Massage or application of warm packs for healthy pregnant women requesting pain relief in accordance with women's preferences (Mark et al. 2015)		
Acupressure		During the 2nd phase of labour if the woman prefers	

Effective, satisfactory pain management needs to be individualised for each woman. Choices should be given between non-pharmacological techniques (as above) or pharmacological medications (as below).

4.3.1.4 Standard for pharmacological pain management in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Opioid analgesia		Parenteral preparations, such as fentanyl, diamorphine and pethidine, are options for healthy pregnant women requesting pain relief during labour, depending on the woman's preferences (Smith et al. 2018)	
Epidural anaesthesia		Depending on availability and woman's demand/preferences (WHO 2018)	

Recent studies investigating the management of analgesia in childbirth have demonstrated that pain relief can be started early in labour with no negative consequences. These findings create a real paradigm shift for care providers and allow women to benefit from greater relaxation during labour and childbirth.

b. Intrapartum evaluation of foetus and foetal well-being

There are several techniques for intrapartum foetal evaluation ranging from simpler form of use of Pinard stethoscopes for intermittent Foetal Heart Sound (FHS) monitoring to complex Foetal Blood Gas Analysis (FBGA) using foetal scalp blood. Maternal and newborn health care professionals should be competent enough to make smart decisions on and which technique to use and when and how to use it.

i. Intermittent FHS assessment though Pinard/foetal stethoscope and doppler

4.3.1.5 Standard for intrapartum intermittent FHR monitoring

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Intermittent FHS assessment though Pinard/foetal stethoscope	Auscultate FHR immediately after contraction for at least 1 minute and record on admission (Liston et al.2018) Then listen to FHR immediately after a contraction: count for 1 full minute at least once every hour during latent phase and once every 30 minutes during active phase Every five minutes during 2nd stage; if FHR abnormalities, <100 or >180 BPM, suspect foetal distress (MCPC 2017) If FHR is not in normal range (i.e. 110–160 BPM), auscultation should be prolonged to cover at least 3 uterine contractions. Auscultate during a uterine contraction and continue for at least 30 seconds after the contraction Record baseline FHR (as a single counted number in BPM) and the presence or absence of accelerations and decelerations (WHO 2018)		
Doppler		Suspected FHR abnormalities, <100 or >180 BPM, as Doppler is more accurate compared to Pinard in detection of abnormal FHR in low-risk population (Mangesi et al. 2009)	

Clear policies to support the use of intermittent auscultation as well as clear indications for when to use continuous FHR monitoring with CTG must be available for all birth settings.

ii. Continuous FHS monitoring through CTG

There are two types of CTG, i.e. external and internal.

4.3.1.6 Standard for intrapartum continuous FHR monitoring

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
External CTG		If any risk factor presented at initial assessment or arises during labour If intermittent auscultation indicated possible FHR abnormalities Then after 20 minutes of normal tracing, switch over to intermittent auscultation unless the woman prefers CTG If abnormalities continue, proceed for further investigation (NICE 2017)	On admission for low-risk women in suspected or established labour in any birth setting as part of the initial assessment (NICE 2017)
Internal CTG		In case of inconsistent reading with external CTG, after either spontaneous or artificial rupture of membrane and open cervix	

For continuous monitoring with CTG, a skilled care provider is necessary as: interpretation of a CTG tracing requires qualitative and quantitative description of uterine activity (contractions), baseline FHR, baseline FHR variability, presence of accelerations, periodic or episodic decelerations and changes or trends of FHR patterns over time (Grivell et al. 2015). CTG monitoring can sometimes lead to unnecessary medical interventions (Alfirevic et al. 2017).

iii. NST

Heart rate reactivity is believed to be a good indicator of normal foetal autonomic function. Loss of reactivity is commonly associated with a foetal sleep cycle but may result from any cause of central nervous system depression, including foetal acidosis.

Interpretation: NST is considered reactive, or normal, if there are two or more FHR accelerations within a 20-minute period, with or without foetal movement discernible by the woman (Preboth 2000). NST lacks sufficient FHR accelerations over a 40-minute period. False-negative rate for NST is low, ranging from 0.19 per cent to 1 per cent, and when assessing the inter-observer variation, proportions of agreement for normal tests were high (Blix et al. 2003). In contrast, false-positive rate of a nonreactive nonstress test is as high as 55 per cent (Freeman et al. 1982).

iv. Contraction Stress Test (CST)

CST is based on response of FHR to uterine contractions. It is believed that foetal oxygenation will be transiently worsened by uterine contractions. In a foetus with suboptimal oxygenation, the resulting intermittent worsening in oxygenation will, in turn, lead to a FHR pattern of late decelerations.

Interpretation: According to the (Preboth 2000) the test is:

- Negative: No late or significant variable decelerations

- Positive: Late decelerations following 50 per cent or more of contractions (even if the contraction frequency is fewer than three in 10 minutes)
- Equivocal-suspicious: Intermittent late decelerations or significant variable decelerations
- Equivocal-hyper stimulatory: FHR decelerations that occur in the presence of contractions that are more frequent than every two minutes or last longer than 90 seconds
- Unsatisfactory: Fewer than three contractions in 10 minutes or a tracing that is not interpretable.

4.3.1.7 Standard for intrapartum foetal behaviour monitoring

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
NST		IUGR, DM, pre-gestational and gestational diabetes mellitus treated with drugs, hypertensive disorder, chronic hypertension, pre-eclampsia, decreased foetal movement, post-term pregnancy, multiple pregnancies, SLE, antiphospholipid antibody syndrome, recurrent pregnancy loss alloimmunisation, hydrops, oligohydramnios, cholestasis of pregnancy Other conditions include maternal heart diseases, hyperthyroidism, chronic liver diseases, maternal drug abuse, and chronic renal insufficiency	In predicting outcomes or determination of foetal well-being in patients with acute condition requiring prompt intervention, e.g. placental abruption and cord prolapse (Brecher et al. 2002) For conditions with increased risk of preterm labour and uterine rupture
CST		Hypoxic foetus will demonstrate recurrent late decelerations	Patient with risk of preterm labour, PROM, History of (H/O) uterine surgery, CS, placenta previa, multiple gestation, cervical incompetence, vasa previa

Behavioural organisation becomes more important in the late third trimester, since clustering of movements and accelerations become more apparent during this general time frame.

v. Meconium-stained Amniotic Fluid (MSAF)

MSAF is an alarming sign of foetal compromise and associated with poor perinatal outcome. Presence of MSAF at delivery is a potential sign of foetal compromise.

Incidence of MSAF ranges from 7 to 22 per cent, while Meconium Aspiration Syndrome (MAS) occurs in approximately 5 per cent of all cases of MSAF. Meconium Aspiration Syndrome contributes to newborn death in up to 0.05 per cent (i.e. 1 in 2000 of all pregnancies) (Rokade et al. 2016).

vi. FBGA

Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of FBGA regarding newborn acidosis (defined as a pH value ≤7, in arterial or venous umbilical cord blood) and Apgar scores indicate newborn depression defined as a five-minute Apgar score ≤5 (Carbonne et al. 2016).

4.3.1.8 Standard for evaluation of intrapartum compromised foetus

Intervention	Recommendations		
	Recommended All	Context-specific	Not Recommended
MSAF		Meconium-stained liquor is an indicator of foetal distress; its concentration determines the severity of the condition and the intensity of the monitoring and evaluation required	
FBGA		Second-line intervention for the assessment of foetal well-being in women in labour with Nonreassuring FHR Tracings (NRFHRT) on CTG with the goal of reducing unnecessary operative deliveries like CS, vacuum, and forceps	Foetal bleeding disorders (e.g. suspected foetal thrombocytopaenia, haemophilia), malpresentation

Alerting a paediatrician and properly resuscitating newborns born through MSAF reduce overall morbidity and mortality. FBGA using scalp blood is used in tertiary set-up, to identify serious foetal distress. Presence of meconium in amniotic fluid is a potentially serious sign of foetal compromise and associated with poor perinatal outcome.

c. Intrapartum evaluation of mother and maternal well-being

A series of procedures are considered for intrapartum evaluation of mother and maternal well-being. These are the measurement of vital signs, clinical pelvimetry and X-ray pelvimetry (Annex VI).

i. BP, pulse, temperature, hydration, and urine output

4.3.1.9 Standard for intrapartum evaluation of maternal well-being

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Vitals for general well-being	Check BP, and pulse at least once every 4 hours in latent phase Check temperature at least once every 2 hours Check pulse once every 30 minutes during active phase (MCPC 2017) Then pulse every 5 minutes during the 2nd stage (MCPC 2017)		

Pelvic examination and should not be confused with a standard pelvic examination, which is required for the clinical assessment of cervical status, and foetal station and position (Pattinson et al. 2017). Diagnosis accuracy of clinical pelvimetry is uncertain; however, findings from some observational studies suggest that it might help to predict Cephalopelvic Disproportion (CPD) (Rozenholc et al. 2007). Use of equipment that requires electricity can be negatively impacted by power cuts in low-income country settings. Therefore, before switching from Pinard foetal stethoscope to Doppler device, it is important to ensure the appropriate resources are available to sustain implementation.

d. Prevention of probable complications of normal first stage of labour

General considerations:

- At the time of diagnosis of labour, reviewing of ANC records, obtaining a detailed clinical history and performing an examination are necessary to identify risk factors
- Before commencing any examination or procedure, make sure to counsel and take verbal/written consent (whichever is applicable) from the birthing woman
- An anaesthesiologist and resuscitation facilities are mandatory for setting up and monitoring of epidurals.

There are two distinct phases of the first stage of labour:

Latent phase: Characterised by painful uterine contractions and variable changes of the cervix, including some degree of effacement and slower progression of dilatation up to 5 cm for first and subsequent labours (WHO 2018).

Active phase: Is considered when there are signs of regular painful uterine contractions, marked degree of cervical effacement and more rapid cervical dilatation from 5 cm until full dilatation. However, duration of active first stage usually does not extend beyond 12 hours for primigravida, and 10 hours for multigravida.

i. Assessment of uterine contraction

While assessing effective uterine contractions consider: Intensity, synchronisation, and frequency

ii. Digital PV examination: For cervical dilatation, effacement, position of the presenting (Annex VII)

Be sure that PV examination is necessary and will add important information to the decision-making process; recognise that PV examination can be very distressing for a woman, especially if she is already in pain, highly anxious and in an unfamiliar environment.

iii. Partograph

A partograph is a graphical presentation of cervical dilatation against time. Research studies have shown that maternal and foetal complications due to prolonged labour were less common when progress of labour was monitored by birth attendant using a partograph.

iv. Clinical pelvimetry

Internal pelvic examination should not be confused with a standard pelvic examination, which is required for the clinical assessment of cervical status, amniotic fluid and foetal station and position (Pattinson et al. 2017).

v. X-ray pelvimetry

X-ray pelvimetry is more accurate than clinical pelvimetry, as well as eliminating the discomfort of clinical pelvimetry; however, it is associated with unnecessary radiation exposure.

4.3.1.10 Standard for evaluation of first-stage labour progress

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Uterine contraction	Half-hourly documentation of frequency and strength of contractions at 1st stage of labour (NICE 2017)		
PV examination	On admission for routine assessment of active 1st stage of labour in low-risk women (WHO 2018) Then 4-hourly, with few additional examinations if concerned about progress (NICE 2007)		PV examination more frequently than every 4 hours, unless there is a clear indication
Partograph	Active phase partograph with a four-hour action line. Progress of the 1st stage of labour should be plotted on a partograph once the woman enters the active phase of labour		
Clinical pelvimetry		Might have a role in triaging women at high risk of CPD who reside in rural and remote areas; however, currently no evidence that the practice improves outcome (Annex VI)	Routine on admission of healthy women, as there is too little evidence to show whether pelvimetry is beneficial and safe when foetus is in cephalic presentation (Pittinson 2005)
X-ray pelvimetry		High-risk women with suspected CPD	Routine

Recognising abnormal labour progression and initiating appropriate supportive care and interventions are important as failure to progress is associated with increased risks for operative delivery and maternal and newborn morbidity.

e. Prevention of probable complications of normal second stage of labour

Second stage of labour is defined as the duration from fully dilated cervix until delivery of the newborn. It includes passive phase, with passive descent of foetal head, and active phase, also known as expulsive phase, with bearing down or pushing. Active phase starts when contractions become expulsive or when woman actively starts pushing (NICE 2017).

Perineum anatomy preservation

While first-degree tear is least damaging, fourth-degree tear affects the anal sphincter or mucosa, thus seriously destroying perineum anatomy (WHO 2018).

- 'Hands on' or 'Hands poised' technique
- Episiotomy.

Multiple reviews have demonstrated that a policy of restricted episiotomy has better maternal outcomes than a policy of routine episiotomy, with no adverse effects for the newborns (Hartmann et al. 2005). Hence, decision for episiotomy should be reserved for selective cases.

4.3.1.11 Standard for perineum anatomy preservation in second-stage labour

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Fundal pressure			Application of manual fundal pressure to facilitate 2nd stage of labour, might cause perineal tear or uterine prolapse
'Hands on' or 'Hands poised' technique	Guarding the perineum and flexing the baby's head Hands off the perineum and baby's head but in readiness		Perineal massage in 2nd stage of labour
Episiotomy		Maternal exhaustion and foetal distress during 2nd stage of labour When quick and easy 2nd stage is needed (women with heart valve disease, previous 3rd degree tear, a repaired rectocoele, and breech forceps delivery)	Routine episiotomy during spontaneous vaginal birth (MCPC 2017)

There is no evidence that policy of routine episiotomy resulted in significant reductions in laceration severity, pain, or pelvic organ prolapse compared with a policy of restricted use (Borghi et al. 2002).

f. Prevention of probable complications of normal third stage of labour

Third stage of labour refers to the period following delivery of newborn until delivery of placenta. Normal duration of third stage in nulliparous and multiparous mother is less than 30 minutes.

General considerations:

- Active management of third stage should be offered to all mothers
- Placenta, membranes and umbilical cord should be examined after delivery for completeness and abnormalities
- Every mother should be monitored in labour room for at least two hours after delivery for any complications
- All mothers after vaginal delivery should be observed for bleeding and their general condition and vital parameters must be monitored during this period.

g. Active Management of the Third Stage of Labour (AMTSL)

There is a joint policy statement between International Confederation of Midwives (ICM), FIGO and WHO, all of which recommend AMTSL in order to prevent PPH (Cynthia 2017). AMTSL is a series of

steps, including administration of a prophylactic uterotonic (at or after delivery of the baby), cord clamping and cutting, Controlled Cord Traction (CCT) and uterine massage, as developed by WHO.

i. Prophylactics uterotonics and antibiotics

There is strong evidence supporting the routine administration of uterotonic agents, which enhance natural uterine contraction in the third stage of labour, thus reducing the incidence of PPH by 40 per cent.

4.3.1.12 Standard for prophylatics, uterotonics and antibiotics during third-stage labour

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Prophylactic oxytocin	Injection 10 IU of oxytocin IM with birth of anterior shoulder or immediately after the birth of baby and before the cord is clamped and cut Oxytocin preferred as it is associated with fewer side effects than oxytocin plus ergometrine (MCPC 2017)		
Ergometrine/methylergometrine		If oxytocin is not available, oral misoprostol or ergometrine or methylergometrine (MCPC 2017) For multiple births administration occurs after the birth of last baby	Pre-eclampsia, eclampsia or high BP because of increased risk of convulsions and CVA
Routine prophylactic antibiotic		Repair of 3rd- and 4th-degree tears, PROM, manual removal of placenta or placement of intrauterine balloon tamponade (IBT) midline	Uncomplicated vaginal birth, undergoing operative vaginal birth, episiotomy, 1st- or 2nd-degree lacerations

Oxytocin is widely used for AMTSL. In some cases, ergometrine/methylergometrine is also used. The benefit of ergometrine/methylergometrine is that the time of onset of uterine response after IM administration is shorter than ergometrine alone, and duration of action is several hours. Although it was found to be more effective than oxytocin, adverse effect profile (hypertension, nausea, vomiting) restricts its use.

Apart from use of uterotonic medications as the prophylaxis for prevention of PPH, there are certain intrapartum manoeuvres that could help achieve better newborn outcomes: for example, delayed cord clamping, CCT, and uterine massage.

ii. Delayed cord clamping

iii. CCT

4.3.1.13 Standard for CCT, and uterine massage for active management

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Delayed cord clamping	Do not clamp cord <1 minute from birth of baby unless there is concern about integrity of cord (NICE 2007) If FHR <60 BPM and not getting faster, but newborn breathing normally, clamp and cut umbilical cord 1 to 3 minutes after birth, while initiating simultaneous essential new-born care (MCPC 2017)		
CCT	Cord traction only after administration of oxytocin and signs of separation of placenta (NICE 2014)		In settings without a SBA
Uterine massage			Sustained uterine massage in women who have received prophylactic oxytocin

CCT has the advantage of reducing risk of manual removal of placenta. Evidence suggests that CCT should be routinely offered during third stage of labour, provided the birth attendant has the necessary skills. CCT should remain a core competence of skilled health professionals (McDonald et al. 2013).

iv. Operative vaginal birth (Assisted vaginal birth)

Operative vaginal delivery is used to shorten the second stage of labour for presumed foetal compromise, and maternal exhaustion and medical condition (cardiac disease Class III or IV, hypertensive crises, myasthenia gravis, spinal cord injury, proliferative retinopathy).

General consideration (Green top 2011):

- Operative vaginal births that have a higher risk of failure should be considered a trial and conducted in a place where immediate recourse to CS can be undertaken
- Forceps and vacuum extraction are associated with different benefits and risks
- An operative vaginal delivery should be performed by an operator who has the knowledge, experience and skills necessary to assess and to use the instruments and manage complications that may arise
- The operator should choose the instrument most appropriate to the clinical circumstances and their level of skill
- Use of sequential instruments is associated with an increased risk of trauma to infant; however, the operator must balance the risks of a CS following failed vacuum extraction with the risks of forceps delivery following failed vacuum extraction
- When conducting mid-cavity deliveries, theatre staff should be immediately available to allow a CS to be performed without delay (<30 minutes)

- Obstetricians should be aware of increased newborn morbidity with failed operative vaginal delivery and/or sequential use of instruments and should inform the neonatologist when this occurs to ensure appropriate management of the baby
- The woman should be reviewed prior to hospital discharge to discuss the indication for operative delivery, management of any complications and the prognosis for future deliveries. Best practice would be for the woman to be reviewed by the obstetrician who conducted the delivery.

Most commonly practised operative vaginal delivery:

Vacuum extraction

The correct technique is as follows: application of a vacuum of up to 0.8 kg/cm^2 to suck part of the scalp into cup and create an artificial caput succedaneum, and then application of a traction force to foetus in concert with uterine contractions to expedite delivery (Norwitz et al. 2001).

Forceps delivery

Use of forceps in clinical practice can constitute an indispensable option in assisting childbirth. In many cases, sole use of vacuum is either inadequate or not indicated, with restrictive guidelines on the number of permitted pulls.

4.3.1.14 Standard for operative vaginal delivery

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Vacuum		Indication: To shorten and reduce the effects of 2nd stage of labour for maternal fatigue/exhaustion, and medical conditions Prerequisite: Head is ≤1/5th palpable/abdomen vaginal examination, vertex presentation, cervix fully dilated, membranes ruptured (RCOG 2014)	POG <34 weeks; the safety of vacuum extraction at between 34 weeks +0 days and 36 weeks +0 days of gestation is uncertain (RCOG 2014)
Forceps		To cut short 2nd stage of labour; indication as that for vacuum Head is ≤1/5th palpable Per Abdomen (PA), pelvis is deemed adequate, vertex presentation, fully dilated cervix, membranes ruptured	POG <36 weeks, before full dilatation of cervix, face presentation, caput and moulding. Irreducible moulding (may indicate CPD)
Analgesia	Regional block	A pudendal block may be appropriate, particularly in the context of urgent delivery	

Undoubtedly, forceps can cause serious harm, but this is true of any instrument in inexperienced hands. The art and practice of instrumental delivery has benefited many; however, it has also led to numerous litigations due to poor foetal and sometimes maternal outcomes, leading to reluctance in its use.

4.3.2 Intervention for management of complications in labour and childbirth

Most labour and childbirth occur without any complications. However, complications can sometimes arise suddenly and unexpectedly, before conception and labour, during labour and childbirth, and immediately after the birth of foetus around the time of placenta delivery.

a. Complications before conception and during labour

Complications that began before conception or develop during pregnancy can be carried out or worsen during labour and childbirth to adversely affect the maternal and newborn outcome. Such complications could be: Heart failure, HIV, GDM, preeclampsia and eclampsia, placenta previa, preterm labour, PROM, post-term, scarred uterus, multiple births (twins and triplets), malposition (Occiput Posterior (OP)) and, malpresentation of foetus (face, brow, breech, transverse).

i. Heart failure

Physiological changes of pregnancy are often well tolerated by those women who conceived with pre-existing heart disease; sometimes, however, their condition may be worsened by superimposed heart failure, arrhythmias and thromboembolic events.

Maternal and newborn outcome: Overall maternal and foetal morbidity and mortality from cardiac disease are directly related to the severity of cardiac disease.

Diagnosis: Electrocardiogram (ECG), echocardiography

General considerations:

- Adequate care in labour and childbirth includes involvement of a multidisciplinary team that ensures appropriate and well-organised care during pregnancy and peri-partum. The core members of this team are the cardiologist and the gynaecologist, and when delivery approaches the anaesthetist and neonatologist (Drenthen et al. 2010).
- Cardiovascular stress can be minimised by the use of early slow incremental epidural anaesthesia and assisted vaginal delivery
- CS is usually necessary only for obstetric indications
- Operative vaginal birth can be employed to cut short second stage of labour
- A nurse practitioner is an especially useful member of the team and can serve as the coordinator
- Cardiologist and gynaecologist must formulate the delivery plan.

4.3.2.1 Standard for the management heart failure in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Supportive care	Positioning to left lateral prop Limit infusion of IV fluids to decrease the risk of circulatory overload, and maintain a strict fluid balance chart Ensure adequate analgesia		Sustained bearing-down efforts during the expulsive phase of 2nd stage of labour
Specific management	Morphine, furosemide, digoxin or nitro-glycerine		
Oxytocin infusion	Concentrated to cut short the 2nd stage		
Operative vaginal	To decrease the maternal workload,		

birth	assist the birth		
Active third-stage management	Oxytocin 5 IU IM and CCT or 2 IU IV over 10 minutes or syntocinon 8–12 mL/minute		Ergometrine

Most women with heart disease can be allowed to go into spontaneous labour. Sometimes it may be preferable to induce delivery at a previously scheduled time (Regitz-Zagrosek et al. 2008). For most cardiac patients, however, vaginal delivery is preferred and CS is reserved for obstetric indications, since CS is associated with greater blood loss and higher thromboembolic and infection risk (Fernandes et al. 2010).

ii. HIV

A woman who is diagnosed HIV-positive during the antenatal period should receive the same standard of care as that for the non-pregnant woman.

Maternal and newborn outcome: Spontaneous abortion, premature delivery, IUGR and LBG. Natural perinatal transmission risk varies from 15 to 45 per cent. If a woman has not been treated, there is a 1 in 4 risk that the baby will have HIV. If treated, the risk drops to about 1 in 100.

Diagnosis: Rapid HIV antibody testing.

General considerations:

- Mode of delivery should be discussed in detail with all women; those on optimal ART for the four weeks prior to delivery are recommended to have a vaginal delivery in the absence of other obstetrical indications for CS
- Women not on optimal ART (monotherapy only, or with an incompletely suppressed VL) should be offered a scheduled pre-labour CS at approximately 38 weeks' gestation
- For a woman living with HIV who has not received antenatal ART in pregnancy, a single dose of oral Nevirapine (NVP, 200 mg) remains an option during labour and childbirth.

4.3.2.2 Standard for management of HIV during labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Rapid HIV antibody testing		Women with unknown HIV status or at continued risk of HIV infection since their last negative HIV serology result	
HIV PCR and HIV antibody tests		If rapid antibody test is not available	
Counselling		If the test result is positive, counsel for further management	
ART		Initiate IV zidovudine as soon as labour starts until delivery in combination with oral cART, regardless of mode of delivery, current ART, or VL (ACOG 2018) Discontinue ART if: antibody test results negative and mother out of seroconversion period or HIV PCR antibody negative	Wait until confirmatory test result

Spontaneous vaginal birth		Appropriate for women who have been maintained on ART and who have VLs of 1000 copies/mL or less at or near delivery, and can be managed in a manner similar to HIV-uninfected women Duration of Rupture of Membrane (ROM) before delivery is not an independent risk factor for MTCT in women who are otherwise appropriately virally suppressed	
CS		Untreated or with suboptimal suppression of antibody because of poor adherence, resistance to their ART regimens, or inadequate time on ART, or with VLs >1000 copies/mL at term, planned early-term CS at 38 weeks of POG If CS is recommended for obstetric indications, it can be conducted at 39 weeks, as usual for those indications	
Ongoing plan		Plans for ongoing HIV care should be established prenatally, and unless otherwise indicated, maternal ART should be continued after delivery and reassessed for ongoing therapy by providers of adult HIV care. Link the infected mother with ART clinics	

Most newborns born to HIV-positive mothers will not get HIV if mothers are treated during pregnancy and delivery, and if newborns receive ART in the first few weeks after birth.

iii. GDM

GDM is a special form of diabetes in women of child-bearing age and is a common gestational endocrine disease. Worldwide, it is estimated that GDM affects less than 1 per cent to 28 per cent of antenatal mothers (Jiwani et al. 2012).

Maternal and newborn outcome: Stillbirth, newborn hypoglycaemia, hyperbilirubinemia; perinatal complications associated with GDM include: increased risk of future type 2 diabetes, CVA, shoulder dystocia, preterm delivery, chances of CS, hypertensive disorders, preterm delivery; postpartum complications include: obesity and impaired glucose tolerance in the offspring.

Diagnosis: GDM should be diagnosed at any time in pregnancy (NICE 2015):

- Assess risk of GDM using risk factors in a healthy population. If women had GDM in previous pregnancy perform 75g Oral Glucose Tolerance Test (OGTT) as soon as possible; if negative repeat again at 24–28 weeks. For women with any other risk factors screen at 24–28 weeks by 2-hour OGTT with 75 g glucose load
- Do not use fasting plasma glucose, random blood glucose, Haemoglobin A1C (HbA1C), glucose challenge test or urine analysis for glucose to assess risk of developing GDM
- Glycosuria of 2+ on more on one occasion or of 1+ or above on two or more occasions by regent strip during ANC needs further testing to exclude GDM
- Diagnosis of GDM made if the woman has either fasting plasma glucose level of 5.6mmol/L or above or a 2-hour plasma glucose level of 7.8mmol/L or above.

General considerations:

- There is no consensus on the timing of IOL in women with GDM, with its mixture of risks and benefits (Kjos et al. 2007)
- The presence of GDM is not by itself an indication for CS
- GDM is not an indication for delivery before 38 weeks' gestation in the absence of evidence of foetal compromise
- All pregnant women with pre-gestational diabetes should be referred to a specialist clinic with expertise in managing these conditions in pregnancy, usually at a specialist hospital
- Follow-up care may be continued at a district hospital, in accordance with instructions from the specialist clinic, depending on facilities, levels of skill, and the stability/control of her diabetes
- Women with gestational diabetes can be managed at the district hospital level if blood sugar levels are controlled on diet fasting blood sugar.
- Offer all women ongoing treatment by multidisciplinary health professionals once diagnosed.

4.3.2.3 Standard for management of GDM in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Monitor		2-hourly glucose in case of labour induction	
Insulin infusion		When woman is mildly hyperglycaemic, at 120 mg/dL. Insulin infusions are preferred to subcutaneous injections due to women's rapidly changing caloric needs during labour and unpredictable oral intake (Hod et al. 2015)	
Dextrose infusions		When glucose levels drop below 60 mg/dL or when they experience symptoms of hypoglycaemia	
IOL		For women with well-controlled diabetes, whether pregestational or gestational, not before 39 completed weeks POG For women with poorly controlled diabetes, an individualised decision aiming for late preterm or early term delivery (before 38 weeks + 6 days gestation) An early term or term delivery (38–39 weeks + 6 days gestation) is suggested if vascular complications are present in women with pregestational diabetes These recommendations assume 24/7 availability, accessibility, and affordability of optimal maternal and foetal monitoring, including seven-point glycaemic profiles* and regular CTG for all women with GDM (ACOG 2018)	Delivery before 38 weeks POG in the absence of evidence of foetal compromise
CS		As for other pregnancies	Only GDM itself

*Seven-point blood glucose profile (ITT). Measurements: 1-before breakfast, 2-2 hours after breakfast, 3-before lunch, 4-2 hours after lunch, 5-before dinner, 7-before sleeping (Dailey 2007).

The timing of delivery in GDM is an important decision, which should be taken keeping in mind the biomedical, psychological, social, and environmental factors operating in the particular person. Such a decision is best arrived at through a process of active, informed discussion with the patient and her family.

iv. Pre-eclampsia and eclampsia

In this section only management of labour and childbirth is recommended, since an introduction to the topic has already been presented in (3.3.3.19).

General considerations:

- Mode of delivery should be determined after considering the presentation of foetus and foetal condition, together with likelihood of success of IOL after assessment of cervix
- Vaginal delivery is generally preferable but, if gestation is <32 weeks, CS is more likely as the success of induction is reduced
- In all situations, a carefully planned delivery matching the resources of the institution, including physical and human, with provision of timely referral is appropriate
- Consultant obstetrician should discuss the mode of delivery with the mother
- Anti-hypertensive treatment should be continued throughout assessment and labour, similar to antenatal period.

4.3.2.4 Standard for management of pre/eclampsia in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Hospital admission		Severe pre-eclampsia and eclampsia	
Prophylaxis for seizure		In severe pre-eclampsia, $MgSO_4$ is the drug of choice	
Timing of delivery		Delivery should occur within 12 hours of onset of convulsions in eclampsia Delivery within 24 hours of onset of symptoms in severe pre-eclampsia	
Labour induction		In mild pre-eclampsia, if POG is >34 complete weeks, with cephalic presentation and favorable cervix In severe pre-eclampsia at any POG when foetus is not viable or unlikely to achieve viability within 1 or 2 weeks	
Active management		With IM or IV Syntocinon	Ergometrine/syntometrine

There must be an enabling environment for implementation of these recommendations, most importantly the behaviour of policy makers and service providers towards adaptation and use of this evidence-based practice. In this process, the role of local professional societies is important and an all-inclusive and participatory process should be encouraged.

v. Placenta previa

An actively bleeding placenta previa is a potential obstetric emergency. These women should be admitted to the maternity ward for maternal and foetal monitoring, and the anaesthesia team should be notified. Management should be focused on achieving and/or maintaining maternal haemodynamic stability and determining if emergency CS is indicated.

4.3.2.5 Standard for management of placenta previa in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Preterm termination of pregnancy		Balance of foetal benefit versus maternal risk favours delivery in women with significant vaginal bleeding after 34 weeks, because the newborn benefits from avoiding preterm birth decrease with advancing POG while maternal risks from persistent or recurrent bleeding probably increase Recurrence of continuous brisk haemorrhage or dead or foetus with CMF	
Normal vaginal delivery		When placenta edge is clearly 2–3 cm away from internal os, foetal lung maturation, and haemodynamically stable	
CS		36 to 37+6 weeks POG with uncomplicated placenta previa (ACOG 2019), or heavy, continuous bleeding, irrespective of foetal maturity, and USG evidence of placental edge at 2 cm from internal os	
Uterine artery ligation/ hysterectomy		Uncontrolled bleeding during the postpartum period	

Some women with placenta previa remain asymptomatic without preterm labour or vaginal bleeding; the clinician must therefore decide when to schedule CS in a "stable" patient.

vi. Preterm labour

WHO defines preterm birth as all births before 37 completed weeks POG. There are sub-categories of preterm birth, based on gestational age: extremely preterm born at <28 weeks, very preterm born at 28 to 32 weeks, (Chawanpaiboon et al. 2019), and moderate to late preterm birth born at 32 to 37 weeks POG (Goldenberg et al. 2008). Inflammation is a common mechanism underpinning multiple aetiologies of preterm labour (Keelan 2017).

Maternal and newborn outcome: Increased risk of RDS, higher rates of cerebral palsy, and sensory deficits.

Diagnosis: TVS measurement of length of cervix in mid-pregnancy should be able to predict preterm labour with clinically useful reliability. For preterm birth prediction, sensitivity of a cervical length of <25 mm in women with a singleton gestation (no prior preterm birth) is 40 per cent, with a negative predictive value of 97 per cent. Risk of preterm labour increases as cervical length decreases; in women with a cervix length of <15 mm the risk of preterm birth approaches 50 per cent (Markham et al. 2016). USG in cervical screening for <37 weeks preterm birth has a sensitivity of 80 per cent and a negative predictive value of 95 per cent (kim et al. 2017).

General considerations:

- In case of preterm delivery, the available data do not allow specific recommendations about the choice of mode of delivery regardless of foetal presentation
- There is not enough evidence to show the effects of a policy of planned immediate CS rather than a policy of planned vaginal delivery for the birth of premature babies
- Claims that planned preterm CS delivery reduces the chances of foetal or newborn death and birth trauma have been met by counterclaims that such a policy leads to risk of serious morbidity for both mother and baby
- For intermediate or late low-risk preterm newborns (32 to 36 weeks), primary CS may in fact increase risk of newborn mortality and morbidity, such as pulmonary hypoplasia, necrotising enterocolitis or sepsis (Malloy 1991).

4.3.2.6 Standard for management of preterm labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
PA	Assessment of intensity, strength and duration of contraction		
PV	Assess the status of cervix in terms of dilatation and effacement		
Labour augmentation with oxytocin		Favourable cervix, but inefficient contraction	
Cord clamping		Uncomplicated preterm deliveries, clamping delayed for minimum of 30 seconds to 3 minutes after delivery	Extremely preterm or moderate to severe depressed foetus with no evidence of benefit by CCT
Operative vaginal delivery			Before 34 weeks both vacuum and forceps, as probable chance for intra- and extracranial haemorrhages and brachial plexus injuries (Swedish National Clinical Guidelines 2010)
CS		Routine use of CS for preterm birth is controversial and a	

		decision concerning CS probably needs to be made on a case basis	

There is a dramatic difference in survival of premature babies depending on facility resources. In low-resource countries, physical resources as well social and cultural factors need to be assessed comprehensively in advance to be better prepared for handling preterm birth.

vii. Prelabour rupture of membrane

Women with PROM usually experience a painless gush or a steady leakage of fluid from the vagina (Norwitz et al. 2007).

Maternal and newborn outcome: Premature birth, cord compression, infection, placental abruption, and postpartum endometritis.

Diagnosis: Signs and symptoms, regular uterine contractions with or without pain (at least one in every 10 minute), dilatation (>2 cm) and effacement (80 per cent) of cervix, pelvic pressure, backache and/or vaginal discharge or bleeding. TVS measurement length of cervix <2.5 cm and funnelling of internal os, and other tests like pooling test, Nitrazine test, and fern test are available.

General considerations:

- Management depends upon POG, duration of ruptured membrane, presenting signs and symptoms and test results
- Induction was previously recommended for 34 to 37 weeks POG (Beckmann 2010); however, as long as the foetus is doing well, and there are no signs of infection or placental abruption, delivery can wait as this results in better outcomes (Bond et al. 2017)
- Standard for tocolytics, corticosteroids, and Rh anti-D as described under management of premature contraction under (3.3.3.16) and (3.3.2.9).

4.3.2.7 Standard for management of PROM

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Antibiotics		If total length of ROM is expected to exceed 18 hours Any other risk factor for group B streptococcal infection: prophylactic antibiotics unless patient has recently been tested and is known to have a negative culture for this organism	
Labour induction		Term pregnancy with favourable cervix: accordingly, labour should be induced as soon as possible with IV oxytocin	
Cervical ripening		>37 weeks pregnancy cervix unfavourable, if labour has not started within 12 hours, oxytocin induction in a non-scarred uterus	
CS		If delivery is not imminent, the longer the time between rupture of membranes and delivery of baby, the more likely chance of occurring infection	

		Risk significantly increases if labour does not occur within 12 hours of membrane rupture (Duff 2012)	

Management should be planned on an individual basis with careful consideration of risk factors and the woman's informed choices. If chorioamnionitis is suspected, ensure placenta is sent for Histopathological Examination (HPE).

viii. Post-term labour

Post-term pregnancy is a pregnancy that extends to 42 weeks POG or beyond (294 days), or Estimated Date of Delivery (EDD) + 14 days (ACOG 2004). Use of standard clinical criteria to determine EDD tends to overestimate gestational age and consequently increases the incidence of post-term pregnancy.

Maternal and newborn outcome: Increased foetal morbidity due to higher risks of meconium aspiration, macrosomia and larger babies, birth injury (brachial plexus damage or cerebral palsy), newborn acidaemia, low five-minute Apgar scores, newborn encephalopathy, and newborn seizures. Maternal morbidity increased due to obstructed labour, resulting in shoulder dystocia, prolonged labour, perineal tear, operative vaginal delivery, CS, PPH and infection.

Diagnosis: Dating of pregnancy by LMP and USG.

General considerations:

- Decision to intervene with IOL requires consideration of multiple factors, including antenatal foetal assessment, favourability of the cervix, gestational age, maternal risk factors and maternal preference
- After evaluation of the earlier mentioned factors, the obstetric care provider and patient should discuss in detail the risks and benefits of IOL vs. expectant management with antenatal monitoring (Doherty et al. 2008)
- IOL has become one of the most common interventions in obstetrics, and this has increased the risk of CS
- While attempting IOL for post-term pregnancy all facilities for CS must be in place.

4.3.2.8 Standard for management of post-term labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
IOL		Favourable-cervix women with uncomplicated pregnancies between 41 + 0 and 42 + 0 weeks At 41–42 weeks POG, risks of IOL outweighed by the benefits (NICE 2014)	
Cervical ripening		Unfavorable cervix (Bishop Score <6) (Kelly et al. 2009) with intravaginal lower dose misoprostol (Sanchez-Ramos et al. 2002)	
CS		Amniotic fluid <2 cm and amniotic fluid index (AFI) amniotic fluid distribution (AFD)< 5cm. Foetal cord blood analysis <PH (Nabhan 2008)	

Use of routine USG for dating in the first trimester has decreased the overall rate of post-term pregnancy and demonstrated higher complication rates in post-term pregnancies due to better distinction between term and post-term gestation.

ix. Scarred uterus

Incidence of uterus rupture significantly increases with women in labour with previous scarred uterus. Incidence is 0.2 to 1.5 per cent in a woman who attempts labour after a transverse lower-uterine segment incision, 1 to 1.6 per cent after a vertical incision in the lower uterine segment and 4 to 9 per cent with a classical or 'T' incision.

Maternal and newborn outcome: Increased chances of CS, increased chances of ruptured uterus requiring hysterectomy, ARDS, IUGR, preterm birth.

Diagnosis: Prediction on evidence that USG measurement of the lower uterine segment's myometrial thickness at 36 to 38 weeks' gestation is a predictor of uterine rupture. If lower segment thickness is <3.5 mm. the risk of uterine rupture or dehiscence is 11.8 per cent; if the measurement is >3.5 mm. the risk of uterine rupture is minimal.

General considerations:

- A pregnant woman with a previous uterine scar should be asked for necessary documents, information and details of the previous CS; myomectomy and uterine perforations should be looked for and recorded in present clinic records
- Women should be counselled for mode of delivery and associated maternal and newborn risk
- A specialised team and a well-equipped centre are necessary
- Case linked to further higher centre if needed.

4.3.2.9 Standard for management of scarred uterus in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Labour ward admission		Patient should be advised to undergo early admission (1st stage of labour) Where transport is difficult admit before labour starts near late preterm	
Trial of labour		Previous CS involved low transverse incision Foetus in a normal vertex presentation Facility for emergency CS if required	Previous classical or inverted 'T' uterine scar Previous hysterotomy or myomectomy entering the uterine cavity Previous uterine rupture Presence of contraindication to labour such as placenta previa, malpresentation

Partograph	Labour progress for all scarred uterus		
FHR monitor (Doppler/Pinard)		1st stage every 15 minutes for 1 full minute 2nd stage after each contraction for 1 full minute	
CS		If above conditions are not met If woman has history of 2 lower uterine segment CS scars H/O ruptured uterus	

If possible, identify the indication of previous uterine scar: whether it is CS or other uterine surgery (repair of a previous uterine rupture, excision of an ectopic pregnancy implanted in the cornua) that left the scar in the uterine wall. This scar can weaken the uterus, leading to uterine rupture during labour (MCPC 2017).

x. Multiple foetuses (twin, triplet, quadruplet)

Incidence of twin pregnancy varies worldwide, from 6.7/1000 births to 40/1000 births. Generally, the rate of monozygotic twins is relatively constant at 3.5/1000 births (Dodd et al. 2015).

Maternal and newborn outcome: Preterm delivery, pre-eclampsia, GDM, polyhydramnios, oligohydramnios, increased chances of operative vaginal and CS increased, trauma to birth canal, IUGR, CMF, birth asphyxia, cord accidents, foetal demise, Twin-to-twin Transfusion Syndrome (TTTS), oligohydramniotic sac, "stuck twin," cord entanglement.

Diagnosis: Per abdominal examination: USG examination is confirmatory. Diagnosis of TTTS is suggested if monochorionic twins showed Hb difference of >5gm/dL. Significant growth discordance of >25 per cent disparity in weights increases perinatal mortality.

General considerations:

- Clinical care for women with twin and triplet pregnancies should be provided by a multidisciplinary team consisting of: a core team of specialist obstetricians, specialist midwives and sonographers, all of whom have experience and knowledge of managing twin and triplet pregnancies, and an enhanced team for referrals, which should include a perinatal mental health professional
- Core team should offer information and emotional support specific to twin and triplet labour and childbirth at their first contact with the woman and provide ongoing opportunities for further discussion and advice, including mode of childbirth
- Management of the first twin is as that of singleton pregnancy, however, management differs for the second twin and is as follows.

4.3.2.10 Standard for management of the second twin in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
External Cephalic		Membrane intact, other	

Version (ECV)		factors favourable for vaginal delivery Tertiary centre	
Vaginal assisted breech/breech extraction		If twin estimated to be smaller than the 1st twin, and cervix has not closed FHR abnormalities: <100 or >180 BPM	
Internal Podalic Version (IPV)		Failed ECV Cervix fully dilated with intact membrane	Untrained provider, ROM, drained amniotic fluid, scarred uterus
Artificial Rupture of Membranes (ARM)		Vertex presentation with intact membrane	
Augmentation rapid oxytocin escalation		With vertex presentation, contractions inadequate after birth of the 1st twin	
CS		Failed/not advisable for ECV and IPV/not qualified for vaginal breech birth	

CS is the preferred delivery route because vaginal delivery is associated with increased risk of adverse outcomes if compared with the CS (Ko et al. 2018).

xi. OP

Persistent OP position occurs in approximately five per cent of births and is the most common malposition in labour. Spontaneous rotation to the anterior position occurs in 90 per cent of cases. Arrested labour may occur when head does not rotate and/or descend. Delivery can be anticipated to be more difficult (Sharmila et al.2014).

Maternal and newborn outcome: Increased rate of induction, prolonged labour, operative delivery, and severe perineal laceration (Ponkey et al. 2003). Newborn cord acidaemia, and birth trauma (Jonsson et al. 2008).

Diagnosis: PA and PV examination: the posterior fontanelle is towards the sacrum and the anterior fontanelle may be easily felt if the head is deflexed.

General considerations:

- Posture during last four weeks and for the duration of labour and childbirth has no benefit in reducing the incidence of OP position, so should not be imposed on women
- Rotational operative vaginal deliveries tend to have a low failure rate when performed by experienced clinicians; they may be associated with anal sphincter injury, despite overall risk being low
- Despite current trends favouring the use of rotational vacuum, most current evidence supports use of rotational forceps in achieving a successful vaginal delivery with no increase in maternal morbidity, and a lower rate of newborn trauma (Tempest et al. 2013)
- Manual rotation followed by direct traction forceps is a commonly performed method of delivery for the OP-positioned foetus; however, this has only been directly compared to rotational forceps or vacuum in one study, with no demonstrable statistical difference in maternal or newborn outcomes (Phipps et al. 2014).

4.3.2.11 Standard for management of OP in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Mobility		If there are signs of obstruction but normal FHR, encourage walking for spontaneous rotation	
Labour augmentation		If cervix not fully dilated, but no signs of obstruction If cervix fully dilated, but no descent in the expulsive phase of 2nd stage of labour	
Vacuum		If cervix fully dilated with foetal head <2/5th below symphysis pubis, or leading bony edge of foetal head at 0 station	
CS		If foetal head >3/5th palpable above symphysis pubis or leading bony edge of the head is above -2 station If signs of obstruction and abnormal FHR (< 100 or >180 BPM) at any stage	

Support measures for mother who is fatigued and doubts her ability to birth vaginally are critical at this juncture. Family support is as important as medical personnel to stave off an unnecessary CS in OP.

xii. Face presentation

Chin serves as the reference point in describing position of head. Incidence of face presentation is about once in every 1000 full-term singleton births and is often not diagnosed until full dilatation. More than 75 per cent of foetuses at term with mentum posterior position require CS because of labour dystocia (Vitner et al. 2015). This contrasts with a more than 88 per cent success rate of vaginal delivery with the mentum anterior position (Benedetti et al. 1980).

Maternal and newborn outcome: Abnormal FHR patterns, Hypoxic-Ischaemic Encephalopathy (HIE), high incidence of operative vaginal delivery and CS.

Diagnosis: Face presentation is usually diagnosed PV at full dilatation of cervix.

General considerations:

- Obstetricians are familiarised with the different techniques of delivery of the impacted head
- Once diagnosis of prolonged second stage is confirmed, causes should be identified and addressed, and treatment should be individualised, and timing and mode of intervention planned.

4.3.2.12 Standard for management of face presentation in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Spontaneous vaginal birth		Chin anterior, fully dilated cervix	
Augmentation oxytocin		Chin anterior fully dilated cervix but slow progress and no sign of obstruction In case where cervix not fully dilated and no signs of obstruction	
CS		Chin posterior, cervix fully dilated	
Craniotomy		Dead foetus after fulfilling prerequisites for destructive operation	

Although accuracy of digital PV examination is greater in the second stage than the first stage of labour, studies in second stage have reported digital PV examination error rates of 26 to 39 per cent compared to the "gold standard" of abdominal ultrasound (Dupuis et al. 2005). It is highly recommended to utilise USG to confirm malposition in case of uncertainty.

xiii. Brow presentation

Bregma is the foetal anatomic landmark used to describe the position in the brow presentation. Approximately two-thirds of brow presentations convert to vertex or face (Cruikshank et al. 1973).

Maternal and foetal outcome: Similar as that for face presentation.

Diagnosis: PA examination: head high as with face presentation; PV examination: palpation of the brow, orbital ridge, orbits, anterior fontanelle; occasionally the eyes and bridge of the nose are palpable. If not possible to palpate chin it is not a face presentation, and if not possible to palpate posterior fontanelle it is not a vertex presentation. USG is more accurate.

General consideration of management of labour and childbirth with brow presentation is similar to that of face presentation.

4.3.2.13 Standard for management of brow presentation in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Operative vaginal delivery			Dead foetus and cervix not fully dilated, obstetric vacuum or outlet forceps
CS		Alive or dead foetus, but cervix not fully dilated	
Craniotomy		If expert is available craniotomy for dead foetus, fully dilated cervix	

Rarely, safe delivery in brow presentation may be possible if the foetus is unusually small and/or mother's pelvic opening is unusually large (Julien et al. 2017).

xiv. Breech presentation

About 3–4 per cent of foetuses are in breech position when labour starts (Zandstra et al.2013). There are several variations of the breech presentation (frank breech, complete and footling incomplete breech).

Maternal and newborn outcome: Cord prolapse (1 per cent compared to 0.5 per cent in cephalic presentations), foetal head entrapment, PROM, birth asphyxia, intracranial haemorrhage, severe perineal tear, prolonged labour.

Diagnosis: PA and PV, confirm by USG.

General considerations:

- At term, patients should be offered the options for an ECV, vaginal breech delivery and/or CS
- Women at term following an unsuccessful or declined offer of ECV should be counselled on the risks and benefits of planning a vaginal breech delivery versus planning a CS
- All breech labours should be treated as a trial of labour having a higher incidence of needing an emergency CS
- Delivery should be conducted by an experienced obstetrician or midwife under the direct supervision of an obstetric registrar and/or consultant on call. Birth in a hospital with facilities for immediate CS should be recommended with planned vaginal breech birth, but birth in an operating theatre is not routinely recommended
- All maternity units must be able to provide skilled supervision for vaginal breech birth where a woman is admitted in advanced labour and protocols for this eventuality should be developed (New 2017).

4.3.2.14 Standard for management of breech presentation in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
ECV		With no maternal risk factors, complete or frank breech, adequate pelvis, flexed foetal head: ECV for Nulliparous 37 weeks after 36 weeks POG ECV for Multiparous 36 weeks POG	Facilities for emergency CS, and skilled health personale not available PROM, maternal medical disorder, APH, previous CS, CPD, IURGR, foetal death, foetal abnormalities, twin pregnancy
Vaginal breech birth		Frank or complete breech with Estimated Foetal Weight (EFW) of 2500–3800 g, flexed foetal head Avalibality of on-site emergency theatre facilities, suitably skilled health care professionals, and no H/O previous CS	Placenta previa, clinically inadequate pelvis, footling breech, previous CS EFW >3800g, low estimated weight <10th centile, hyper-extended foetal neck, and compromised foetus
Labour augmentation		If clinical circumstances favourable and woman wishes	

		to have vaginal birth; however, poor uterine contraction	
CS		Delay in descent of breech at any stage in the 2nd stage of labour, cord prolapses and birth not imminent FHR abnormalities (<100 or >180 BPM), hyperextended neck on USG, high EFW (>3.8 kg), low estimated weight (<10th centile), footling presentation, evidence of antenatal foetal compromise (New 2017)	Routine CS for breech presentation Emergency CS for breech 1st twin Routine CS for breech presentation of the 2nd twin in either term or preterm
IPV		In tertiary centre by a skilled service provider	

In view of insignificant difference in the foetomaternal outcome, a balanced decision about mode of delivery on a case-by-case basis will go a long way in improving both foetal and maternal outcome. Regular drills and conduct of vaginal breech delivery should be pursued in all maternity hospitals.

xv. Transverse lie

Transverse lie of the foetus is a position when the long axis of foetus is approximately perpendicular to the long axis of mother. The incidence of transverse lie is around 1:335 foetuses (Dahiya et al. 2004).

Maternal and newborn outcome: High risk of cord prolapse, uterine rupture, traumatic delivery, and stillbirths. Foetal mortality ranges from 0 to 10 per cent (Seeds et al. 1991).

Diagnosis: PA and PV examination, confirmation by USG.

General considerations:

- Early diagnosis during the antenatal period and elective CS should be the goals of proper management in a transverse-lie presentation
- Delivery should be carried out without delay, in a hospital well-equipped for CS and operative vaginal delivery.

4.3.2.15 Standard for management of transverse lie in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
ECV		If a woman is in early labour and membranes intact with all other criteria fulfilled for vaginal birth	
CS		If cord prolapses but birth is not imminent, persistent transverse lie in labour CS whether the foetus is alive or dead	

In modern practice, persistent transverse lie in labour is delivered by CS whether the foetus is alive or dead. One of the major decisions facing the surgeon is the type of uterine incision to make during CS in transverse lie.

b. Complications during labour or childbirth

Unanticipated complications may develop suddenly during labour and childbirth, such complications are: abruptio placentae, sudden collapse during labour and childbirth, labour dystocia (shoulder dystocia and foetal macrosomia), nuchal cord, cord prolapsed, foetal distress and stillbirth.

i. Abruptio placentae

Placental abruption is a life-threatening disorder for both mother and foetus, often unexpected, sudden, and intense, requiring immediate labour termination.

Maternal and neonatal outcome: Besides the haemorrhage, other morbidity is related to blood transfusions, the prematurity of the foetus, hysterectomy and CS. Recurrence rates of 3 to 10 per cent are reported (Martinelli et al. 2018).

Diagnosis: USG.

4.3.2.16 Standard for management of abruption in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Vacuum extraction		Term pregnancy, heavy bleeding with fully dilated cervix, vertex presentation	
Labour augmentation with oxytocin		Class 0 and 1 not in immediate danger in labour but poor uterine contraction, cervix favorable, FHR normal or absent	
CS		Class 2 and 3, vaginal birth not imminent, poor uterine contraction, unfavourable cervix (Bishop score ≤5), FSH normal or absent or abnormal (<100 or >180 BPM)	

Pregnant women with symptoms of abruption should be evaluated promptly to establish diagnosis, assess maternal and foetal status and initiate appropriate management. Even those with an apparently small abruption who are initially stable may deteriorate rapidly if placental separation progresses.

i. Sudden collapse

Amniotic Fluid Embolism (AFE) is one of the catastrophic complications of pregnancy in which amniotic fluid, foetal cells, hair, or other debris enters into the maternal pulmonary circulation, causing cardiovascular collapse. Incidence of AFE is estimated to occur between 1 in 8000 and 1 in 80,000 deliveries. True incidence is unknown because of inaccurate diagnosis and inconsistent reporting of nonfatal cases (Gist et al. 2009).

Maternal and newborn outcome: Catastrophic to both mother and newborn, ranging from neurological injury to death. Maternal prognosis after amniotic fluid embolism is very poor though infant survival rate is around 70 per cent (Tsunemi et al. 2012).

Diagnosis: Four diagnostic criteria of AFE:

- Acute hypotension or cardiac arrest
- Acute hypoxia
- Coagulopathy
- Severe haemorrhage.

All of the criteria above, occurring at any time during labour, CS, D&E, or within 30 min postpartum with no other explanation of findings, suggest AEF (O'Shea et al. 2007). Chief radiographic abnormalities in AFE are diffuse bilateral heterogeneous and homogeneous areas of increased opacity, which are indistinguishable from acute pulmonary oedema. Lung scan may demonstrate some areas of reduced radioactivity in the lung field (O'Shea et al. 2007). ECG may show tachycardia, ST-segment and T-wave changes, and findings consistent with right ventricle strain

General considerations:

- Treatment is mainly supportive, but exchange transfusion, Extracorporeal Membrane Oxygenation (ECMO), and uterine artery embolisation have been tried from time to time
- To prevent AFE, trauma to the uterus must be avoided during manoeuvres such as insertion of a pressure catheter or rupture of membranes
- Incision of the placenta during CS should also be avoided if possible.

4.3.2.17 Standard for management of sudden collapse in labour and childbirth

Intervention	Recommendations		
	Recommended All	Context-specific	Not Recommended
Tracheal intubation	Prevent additional hypoxia and subsequent end-organ failure by administration of 100% O_2 with positive pressure ventilation as soon as possible		
Fluid resuscitation	Counteract hypotension and haemodynamic instability by optimising preload, with rapid-volume infusion of isotonic crystalloid and colloid solutions (Conde-Agudelo et al. 2009)		
Blood and blood products		Fresh Frozen Plasma (FFP), platelets and cryoprecipitate early in the resuscitation phase of AFE	
Emergency CS		Simultaneous stabilisation and emergency CS for patients with clinically suspected AFE (Conde-Agudelo et al. 2009)	

Prognosis after AFE is very poor, and most women do not survive. Most women who survive the embolism, have neurological deficits; the infant survival rate is 70 per cent. The neurological status of the infant is directly related to the time elapsed between maternal arrest and delivery, and risk of recurrence is unknown.

ii. Labour dystocia in second stage of labour

Dystocia is characterised by the slow and abnormal progression of labour. It can be a prolonged active phase or prolonged expulsive phase or both of second-stage labour.

Active-phase labour dystocia

Maternal and newborn outcome: PPH, third- and fourth-degree perineal tears, birth asphyxia, Intrauterine Foetal Death (IUFD).

Diagnosis: While cervical dilation rate of <1 cm/hour is diagnosed as active phase dystocia for nulliparas, for multiparas, the lower limit of normal is 1.5 cm/hour (Philpott et al. 1972).

4.3.2.18 Standard for management of active-phase labour dystocia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Trial of labour		Suspected CPD	
Foetal monitoring		Continuous FHR monitoring in active phase of 2nd stage of labour if pushing has progressed beyond 1 hour and birth is not imminent (Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG) 2016)	
Augmentation of labour using oxytocin		In case of inadequate uterine activity with no signs of CPD or obstruction and intact membranes	ARM
CS		Alive foetus Dead foetus if operator not proficient in craniotomy	
Craniotomy		Dead foetus on hand of expert operator	Inefficient operator

Prolonged second stage of labour is a serious complication which requires immediate and appropriate management. Prolonged active phase of second stage of labour leads to prolonged expulsive second phase of labour.

Expulsive-phase labour dystocia

Prolonged expulsive second phase is marked by the urge to bear down and may not coincide with full dilatation. Dystocia in expulsive second phase is defined as >2 hours of active pushing with no descent of the presenting part (Toledo et al. 2008).

Maternal and newborn outcome: Low 5-minute Apgar score or admission to newborn care unit, increased rate of operative delivery, maternal stress and anxiety, maternal infection and PPH (Hartmann et al. 2012).

Diagnosis: USG and an increasingly long time in labour also indicate a mechanical issue that is preventing foetus from exiting the womb.

4.3.2.19 Standard for management of expulsive-phase labour dystocia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Augmentation labour		If malpresentation and obvious obstruction have been excluded, induction with oxytocin	
Obstetric vacuum or forceps		If foetal head is <1/5th below symphysis pubis or leading bony edge of foetal head is at 0 station	
CS		Foetal head is between 1/5th and 3/5th above symphysis pubis or leading bony edge foetal head is between 0 station and 2 station Foetal head is >3/5th above symphysis pubis or leading bony edge of foetal head is above 2 station	

In the past, a prolonged expulsive phase was defined as pushing for >3 hours for nullipara with an epidural, >2 hours without an epidural. For multipara it is >2 hours in with an epidural, and > 1 hour without an epidural (ACOG 2003).

Labour dystocia due to shoulder presentation

Shoulder dystocia is a complication of vaginal delivery in which foetal shoulders fail to deliver spontaneously after head emerges. Incidence of shoulder dystocia is estimated to be between 0.15 and 2.0 per cent (Bruner et al. 1998).

Maternal and foetal outcome: PPH, severe perineal tears, Brachial Plexus Injury (BPI) and CPD are common (Bingham et al. 2010).

Diagnosis: USG has not proved very helpful in identifying candidates for presumptive CS. Shoulder dystocia and BPI are strongly associated with large foetal weight (Nath et al. 2015).

General considerations:

- Once shoulder dystocia identified, additional help should be called
- The problem should be stated clearly as shoulder dystocia to the arriving team
- Fundal pressure should not be used
- McRoberts manoeuvre is a simple, rapid and effective intervention and should be performed first
- Suprapubic pressure should be used to improve the effectiveness of the McRoberts manoeuvre
- Episiotomy is not always necessary.

4.3.2.20 Standard for management of shoulder dystocia in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Positioning	Lie flat and move buttocks to the edge of the table		
McRoberts		Delivery of posterior arm (Green-top Guideline 2012)	

manoeuvre			
Cleidotomy, Zavanelli manoeuvre/ symphysiotomy		In case of failed McRoberts manoeuvre, repeat once; if failed again, use cleidotomy manoeuvre, symphysiotomy	
CS		Consider elective CS to reduce the potential morbidity for pregnancies complicated by pre-existing or gestational diabetes mellitus, regardless of treatment, with EFW of >4.5 kg	

Key factors for the successful management of shoulder dystocia include constant preparedness, a team approach and appropriate documentation.

Labour dystocia due to foetal macrosomia

Foetal macrosomia has been defined in many ways: for example, birth weight >3600 g, >3800 g, >4000 g, >4500 g, or >90th centile for gestational age. 4000 g is by far the commonest birth weight cut-off used to define macrosomia (Horvath et al. 2010).

Maternal and newborn outcome: Prolonged labour, operative delivery, perineal tear, shoulder dystocia, birth trauma, BPI, meconium aspiration, and IUFD.

Diagnosis: Confirmation of suspected macrosomia is based on reliable determination of foetal age and weight, which requires USG assessments early in pregnancy and then at near term (Legal et al. 2012).

General considerations:

- Considering that in under-resourced settings, USG facilities may not be available or accessible to all women, the participants in the technical consultation preferred not to recommend IOL for suspected macrosomia, even though they acknowledged that in cases of confirmed macrosomia, IOL could reduce the incidence of clavicle fracture due to shoulder dystocia (WHO 2011).

4.3.2.21 Standard for management of foetal macrosomia in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Spontaneous vaginal birth		Provided experienced gynaecologist, a good back-up team for manoeuvres to deliver posterior shoulder	
Early labour induction		Suspected foetal macrosomia	
Elective CS		CS at 39+ weeks for live foetus with EFW of >5000 g without diabetes >4500 g with diabetes, or prolonged 2ndstage of labour Arrest of descent in 2ndphase	
Craniotomy		Dead foetus	

A policy of IOL for women with a constitutionally LGA foetus among women without diabetes does not reduce maternal morbidity (Billionn et al.2012).

iii. Nuchal cord

Nuchal cord occurs when the umbilical cord becomes wrapped 360 degrees around the foetal neck. Overall incidence of nuchal cords was 6 per cent at 20 weeks POG and 29 per cent at 42 weeks (Larson et al. 1995). If there is a nuchal cord at the onset of labour, it is very unlikely to correct itself. If there is no nuchal cord during prelabour, it is unlikely to occur during labour.

Maternal and newborn outcome: Multiple nuchal cords are more likely to cause problems when the cord is tightly wrapped around the neck, with effects of a tight nuchal cord conceptually similar to strangulation.

Diagnosis: Variable FHR decelerations. USG is the gold standard when combined with colour Doppler imaging. Ultrasonographers can look for a "divot" sign on high-resolution USG a circular indentation of the foetal nuchal skin but care should be exercised not to confuse this finding with posterior cystic masses, folds of skin, or amniotic fluid pockets (Ranzini et al. 1999).

iv. Umbilical Cord Prolapse (UCP)

UCP is an uncommon but serious obstetric emergency with significant newborn morbidity and/or mortality.

Maternal and newborn outcome: Perinatal outcome largely depends on the location where the prolapse occurred and the gestational age/birth weight of the foetus.

Diagnosis: In overt UCP, the diagnosis is straightforward as the umbilical cord is seen coming out of the vagina or palpated as a soft pulsating mass during vaginal examination. In case of occult UCP, abnormal FHR tracings in the form of recurrent, variable, sudden severe, and/or prolonged (lasting a minute or more) decelerations may be the first sign of UCP, especially the occult type. These FHR abnormalities may occur in up to 67 per cent of cases (Murphy et al. 1995). Fore-lying umbilical cord can be diagnosed by USG (Hasegawa 2016).

General considerations:

- The diagnosis-to-delivery interval must be less than 30 minutes in order to optimise the perinatal outcome, particularly in the presence of evidence of foetal compromise (RCOG 2014)
- If vaginal delivery is imminent or instrumental delivery is possible, they can be contemplated after manually releasing cord compression if possible, by:

Funic decompression/elevation of the presenting part

- Two fingers/hand in the vagina and elevation of the presenting part
- Steep Trendelenburg or knee-chest position
- Insertion of Foley's catheter and filling the urinary bladder (500–750 mL)

Funic reduction (rarely used)

- Replacement of the umbilical cord into the uterus.

4.3.2.22 Standard for management of cord accidents in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended

Supportive management	Oxygen at 4–6 L/minute by mask or nasal cannula		
Tocolytics		If cord pulsating, in 1st stage of labour reduce pressure over cord through Funic decompression/elevation or Funic reduction then CS followed by tocolytics	
Obstetric operative delivery		After ruling contraindications, if vaginal delivery is imminent and cord pulsating, in 2nd stage of labour	
CS		If vaginal delivery is not imminent with cord pulsating, emergency CS is the treatment of choice Continuous O_2 by mask, FHR monitoring and recording are until delivery of the newborn	

The urgent nature of management of UCP, which often ends by emergency CS, can be traumatic to the woman and those accompanying her. Debriefing the patient and her family regarding the course of events is important.

v. Foetal distress

Foetal distress involves hypoxic or acidotic condition of foetus during intrauterine life or intrapartum period (Cavazos et al. 2015).

Maternal and newborn outcome: Prolonged, inadequate oxygenation may cause damage to various foetal organs, such as kidneys, bowels and the brain (Graham et al. 2008). About 25 per cent of such asphyxiated newborns will face major handicaps later in life, such as cerebral palsy, cognitive impairment and impaired hearing and vision. In 10-20 per cent, perinatal asphyxia leads to newborn death in the first month after birth (Almeida et al. 2017).

Diagnosis: NST, electronic FHR monitoring, foetal movement, MBPP, diagnosis of foetal acidosis by Fasting Blood Sugar (FBS), and CTG.

General considerations:

- There have been no contemporary trials of operative versus conservative management of suspected foetal distress. In settings without modern obstetric facilities, a policy of operative delivery in the event of meconium-stained liquor or FHR changes has not been shown to reduce perinatal mortality (Hofmeyr et al. 2012)
- Policy for intrapartum foetal surveillance for foetal distress in labour has to be in place.

Intrauterine Resuscitation of Foetus (IUFR)

Intrauterine resuscitation consists of applying specific measures with the aim of increasing oxygen delivery to the placenta and umbilical blood flow, in order to reverse hypoxia and acidosis.

Review of national/international guidelines for IUFR and one proposed for Nepal

Country	Maternal Repositioning	O_2	Stop Oxytocin	Tocolytic	Amnioinfusion	IV Fluid Bolus
Netherland	Yes	—	Yes	Yes	#	—
USA	Yes	Yes	Yes	Yes	Yes	Yes
UK	Yes	No	Yes	Yes	No	Yes
Ireland	Yes	—	Yes	Yes	—	No
Canada	Yes	Yes	Yes	—	Yes	Yes
Aus/NZ	Yes	—	Yes	Yes	No	Yes

Nepal	Yes	Yes	Yes	#	#	Yes

O_2 = maternal hyperoxygenation, — = not mentioned, # = neither recommended nor discouraged

The recommendations for Nepal are based on a review of national/international guidelines and country context for IUFR during labour. Soon after supportive measures for the foetus have been deployed, action should be taken for delivery.

4.3.2.23 Standard for management of foetal distress in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Check for explanatory signs of distress		If maternal cause is not identified and FHR remains abnormal throughout at least three contractions, perform PV examination; if the cord is below the presenting part or in the vagina manage as UCP	
Obstetric vacuum/ forceps		FHR abnormalities persist/additional signs of distress (thick meconium-stained fluid): apply vacuum or forceps if cervix fully dilated, foetal head >1/5th above symphysis pubis, or leading bony edge of foetal head at 0 station	
CS		If FHR abnormalities persist or there are additional signs of distress (thick meconium-stained fluid), cervix not fully dilated, or foetal head >1/5th above the symphysis pubis, or leading bony edge of the foetal head above 0 station	

One important aspect in the care of compromised foetus is the presence of a well-coordinated team. Team members should clearly understand the medical terms used to describe foetal status and the urgency of the necessary intervention.

vi. Stillbirth

The majority of foetal deaths occur in developing countries. About half of all stillbirths occur in the intrapartum period, representing the greatest time of risk. Global stillbirth rate (≥28 completed weeks' gestation) is estimated to be 18.4 per 1000 births or around 2.6 million stillbirths each year (Lawn et al. 2016). WHO's Every Newborn (2014): An Action Plan to End Preventable Deaths aims to reduce the stillbirth rate to 12 or fewer per 1000 births by 2030 in every country, and for countries already meeting this target to reduce equity gaps.

Maternal outcome: Chorioamnionitis, DIC, septicaemia, psychological disturbances.

Diagnosis: Clinical, Doppler, USG, X-ray of abdomen (Spalding sign in macerated stillbirth).

General considerations (Green top 2010):

- Recommendations about labour and birth should take into account the mother's preferences as well as her medical condition and previous intrapartum history
- Women should be strongly advised to take immediate steps towards delivery if there is sepsis, pre-eclampsia, placental abruption or membrane rupture, but a more flexible approach can be discussed if these factors are not present
- Routine antibiotic prophylaxis should not be used

- Women should be cared for in an environment that provides adequate safety according to individual clinical circumstance
- Women should be routinely assessed for thromboprophylaxis, but IUFD is not a risk factor
- Care must be alert to the fact that mothers, partners and children are all at risk of prolonged severe psychological reactions, including post-traumatic stress disorder, but that their reactions might be very different
- Review all perinatal deaths through a formal process (e.g. Perinatal Morbidity and Mortality Committee) involving the multidisciplinary team
- Provide feedback to clinicians on clinical care, perinatal mortality investigations, documentation and communication
- Arrange debriefing and follow-up of all families following the review and consider open disclosure (if appropriate) to the woman and her partner.

4.3.2.24 Standard for labour preparation for stillbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Labour preparation	Collaborate with parents regarding the timing of the IOL, (Johanna Briggs Institute2014) Ensure the birthing suite is set up and equipped to support parents during stillbirth Ideally provide designated area away from crying babies but with access to staff able to support the parents (Johanna Briggs Institute 2014)		Restriction of family member during birthing process
Amniotomy		If signs of infection (fever, foul-smelling vaginal discharge)	Routine ARM
For ripening cervix with misoprostol/ Foley/balloon catheter/oxytocin		If spontaneous labour does not occur within 4 weeks Platelets continues to decrease Cervix unfavourable (Bishop score <5) On request	Scarred uterus
Induction with oxytocin		If cervix favourable Bishop score ≥6	

Effective counselling is integral part of management of stillbirth. Not every maternity centre has a specialist counsellor; service providers must therefore adopt an empathetic, non-intrusive approach. A woman's experience is influenced by the protocol of the medical facilities in which she delivered and the attitudes of the health care providers involved.

4.3.2.25 Standard for mode of labour and birth of stillbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended

Counseling	Prepare parents by providing clear step by step information about: IOL and birthing process Potential length of labour Methods of analgesia Reassurance that their baby will be treated with care and respect at all times		Avoid negative comments such as "You still have one baby to take home" Confronting descriptions that may impact their decisions about seeing their baby Over medicalisation of the event (Johanna Briggs Institute 2014)
IOL		During the next 4 wks: If decreasing platelets counts, and fibrinogen levels Labour did not start Woman requests	
Antibiotics		If signs of infection (fever, foul-smelling vaginal discharge)	Routine

CS has very limited indication in stillbirth because its complications could affect the future fertility of the patient.

c. Complications that begin immediately after childbirth, around the time of placenta delivery

Management of sudden collapse during labour and childbirth is described in Section 4.3.2.16 (AFE), Section 5.3.2 (immediate PPH), National Medical Standard for Reproductive Health Volume II: Other Reproductive Health Issues (prolapsed uterus) and below (uterine inversion):

i. Uterine inversion

Uterine inversion is defined as the passage of uterine fundus through the endometrial cavity and cervix, turning the uterus inside out. Uterine inversion is a rare obstetric complication, occurring in the third stage of labour. Incidence varies considerably and can range from 1 case in 2000 to 1 case in every 50,000 births (Hussain et al. 2004).

Maternal outcome: Neurogenic shock emergency that can lead to hypovolaemic shock or even maternal death (Dwivedi et al. 2013).

Diagnosis: Clinically:

- Observation of uterine fundus beyond vaginal introitus in complete form
- Palpation of the fundus through the external os in 3rd-degree uterine inversion
- PA examination reveals absence of fundus in milder forms.

Confirm diagnosis by USG, which detects a vaginal mass with specific characteristics (the echogenicity of the endometrium shows the shape of letter C and the echogenicity of the uterus the shape of letter H (Hsieh 1991).

General considerations:

- Puerperal uterine inversion is a rare and severe pathology
- Its diagnosis is essentially clinical
- Amount of blood loss is disproportionate to the degree of shock
- Treatment has to be immediate
- This associates a medical reanimation and a rapid manual reinversion for avoiding an invasive surgical approach
- Prevention is essentially based on the eviction of extrinsic factors.

4.3.2.26 Standard for management of uterine inversion in labour and childbirth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Johnson manoeuvre		Immediate reversal of uterus with manual pressure over the fundus through vagina in stable woman (Momaniet al. 1989)	
Haultaim technique surgical		When the initial approach fails, surgical intervention is necessary (Neves et al. 2006)	
Hydrostatic pressure		Alternative when manual reduction is not successful and conditions for surgical intervention are not fulfilled (Hostetler & Bosworth 2000)	
Antibiotics		If right ovarian thrombosis, and pelvic vein thrombosis, use ertapenem, gentamycin, ampicillin, clindamycin	

Uterine inversion, either partial or complete, is a rare but serious obstetric complication. It usually occurs after the delivery of baby and around third stage of labour and is a life-threatening complication requiring prompt diagnosis and definitive management.

Chapter 5: Management of Postpartum Period

According to WHO Technical Consultation on Postpartum and Postnatal Care (2010), the postnatal period begins immediately after the birth of the baby and extends up to six weeks (42 days) after birth. For purposes of describing care provision, the postnatal period consists of immediate, early and late periods. This chapter outlines the aim, approaches, standard statements, and applications of standards to the care for both normal and complicated postpartum period.

5.1 Aim

The aim of PNC is to support a mother and her family for easy transition, prevention, early diagnosis and treatment of maternal and newborn complications during the postnatal period to ensure a positive childbirth experience for mother and her family.

5.2 Approaches

There are two important approaches for PNC:

Mother-friendly

Mother-friendly maternal and newborn services date back to the women's health movement of the 1960s and 1970s. The mother-friendly approach is based on the philosophy of feminist ethics (Leap 2009):

- Service should respond to mother's unique needs and be respectful of ethnic, cultural, social, and family backgrounds
- Mother should be actively involved in planning her own care and should be cared for by a known caregiver
- Mother should be provided with adequate information with which to plan her care
- Mother's psychological and physical needs should be understood and her autonomy respected.

Provider-friendly

The concept of provider-friendly service is based on Cartesian philosophy of the 17th century. Descartes' dualistic thought overthrew the views of classical medicine and replaced it with a scientifically based logic in which the need for faith was superseded by rationalism. With this rationalist-thought, medicine became a science and no longer remained the art of balancing the internal self with external environment (Regmi et al. 2005). PNC became mechanical:

- Risk-directed interventions
- Health care facilities have fixed-time services: for example, certain days for routine elective surgeries, ANC, and no OPD service on holidays
- Subject–object health-worker–client relationship
- Greater emphasis on teaching and learning programmes compared to clinical service provision.

Comparison of mother- and provider-friendly approaches for implementation challenges

Possible strategies	Challenge	Intensity of Challenges
•Mother and baby go to the facility for PNC	•Requires mother to come to the facility within a very short time of birth. More likely following a facility birth	•Mother-friendly Low •Provider-friendly High
•Skilled provider visits the home to provide PNC for the mother and baby	•Conditional on sufficient human resources, which is challenging and may not be the highest priority for skilled attendants in settings where skilled attendance at birth is still low; may be possible where rural health facilities are quiet during afternoons	•Mother-friendly High •Provider-friendly Low
•Community Health Worker (CHW) visits home to see mother and baby	•Requires training for CHW and management, supervision, and logistical support	•Mother-friendly High •Provider-friendly Low
•Combination: facility birth and 1st PNC visits in the facility, then home visit within 2 to 3 days, with subsequent PNC visits at the facility	•Requires team approach with facility and CHW, sufficient human resources, good referral systems, and an efficient information and tracking system so that mother and baby are not lost to follow-up	•Mother-friendly Medium •Provider-friendly Medium

In Nepal, as there is an acute shortage of skilled health professionals, it is possible that even mothers who delivers at facilities may not necessarily receive effective PNC before discharge. It is also possible that mothers that visited health facilities for birth might not be able to revisit the health facility in the first few days after birth for follow-up contacts because of various established barriers. Hence, both the quality and coverage of PNC is considerably low in Nepal.

Considering the above, the combination approach of “provider-friendly” and “mother-friendly” might be the best strategy. In this model, skilled health professionals might provide PNC at home in the first crucial two to three days after birth for those mothers who gave birth at home. Subsequent contacts, from six to seven days to six weeks after delivery, would take place at the facility, when the mother is better able to leave her home.

Nepal has already established more than 1800 birthing centres, yet they remain underutilised. In such circumstances, those skilled health professionals who are deployed to birthing centres can visit homes to offer PNC to mother and newborn. Another strategy would be for FCHVs to make home visits, linking up with a birthing centre. In those provinces where health systems are not as strong and human resources are limited, certain tasks can be delegated to FCHVs, linking to health facilities for referral as required.

5.3 Standard statement, readiness and application

Standard statement

PNC should optimise the health of women and newborns during the postpartum period through an ongoing process, rather than a single encounter, with support and services tailored to a woman’s, her newborn’s and her family’s specific needs.

Readiness

- Treatment and prevention guidelines for potentially modifiable conditions

- Institutional policies that support 24-hour postpartum hospital stay for normal institutional childbirth, which safely prevents medicalisation of postpartum period in low-risk women and institutes support as soon as complication occurs
- Evidence-based tool that includes algorithm for identification and treatment of complications in postpartum period
- Evidence-based set of emergency response medication(s) that are immediately available in the obstetric unit
- Response team members and their roles in the event of severe complication
- Blood bank and response for emergency release of blood products and capacity to initiate the organisation's massive transfusion procedures
- Protocol on when to consult additional experts and consider transfer to a higher level of care
- Protocol on how to communicate with patients and families during and after the event.

Application of standards

Comprehensive PNC should include a complete package of evaluation, prevention and management focusing on the physical, social and psychological problems of the woman and her newborn during the immediate postpartum period until six weeks after birth:

- Immediate postpartum period care
- 24 to 48 hours care (First contact)
- 7 to 14 days care (Second contact)
- 4 to 6 weeks care (Third contact).

All mothers and newborns need at least four postpartum check-ups in the first six weeks. This is a notable change to previous WHO guidance, which recommended only two postpartum check-ups within two to three days and at six weeks after birth.

General considerations:

- Optimum postpartum care should include a full assessment of physical, social, and psychological well-being
- Provision of outreach clinics, and home visits by FCHVs
- Encourage family involvement throughout the six-week postpartum period
- Respect women's preferences
- Team debrief is required immediately after a case of severe complication.

5.3.1 Management of normal postpartum period

Three follow-up contacts can be made, either at home or in a health facility, depending on context and the provider. Additional contacts may be needed to address issues or concerns.

Components of PNC:

- Counselling and health education on recognition of danger signs and appropriate care-seeking (for both mother and newborn)
- Counselling and health education on routine care practices such as exclusive breastfeeding and good thermal care practices
- Dispensing and related counselling for routine preventive interventions (such as CLX for cord-stump care and postnatal iron supplementation)

- Assessment and case-management and referral for any identified complications or risk conditions.

a. Immediate postpartum period care

Immediate postpartum period refers to the time just after childbirth and first 24 hours, during which the newborn's physiology adapts and risks to mother of PPH and other significant morbidity are highest. Following institutional birth, the first check-up should be done performed one hour after birth, when the newborn has had its first breastfeed, and then just before discharge (WHO 2014). In case of homebirth, it is important that the mother and newborn should receive a postpartum evaluation as early as possible, preferably within 24 hours of birth.

5.3.1.1 Standard for management of immediate postpartum period

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Thorough clinical examination	Assess PV bleeding, uterine contraction, fundal height, temperature and heart rate (pulse) routinely during the first 24 hours, starting from the first hour after birth Measure BP shortly after birth. If normal, the 2nd BP measurement within 6 hours Document bowel and urine void within 6 hours		Following normal vaginal birth in facility, healthy mother's hospital stay >24 hours as this risks hospital infection Maternal comfort
Mobility	As soon as appropriate following childbirth		Prolonged bed rest
Establishment of breastfeeding	Within 1 hour of childbirth	If engorged, provide breast support, continue feeding	
Supplements	Iron and folic acid for at least 3 months		Vitamins
Td		If not already immunised	
Insecticide-impregnated bed nets		In malaria-endemic areas, for mother/baby	
Antibiotics		Vaginal delivery with 3rd- or 4th-degree perineal tear	
Contraceptive advice	Counsel on birth spacing and FP Discuss FP options Provide FP methods of choice		

Advice on danger signs		Should wait if: Vaginal bleeding has increased Fits Fast or difficult breathing Fever and too weak to get out of bed Severe headaches with blurred vision Calf pain, redness or swelling; shortness of breath or chest pain She should go to the health centre as soon as possible if she has any of the following signs: Swollen, red or tender breasts or nipples Problems urinating, or leaking Increased pain or infection in the perineum Infection in the area of the wound (redness, swelling, pain, or pus in wound site) Severe depression or suicidal behaviour (WHO 2013)	

All women and their families need to be aware of danger signs during the postpartum period. The subsequent contact is important, as mothers and newborns are away from a safe health-institution environment under skilled personal supervision. However, there is low PNC coverage.

b. Subsequent follow-up contacts

Traditionally, PNC was focused on routine observation and examination of vaginal blood loss, uterine involution, blood pressure and temperature, with limited guidance for health care professionals on postnatal practice. However, current practice is multidimensional, involving psychosocial aspects of care along with vital check-ups and other physical discomforts during each subsequent follow-up contact.

General considerations:

- Even after normal childbirth, because of adjustment required to the changing physiological, anatomical, and hormonal circumstances of the postpartum period, mothers could have various complaints, whether common or unique, at each follow-up contact
- At each subsequent follow-up contact, all women should be informed about the physiological process of recovery after birth, with some common health problems described
- Subsequent visits can also be provided at home; however, if, in particular, signs and symptoms of PPH, pre-eclampsia/eclampsia, infection and thromboembolism are evident, they should report to a health care professional

i. First follow-up contact, 24 to 48 hours after birth (2rdcheck-up)

Based on epidemiological data, the first 24 to 48 hours are the most critical time for the mother and newborn: it is a life-saving policy to provide individualised care during the immediate postpartum period under the direct or indirect supervision of a skilled attendant.

5.3.1.2 Standard for management of first subsequent follow-up contact

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Evaluation of general well-being	As that of immediate PNC		
Activity	Mild movement		Heavy
Assessment of psychosocial and social status	Ask about emotional well-being, family and social support and their usual coping strategies for dealing with day-to-day matters Encourage to tell their health care professional about any changes in mood, emotional state and behaviour that are outside of the woman's normal pattern		
Breastfeeding	Any difficulties in establishing breastfeeding, breast engorgement		
Domestic violence inquiry	Any risks, signs and symptoms of intimate partner violence		
Counsel	On hygiene, especially handwashing, and safer sex, including condom use		

As this is a critical period, individualised care in the period from 24 to 48 hours after birth under the direct or indirect supervision of skilled health professionals is a lifesaving policy.

ii. Second follow up contact, 7 to 14 days after birth (3rd check-up)

The second follow up contact, between 7 to 14 days after birth, provides another opportunity to assess newborn feeding and essential obstetric and newborn care, as well as to assess the psychological and physical health of women, provide reassurance and re-iterate FP messages.

5.3.1.3 Standard for management of second postpartum contact

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
General well-being	As for first postpartum contact		
Enquiry about psychological status	Ask about resolution of mild, transitory postpartum depression ("maternal blues") If symptoms have not resolved, the woman's psychological well-being should be assessed for postpartum depression If symptoms persist, provide specialised service by an expert		
Enquiry about sexual resumption	Ask about resumption of sexual intercourse and possible dyspareunia as part of an assessment of overall well-being		
Enquiry about breastfeeding and	Any difficulties in establishing breastfeeding, breast discomfort		

evaluation of breast problems	If suffering from breast engorgement, tenderness or abscess, manage accordingly		

If mother cannot function normally and/or neglects herself and/or the newborn; refer her to more specialised help. Health workers or counsellors trained to treat depression can offer more advanced psychosocial treatments; if this does not work, they can prescribe some medication, or refer to mental health specialists.

iii. Third follow-up contact, six weeks after birth (4th check-up)

The six-week contact is especially important, to enquire about obstetric fistula, and uterine prolapse in case of childbirth after prolonged labour and/or difficult CS. The rest of the care provided is the same as at the second follow-up contact; however, in the event of complication, efficient measures have to be taken immediately.

iv. Postnatal exercise

Postnatal exercise

Usually, most of the physiological and morphological changes of pregnancy persist for four to six weeks post partum. Physical activity can thus be resumed as soon as physically and medically safe. This will certainly vary from one woman to another, with some being capable of engaging in an exercise routine within days of delivery. The aim of exercising after the baby is born is gradually to regain and then improve the former level of fitness.

The short-term benefits of postpartum physical activity include improvement in mood and cardiorespiratory fitness, promotion of weight loss, and a reduction in postpartum depression and anxiety (Evenson et al. 2014).

Mothers should be encouraged to try exercises as often as possible in order to regain full bladder control, prevent incontinence and prolapse and ensure normal sexual satisfaction.

5.3.1.4 Standard for postnatal exercise

Intervention	Recommendations		
	Recommended for All	Context-specific	Not recommended
Initiation of postnatal exercise	As early as possible		Sedentary lifestyle Complete bed rest
Pelvic floor exercises	Practise this set up to 10 times: 10-second squeezes Women should be advised to aim to practise three times a day (Fraser et al. 2009)	If the area is painful, side lying is comfortable If mother is in catheter, hold this exercise	High-intensity exercise (ACOG 2002)
Abdominal exercises	Women should be advised to aim to practise three times a day at least for 3 months after childbirth		High-intensity exercise
Knee bends	Hold for 10 seconds and slowly lower, repeat with the other leg: three times for each side		High-intensity exercise

Care of the back after the birth	Every mother should be taught about back care in relation to every activity (Artal & O'Toole 2003)		Lifting anything heavier than the baby for the first 6 weeks should be avoided

5.3.2 Management of complications in postpartum period

While most complications in the postpartum period are mild maternal discomforts related to physiological changes and resolve with simple interventions, for example breast conditions, some complications are severe enough to take mother's life, requiring multifaceted interventions.

a. Breast conditions and management

Common problems related to breastfeeding, including poor milk production, incorrect technique and infrequent feeding. Conditions such as breast engorgement, sore or fissured nipples, inverted, flat, large and long nipples and blocked ducts are usually problems to do with breastfeeding.

5.3.2.1 Standard for management of simple breast conditions

Condition	Sign	Management
Breast engorgement	Swollen and oedematous breast Skin looks shiny and diffusely red Painful A fever that usually subsides in 24 hours Nipples may become stretched tight and flat which makes it difficult for the baby to attach and express milk Milk does not flow well	If baby can attach well and suckle, then breastfeed as frequently as baby is willing If the baby is not able to attach and suckle effectively, express milk by hand or with a pump a few times until the breasts are softer Apply warm compresses to the breast or take a warm shower before expressing, which helps the milk to flow. Cold compresses after feeding or expressing, help to reduce the oedema (WHO 1998)
Sore or fissured nipple	While baby suckling, severe nipple pain Fissure across tip or base of nipple Nipple may look squashed from side-to-side at the end of a feed, with a white pressure line across the tissue	100% lanolin Place chilled glycerin nipple pads over the nipples Improve baby's position and attachment Baby can continue breastfeeding normally: no need to rest the breast – the nipple will heal quickly when it is no longer being damaged (Mohrbacher 2008)
Inverted, flat, large and long nipple	Sometimes an inverted nipple is non-protractile and does not stretch out when pulled; instead, the tip goes in	Antenatal treatment not helpful As soon as possible after delivery, the mother should be helped to position and try to attach her baby The mother should give the baby plenty of skin-to-skin contact near the breast, and let the baby try to find his or her own way of taking the breast, which many do If a baby cannot attach in the first week or two, the mother can express her breast milk and feed it by cup Mother can express milk into the baby's mouth, and

		touch the lips to stimulate the rooting reflex and encourage the baby to open his or her mouth wider Feeding bottles or dummies, which do not encourage a baby to open the mouth wide, should be avoided Mother can use a 20 mL syringe, with the adaptor end cut off and the plunger put in backwards, to stretch out the nipple just before a feed (Mohrbacher 2008)
Blocked duct	A tender, localised lump in one breast, with redness in the skin over the lump	Express milk frequently Continue breastfeeding Offer baby the affected breast first (if not too painful) Help milk to flow Gently massage blocked duct or tender area down towards the nipple before and during the feed

While the breast problems detailed above can be resolved with simple manoeuvres, mastitis, breast abscess and candida infection need special attention.

5.3.2.2 Standard for management of complicated breast conditions

Condition	Sign	Management
Mastitis	Breast feels hot and tender Red patch of skin that is painful to touch General feeling of illness High temperature	Check baby's positioning and attachment Carry on breastfeeding Let baby feed on the tender breast first If the affected breast still feels full after a feed, or baby can't feed for some reason, express milk by hand Warmth can help the milk flow, so a warm flannel, or a warm bath or shower, can help. Take paracetamol or ibuprofen to relieve the pain If symptoms are severe, if there is an infected nipple fissure or if no improvement is seen after 24 hours of improved milk removal, start penicillinase-resistant antibiotics (e.g. flucloxacillin) However, antibiotics will not be effective without improved removal of milk (WHO 2000)
Breast abscess	A painful swelling in the breast, which feels full of fluid There may be discoloration of the skin at the point of the swelling	Drain and start antibiotics Mother may continue to feed from the affected breast If suckling is too painful or if the mother is unwilling, can express milk Mother can continue to feed from the other breast Feeding from an infected breast does not affect the infant (unless the mother is HIV-positive (WHO 2000)
Mastitis, abscess and nipple fissure in HIV-infected women		Avoid breastfeeding on the affected breast Express milk from the affected breast, to help breast recover and to maintain the flow of milk If only one breast is affected, baby can continue to feed on unaffected breast Give antibiotics for 10–14 days, rest and analgesics as required, and incision if there is an abscess Mother can resume breastfeeding from the affected breast

		when the condition subsides If both breasts are affected, mother will not be able to feed the baby from either side, and will need to consider other feeding options as a permanent solution
Candida infection	In mother: Sore nipples with pain There may be a red or flaky rash on the areola, with itching and depigmentation In baby: White spots inside cheeks or over tongue, which look like milk curds, but cannot be removed easily	Gentian Violet paint: Apply 0.25% solution to baby's mouth daily for 5 days, or until 3 days after lesions heal Apply 0.5% solution to mother's nipples daily for 5 days Nystatin: Nystatin suspension 100,000 IU/mL: apply 1 mL by dropper to child's mouth 4 times daily after breastfeeds for 7 days, or as long as the mother is being treated Nystatin cream 100,000 IU/mL: apply to nipples 4 times daily after breastfeeds. Continue to apply for 7 days after lesions have healed (Mohrbacher 2008)

The adequate management of these conditions is particularly important, and –if not treated – lead to early weaning or improper feeding.

b. Severe life-threatening complications

Severe life-threatening complications during the postpartum period are: severe primary PPH, secondary PPH, pre-eclampsia and eclampsia, septicaemia, sudden collapse during postpartum period, for example, Amniotic Fluid Embolism (AFE) under (4.3.2.17), thromboembolism, septic thrombophlebitis, and uterine inversion under (4.3.2.26).

i. Severe primary PPH

5.3.2.3 Standard for management of severe primary PPH

Postpartum haemorrhage is defined as a blood loss of 500 mL or more within 24 hours after birth, while severe PPH is defined as a blood loss of 1000 mL or more within the same timeframe (Rath 2011). Overall prevalence of PPH worldwide is estimated to be 6 to 11 per cent of births with substantial variation across regions (Calvert et al.2012). PPH is a leading cause of maternal mortality and morbidity in most low-income countries (Creanga et al. 2015).

Maternal outcome: Organ failure, shock, oedema, compartment syndrome, transfusion complications, thrombosis, ARDS, sepsis, anaemia, intensive care, DIC and prolonged hospitalisation.

Diagnosis: Clinical amount of blood loss, general condition of mother with signs and symptoms of shock.

General considerations:

- Estimates of blood loss are notoriously low, often half the actual loss
- Blood is mixed with amniotic fluid and sometimes with urine; it is dispersed on sponges, towels and linens, in buckets, and on the floor
- Bleeding can occur at a slow rate over several hours; the condition might not be recognised until the woman suddenly enters shock
- Importance of a given volume of blood loss varies with the woman's haemoglobin level before she gives birth, as a woman with a normal haemoglobin level will tolerate blood loss that would be fatal for an anaemic woman
- Care bundles for PPH is the recommended management

Care bundle for PPH management for severe primary PPH (WHO 2020)

The Institute for Health care Improvement (IHI) defines bundles as "small sets of evidence-based interventions for a defined patient population and care setting that, when implemented together, result in significantly better outcomes than when implemented individually" (Resar et al. 2012). The "bundles" approach was designed to increase uptake of and compliance with recommended interventions. Care bundles differ from other care packages in that compliance is achieved only when all the bundled interventions are completed and recorded (Resar et al. 2012). In early 2017, WHO decided to explore whether bundling current WHO-recommended evidenced-based interventions for PPH due to uterine atony might accelerate adoption and adherence to PPH guidelines. The response is encouraging (WHO 2012).

First care bundle

The first care bundle is for implementation at both the PHC and hospital levels. First care bundle consists of:

- Uterotonic drugs
- Isotonic crystalloids
- Tranexamic Acid (TXA)
- Uterine massage.

Initial fluid resuscitation is performed together with IV administration of uterotonics. If IV uterotonics are not available, fluid resuscitation should be started in parallel with sublingual misoprostol or other parenteral uterotonics. If PPH is in the context of placental retention, the placenta should be extracted, and a single dose of antibiotics should be administered.

Response to refractory PPH care bundle consists of continuing with IV fluids, uterotonics, and TXA, in addition to:

- Compressive measure (aortic compression or bimanual uterine compression)
- Intrauterine Balloon Tamponade (IBT)
- Non-pneumatic anti shock garment (NASG)

Blood transfusion is recommended for ongoing blood loss at excess of 2000 mL, or signs and symptoms of shock despite aggressive resuscitation (Begley et al. 2015). Some cases might even require hysterectomy total/subtotal; however, this should take place only in better-equipped facilities with skilled surgical staff.

ii. Severe secondary PPH

Secondary PPH is defined as excessive vaginal bleeding in the period from 24 hours after delivery to twelve weeks postpartum. The overall incidence of secondary postpartum haemorrhage in the developed world has been reported as 0.47–1.44 per cent (Hoveyda & MacKenzie 2001).

Maternal outcome: Secondary PPH may result into significant maternal morbidity as well as mortality.

Diagnosis: A pelvic USG may help to exclude the presence of retained POC, although the diagnosis of retained products is unreliable (New 2016).

General considerations:

- Ongoing assessment of blood loss is vital (accumulative total)
- Management will depend largely on the woman's condition and haemodynamic status

- When seeking consent from a woman for 'examination under anaesthesia' the consent must include the possibility of hysterectomy in the event of intractable bleeding due to uterine atony
- Follow first-line therapy as that for severe primary PPH
- Any surgical evacuation of retained POC carries a high risk of uterine perforation (as the uterus is softer and thinner post partum). It should involve a senior obstetrician.

First-line therapy

First, manage with care bundle as for primary PPH. If response is not satisfactory, second-line therapy should be implemented.

5.3.2.4 Standard for management of second-line therapy for severe secondary PPH

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Manual exploration		If the cervix is dilated, explore to remove large clots and placental fragments	
Evacuate uterus		If the cervix is not dilated, D&E to remove placental fragments	
Hysterectomy		If bleeding did not stop with conservative care	
HPE of curetting/hysterectomy specimen	To rule out trophoblastic tumour		
Antibiotics		As per clinical presentation	
High vaginal and endocervical swabs		For the assessment of vaginal microbiology and appropriate antimicrobial therapy when endometritis is suspected (New 2016)	

Secondary PPH is a serious postpartum complication, significance of which is perceived differently between practices, and settings. It is generally less focused, in contrast to primary PPH.

iii. Postpartum severe pre-eclampsia and eclampsia

5.3.2.5 Standard for management of postpartum severe pre-eclampsia/eclampsia

Some postpartum women presented with onset of postpartum eclampsia more than 48 hours post partum (Okanloma & Moodley 2000). Pre-eclampsia often persists after delivery, and sometimes arises de novo post partum (Goel et al. 2015). Approximately one-third of eclampsia occurs post partum, nearly half beyond 48 hours after childbirth (Chames et al. 2002).

Maternal outcome: Acute renal failure, acute liver failure, congestive heart failure, and respiratory complications (aspiration pneumonia and acute pulmonary oedema), cerebral infarction or haemorrhage (Kuklina et al. 2009).

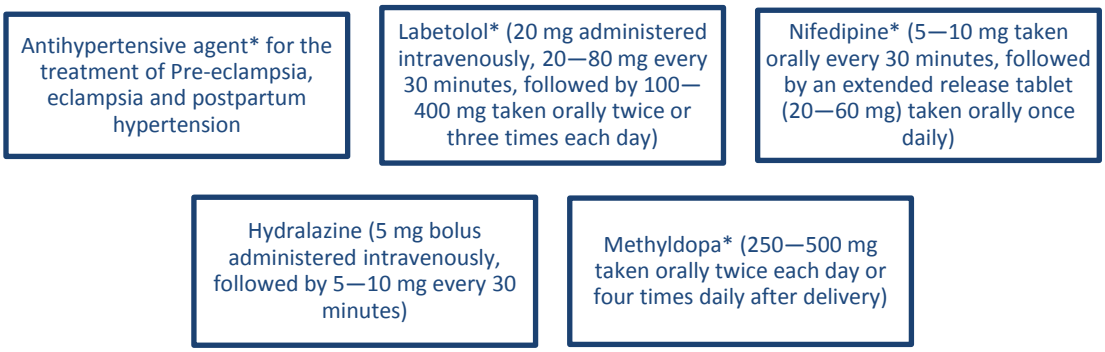
Diagnosis: Suspect postpartum pre-eclampsia when there is a decrease in BP within 48 hours post partum, which increases again between three to six days after birth, with other associated signs and symptoms (Walters & Walters 1987). Postpartum eclampsia can present with a variety of clinical and neurological symptoms and signs of severe and persistent headache, visual symptoms, epigastric or right upper quadrant pain, and hypertension can present as prodromal symptoms (Matthys et al. 2004).

Eclampsia should be considered in any postpartum woman who develops any of these prodromal symptoms. Further indicators include convulsions up to four weeks after delivery, hypertension or proteinuria.

General considerations:

- Postpartum pre-eclampsia/eclampsia has to be differentiated from cerebral venous thrombosis, intracerebral haemorrhage, phaeochromocytoma, space-occupying lesions and metabolic disorders, as the management is entirely different
- General management is similar to that of antenatal severe pre-eclampsia/eclampsia
- Magnesium sulphate doses and schedule is same as that for eclampsia in pregnancy, labour and childbirth
- Antihypertensive medication should be used cautiously for postpartum mothers in view of lactation and breastfeeding.

Antihypertensive for postpartum women



*Accepted choice for women who are breastfeeding

v. Puerperal infection

Puerperal sepsis is as an infection of the genital tract occurring at any time between the rupture of membranes or labour and the 42nd day post partum, in which two or more of the following are present: pelvic pain, fever, abnormal vaginal discharge and delay in the reduction of the size of uterus (WHO 1992). Septicaemia is the systemic manifestation of severe infection with organ dysfunction or tissue hypoperfusion. Septic shock is one of the fulminating manifestations of septicaemia with persistence hypoperfusion despite adequate fluid replacement therapy.

Maternal outcome: Severe sepsis with acute organ dysfunction has a mortality rate of 20–40 per cent, rising to around 60 per cent if septicaemic shock develops (Dellinger et al.2008).

Diagnosis: Infection with organ dysfunction:

- Organ dysfunction defined as a Sequential Organ Failure Assessment (SOFA) score of at least 2
- Alternatively, fulfilling at least two of the following quick SOFA criteria correlates with a high risk of mortality (>24%) and should prompt further investigation of organ dysfunction, hypotension (systolic blood pressure <100 mm Hg), altered mental status (Glasgow Coma Scale score <15), tachypnoea (respiratory rate >22 breaths per minute).

Septic shock is identified as vasopressors required maintaining a mean arterial pressure of at least 65 mm Hg with serum lactate level of at least 2 mmol/L.

General considerations:

- Health care workers (doctors, midwives, nurses, anaesthetists and members of the wound care team) should wear personal protective equipment including disposable gloves and aprons when in contact with the woman, equipment and their immediate surroundings
- Breastfeeding limits the sequential organ failure assessment use of some antimicrobials, hence all cases of sepsis in puerperium should be discussed with a clinical microbiologist or infectious diseases physician at the earliest possible stage
- Appropriate specimens should be sent for urgent examination. Antimicrobials should be started within 1 hour of recognition of severe sepsis
- Suspicion of necrotising fasciitis should prompt involvement of intensive care physicians and referral for surgical opinion, ideally from plastic and reconstructive surgeons if available (Rouphael et al. 2008)
- Women with sepsis in the puerperium are best managed in a hospital where diagnosis services are easy to access and intensive care facilities are readily available
- Presence of shock or other organ dysfunction in the woman is an indication for septicaemia admission to the Intensive Care Unit (ICU).

vi. Septicaemia

It is difficult to pick up septicaemia even in mothers with institutional childbirth, as they are discharged quite early (within 24 hours) before clinical signs appear (WHO 2015). The third leading cause of maternal death – maternal sepsis – has received less attention and research than other leading causes of maternal mortality.

5.3.2.6 Standard for management of postpartum septicemia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Oxygen therapy	Maternal arterial Partial Pressure of Oxygen (PaO2) should be maintained at >70 mm Hg Partial pressure of carbon dioxide at <60 to 70 mm Hg to ensure foetal oxygenation and placental perfusion (Cole et al. 2005)		
"Hour-1 bundle"	Elements of care of "Hour-1 bundle": Measure serum lactate Obtain blood cultures prior to antibiotic administration Broad-spectrum antibiotic within 3 hours of emergency department admission and within 1 hour of non-emergency room admission Treat hypotension/elevated lactate with fluids Vasopressors for hypotension not responding to initial fluid resuscitation to maintain Mean Arterial Pressure (MAP) >65 mmHg Central Venous Pressure (CVP):in the event of persistent hypertension despite fluid resuscitation (septic shock) and/or lactate >4 mmol/L, achieve a CVP of >8 mmHg Achieve Central Venous Oxygen Saturation (ScvO2) >70% or Mixed Venous Oxygen Saturation (SvO2) >65%. (Levy et al. 2018) Plus UK "Sepsis Six" bundle "Hour-1 bundle" + high-flow oxygen,		

	monitoring urine output within 1st hour of recognition of sepsis		

Yet, undetected infections can easily lead to sepsis and, in turn, death or disability for mothers and potentially fatal newborn infection for babies.

vii. Septic Pelvic Thrombophlebitis (SPT)

SPT is a rare condition of the postpartum period, which is characterised by persistent fever, despite antimicrobial therapy, and diffuse abdominal and leg pain. Reported incidence is 1 in 3000 deliveries. It is more frequent after CS, with approximately 1/800 compared with 1/9000 after vaginal delivery (Dotters et al. 2017), probably due to a higher rate of postoperative infection (Parino et al. 2015). There are two types of SPT:

- Ovarian Vein Thrombophlebitis (OVT)
- Deep Septic Pelvic Thrombophlebitis (DSPT)

Diagnosis: USG has to be repeated at least once within seven days if the initial study is negative. For each examination, the entire length of the venous system from the external iliac to the popliteal vein must be visualised and compression manoeuvres performed from the femoral to the popliteal vein. Computed tomography and MRI (with or without angiography) are definitive imaging modalities to rule out OVT.

General considerations:

- Key to the diagnosis of SPT is to consider it among the differential diagnoses for postpartum persistent puerperal fever, especially when it is resistant to broad-spectrum antibiotic therapy and resolves after systemic anticoagulation
- Thrombophlebitis still is a condition underdiagnosed and poorly managed.

5.3.2.7 Standard for management of postpartum septic pelvic thrombophlebitis

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Initial IV bolus heparin 15,000 to 20,000 units, maintained for 5 days, until discharge		Elective CS, family history of Venous Thromboembolism (VTE), current systemic infection, immobility, e.g. multiple pregnancy, preterm delivery in this pregnancy (24 hours), PPH >1 L or blood transfusion requiring re-operation Discontinue heparin after 5 days and start warfarin	
Warfarin therapy		Initiated along with heparin, and Prothrombin Time (PT) is used to monitor to maintain international normalised ratio between 2.0 and 3.0. May require 3 to 6 months in pulmonary embolism Women with documented extensive thrombosis by CT scan, especially if the thrombus extends to the inferior vena cava, require long-term treatment	

Intermittent or sequential pneumatic compression devices		Alternatives when heparin is contraindicated When the risk of postpartum VTE is high, may be used in combination with low-molecular-weight heparin or unfractionated heparin	
Parenteral broad-spectrum antibiotics		Confirmed ovarian vein thrombosis continued for at least 48 hours after defervescence and clinical improvement	

Usually, patients with SPT respond to heparin within 48 to 72 hours. Need for long-term anticoagulation is debated. In most patients with rapid response to heparin therapy, long-term anticoagulation is not continued.

viii. Postpartum emotional distress

Postpartum emotional distress is fairly common after pregnancy and ranges from mild "postpartum blues" (affecting about 80% of women) to postpartum depression or psychosis. "Postpartum blues" refers to mild depressive symptoms (i.e. sadness, tearfulness, irritability and anxiety), insomnia and decreased concentration. Women with "postpartum blues" are at increased risk of developing postpartum minor or major depression.

It has been estimated that 5 to 25 per cent of pregnant, postpartum women experience depression, although the estimates vary substantially between countries and settings.

Postpartum psychosis is a severe illness that shows similarities to bipolar disorder (e.g. an elated or depressed mood that can cycle rapidly, irritability, hallucinations or delusions). It usually presents in the days or weeks after childbirth (Bergink et al. 2016). Postpartum psychosis can pose a threat to the life of the woman and the baby.

Maternal outcome: Emotional distress may have severe consequences for the mother and, in turn, have physical, cognitive and emotional effects on their children's development, continuing into later life (Stewart & Vigod 2016).

Diagnosis: By sign and symptoms. The symptoms of postpartum blues develop within two to three days of giving birth and typically peak over the next few days, resolving within two weeks.

General considerations:

- Postpartum depression is a common, disabling and treatable problem that affects the woman, infant, and family
- Sensitive inquiry about mental health symptoms should occur at all postpartum consultations, and comprehensive evaluation should be sought when core symptoms of depression, such as low mood or loss of interest, are present
- Clinicians should be alert to symptoms that suggest bipolar disorder or postpartum psychosis because these require a management strategy that is different from that for postpartum depression
- Treatment for postpartum depression depends on the severity of symptoms and the level of functional impairment. Mild depression may be addressed with psychosocial strategies, including peer support and nondirective counselling, and psychological therapy is recommended for moderate depression

- Most Selective Serotonin Reuptake Inhibitors (SSRIs) pass into breast milk at a dose that is less than 10 per cent of the maternal level and are generally considered to be compatible with breastfeeding of healthy, full-term infants
- Once the diagnosis has been established, the physician should educate the patient and her families about the illness, rule out organic causes, initiate pharmacotherapy and supportive therapy, and repeatedly assess the patient's function and safety status.

5.3.2.8 Standard for management of postpartum mental disorder

Intervention	Recommendations		
	Recommended All	Context-specific	Not Recommended
Psychotherapy: Family-focused Cognitive Behavioural Interpersonal Problem-solving		In mild to moderate major depressive disorder, psychosocial intervention and psychotherapy should be offered, based on resource availability	
Pharmacotherapy: SSRIs		First-line treatment for severe depression, for lack of response to non-drug therapy, or in accordance with patient preference	

Prompt and accurate diagnosis of postpartum psychosis is essential for initiating appropriate treatment and to allow for quick, full recovery, prevention of future episodes and reduction of risk to the mother and her children and family. In case of severe depression and psychosis, link the woman with psychotherapy clinic under a specialist.

Chapter 6: Newborn Care

6.1 Introduction

Much progress has been made during the past two decades in coverage of births in health facilities; however, reduction in neonatal mortality remains slow. The neonatal period is defined as the first 28 days after birth and may be further subdivided into the very early (birth to <24 hour), early (birth to <7 days), and late neonatal periods (7 days to <28 days). Perinatal mortality is most of the time influenced by prenatal, maternal, and foetal conditions and by circumstances surrounding delivery.

According to NDHS 2016, 1 in 48 babies die in their first 28 days of life, making up to 13,000 newborn deaths every year in Nepal.

Neonatal health is an important component of the National Reproductive Health Strategy. The National Safe Motherhood Programme also aims to reduce maternal and neonatal mortality. The National Neonatal Health Strategy was developed in 2004 in response to the magnitude and gravity of neonatal health outcomes in Nepal.

In response to the global call to end preventable child deaths, the GoN has taken on the SDG 3 target to reduce newborn deaths to 12 or fewer per 1000 live births and under-5 mortality to 25 or fewer per 1000 live births by 2030. It hopes to achieve this target by implementing the Nepal Every Newborn Action Plan (NENAP) that is guided by the National Health Policy (2014) through the Nepal Health Sector Strategy (NHSS, 2015–2020). The plan identifies several interventions targeting mothers and their newborns that will be integrated into existing facility- and community-based programmes.

6.2 Components of care

- Essential Newborn Care (ENC), including breastfeeding
- Newborn resuscitation and post-resuscitation care
- Care of LBW babies
- Common newborn problems: respiratory distress, jaundice, hypothermia, infections, congenital anomalies and birth injuries
- Triage, stabilisation and referral system with neonatal health care interventions by level
- Newborn screening.

6.3 ENC

6.3.1 Overview

The majority of babies are born healthy and at term. The care they receive during the first hours, days and weeks of life can determine whether they remain healthy. All babies need basic care to support their survival and well-being. This basic care is called ENC. ENC is comprised of warmth, normal breathing, feeding, and infection prevention, and includes (NDHS 2016):

- Immediate care at birth
- PNC: care during the first day and up to 28 days postpartum

6.3.2 Aim

The aim of ENC is to provide care to meet babies' basic needs for health, which includes warmth, breathing, feeding and protection.

Routine care of newborns immediately after birth facilitates adaptation of the newborn to the new environment, meets his or her immediate needs in the best possible way and avoids preventable complications.

Immediately after birth:

- Newborns are dried thoroughly
- Babies are placed in skin-to-skin contact with the mother for at least 1 hour
- Clamping of the umbilical cord is delayed until 1–3 minutes after birth
- Breastfeeding is supported in the first hour after birth
- Any complications are identified and managed appropriately.

6.3.3 Standard for Normal babies

6.3.3.1 Immediate newborn care

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Drying	All babies are dried immediately after birth.	Thermal control is emphasised with recommendations to apply plastic bags or occlusive wrapping under a radiant warmer during stabilisation in the delivery suite for babies <28 weeks' gestation to reduce the risk of hypothermia	
Suctioning		In neonates who do not start breathing after thorough drying and rubbing the back 2–3 times, suctioning of mouth and nose should be done only if the mouth or nose is full of secretions or meconium before initiating positive pressure ventilation	Suctioning of mouth or nose in neonates born through liquor with meconium who start breathing on their own In the presence of meconium-stained amniotic fluid, intrapartum suctioning of the mouth and nose at the delivery of the head
Cord clamping	Cord clamping is done after 1 to 3 minutes of birth (delayed cord clamping) in all normal newborns who cry immediately. 1st clamp/tie is applied at 3 cm and second clamp/tie at 5 cm from the baby's abdomen and the cord is cut in between two clamps	Immediate cord clamping is done in those newborns who do not cry after drying and stimulation	

Skin-to-skin contact in the first hour of life	All newborns without complications should be kept in skin-to-skin contact with their mothers during the first hour after birth to prevent hypothermia and promote breastfeeding	Newborns without complications should be kept in skin-to-skin contact with their mothers during the first hour after birth to prevent hypothermia and promote breastfeeding	
Initiation of breastfeeding	All newborns, including LBW babies who are able to breastfeed, should be put to the breast as soon as possible after birth when they are clinically stable, and the mother and baby are ready	All newborns, including LBW babies who are able to breastfeed, should be put to the breast as soon as possible after birth when they are clinically stable, and the mother and baby are ready	
Cord care	Umbilical cord should be kept clean and dry	In home births in community settings, CHX gel is applied in the cord after 1st hour	
Vitamin K_1 prophylaxis	All newborns should be given 1 mg of vitamin K_1 IM (for less than 1.0 kg, 0.5 mg) after first hour of birth during which the infant should be in skin-to-skin contact with the mother and breastfeeding should be initiated		

6.3.3.2 PNC

If birth is in a health facility, mothers and newborns should receive PNC in the facility for at least 24 hours after birth.

If birth is at home, the first postnatal contact should be as early as possible within 24 hours of birth.

At least three additional postnatal contacts are recommended for all newborns, on day 3 (48–72 hours), between days 7 to 14 after birth, and six weeks after birth.

Standard for PNC of Newborns

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Keeping the newborn warm	Appropriate clothing of the baby for ambient temperature is recommended: this should be 1–2 layers more than adults and a hat The mother and baby should stay in the same room 24 hours a day Bathing is postponed for at least		Separation of mother and baby

	24 hours		
Breastfeeding	Exclusive breastfeeding is performed 8–12 times in 24 hours	Mothers known to be HIV-infected (and whose infants are HIV-uninfected or of unknown HIV status) should exclusively breastfeed their infants for the first 6 months of life, introducing appropriate complementary foods thereafter, and continue breastfeeding (WHO 2019)	
Cord care (Imdad et al. 2013, Sinha et al. 2015)	Clean, dry cord care is recommended for all newborns	Application of CHX (7.1% CHX digluconate aqueous solution or gel, delivering 4% CHX) to the umbilical cord stump after first hour of birth is recommended for newborns who are born at home or in settings with high neonatal mortality (30 or more neonatal deaths per 1000 live births). Clean, dry cord care is recommended for newborns born in health facilities and at home in low neonatal mortality settings. Use of CHX in these situations may be considered only to replace application of a harmful traditional substance, such as cow dung, to the cord stump	
Immunisation	Bacille Calmette Guérin (BCG) vaccination is given to all newborns before discharge or on 1st visit		
Newborn examination	All newborn babies should be examined thoroughly after birth, before discharge and at each PNC contact Newborn should be referred for further evaluation if any danger	The following signs should be assessed during each PNC contact and the newborn should be referred for further evaluation if any of the	

	signs are found The family should be encouraged to seek health care early if they identify any danger signs in between PNC contacts	signs is present: -Stopped feeding well -History of convulsions -Fast breathing -Severe chest in-drawing -No spontaneous movement - Temperature >37.5°C or temperature <35.5°C or a temperature that is 35.5-36.4°C and does not rise with re-warming -Any jaundice in first 24 hours of life, or yellow palms and soles at any age The family should be encouraged to seek health care early if they identify any of the above danger signs in between PNC contacts	
Counselling on exclusive breastfeeding and immunisation	All babies should be exclusively breastfed from birth until 6 months of age. Mothers should be counselled and provided with support for exclusive breastfeeding at each PNC contact. Immunisation should be promoted as per existing national immunisation schedule (Annex XVI)		

6.3.4 Assessment of the baby

The baby should be assessed during each PNC contact for the following danger signs:

- Not feeding well or unable to breastfeed
- Lethargy or unconsciousness
- Movement only when stimulated or no movement at all
- History of convulsions
- Fast breathing (breathing rate ≥60 per minute)
- Severe chest in-drawing, no spontaneous movement
- Grunting
- Fever (temperature ≥37.5 °C)

- Low body temperature (temperature <35.5 °C) or a temperature that is 35.5–36.4°C and does not rise with re-warming
- Any jaundice in first 24 hours of life, or yellow palms and soles at any age
- Bleeding from any site
- Persistent vomiting or drooling saliva.

The family should be encouraged to seek health care early if they identify any of the above danger signs in-between PNC contacts.

6.3.5 Exclusive breastfeeding

All babies should be exclusively breastfed from birth until 6 months of age. Mothers should be counselled and provided support for exclusive breastfeeding at each postnatal contact.

All newborns should be exclusively breastfed immediately within one hour of birth (without pre-lacteal feeds, not even water). It is essential to explain to the mother about the benefit of early and exclusive breastfeeding and the risks to the newborn of being fed on food or liquid other than breast milk (pre-lacteal feed):

- Explain to the mother about the benefits of colostrum
- Explain the mother about correct positioning and attachment of the baby during breastfeeding
- Explain how to recognise if the baby is breastfeeding well
- Identify the problems in the mother and the baby in relation to breastfeeding and advise accordingly
- Explain to the mother regarding the hazards of artificial feeding
- Advise the mother to breastfeed on demand but at least 8–10 times a day and for at least 10–15 minutes each time.

6.3.5.1 HIV and Infant Feeding

Exclusive breastfeeding for 6 months then complementary feeding along with breastfeeding for 2 years while mother being fully supported for ART adherence.

6.3.6 Management of newborn of HIV-positive mother[7]

Vertical transmission of HIV is the most frequent source of HIV infection in children. PMTCT was started in 2005 in Nepal. The recently endorsed National HIV Strategic Plan 2016–2021 has articulated its commitment to Eliminate Vertical Transmission (eVT) in children and keeping mothers alive and well by 2021, and the indicators are reflected in the National Health Sector Strategy 2015–2020.

Immediate newborn care includes the following:

- Maintaining universal precautions throughout care and treatment: wear gloves when giving injections; clean injection sites; dispose of all needles according to the injection safety protocol
- During cord clamping after birth: avoid “milking” the cord towards the baby; cover the cord with gloved hand or gauze before cutting
- Using suction only when meconium-stained liquid is present, using mechanical suction at less than 100mm Hg pressure
- Wiping the infant dry with a towel, wrapping with warm cloth, and giving the baby to the mother for skin-to-skin contact

- Determining the mother's infant feeding choice, encouraging breastfeeding according to the national breastfeeding protocol
- Administering vitamin K, and BCG vaccine according to the national guidelines
- Administering first dose of infant NVP within 6 to 12 hours of delivery
- Regardless of the mother's HIV status, keeping all infants warm after birth and handling them with gloves until maternal blood and secretions have been washed off.

6.3.6.1 HIV Diagnosis

Diagnosis of HIV infection in babies born to HIV-infected mothers cannot be confirmed by conventional antibody tests. The presence of anti-HIV antibodies in the newborn may not necessarily indicate primary infection. It may be due to the presence of passively transmitted anti-HIV antibodies from the mother to uninfected babies. These maternal antibodies may persist in the infant for as long as 18 months. Hence, virological assays such as HIV DNA PCR or total nucleic-acid-based assays represent the gold standard for diagnosing of HIV infection in children younger than 18 months. Some DNA assays support the use of Dried Blood Spot (DBS) samples, which have considerable advantages in settings where sample transportation and storage are problematic.

Diagnosis at birth: Samples from HIV-exposed infants will be collected within 48 hours after birth (at the earliest) in DBS. All infants with non-reactive DNA PCR at birth will be retested at six weeks. Infants with the first reactive sample will be put on ART and another DNA PCR performed to confirm the status. Adherence to treatment is dependent on the counselling provided to the caregiver.

Use of ARV for infant prophylaxis for HIV-exposed infants: ART should be initiated urgently in all pregnant and breastfeeding women, even if they are identified late in pregnancy or postpartum because the most effective way to prevent vertical HIV transmission is to reduce maternal VL. All HIV-exposed babies should receive ARV prophylaxis as soon as possible after birth. Dual prophylaxis for babies with high risk of HIV is adopted to reduce the risk of HIV transmission.

6.3.6.2 Treatment Recommendations

Low risk	Oral NVP for 6 weeks or Oral AZT for 6 weeks for infants of mothers exposed to NVP in the past
High risk[a]	Dual prophylaxis AZT[b] + NVP for 12 weeks

[a] High-risk infants are defined as:
– Mothers not on ART or <8 weeks of ART at delivery
– If VL is available
VL >1000 copies/mL at or 4 weeks before delivery
– If VL not available
Newly diagnosed women at delivery or post partum

[b] Azidothymidine (AZT) is to be given only to those infants who can come for regular follow-up of Hb tests. If not feasible, then give oral NVP to high-risk infants for 12 weeks.

6.4 Perinatal Asphyxia and resuscitation of asphyxiated babies at birth

6.4.1 Overview

According to the International Liaison Committee on Resuscitation (ILCOR), 85 per cent of babies born at term initiate spontaneous respirations within 10–30 seconds, 10 per cent respond to drying and stimulation, 3 per cent initiate respirations after positive pressure ventilation, 2 per cent will be intubated to support respiratory function, and only 0.1 per cent will require chest compressions and/or epinephrine (Perlman et al. 2015). Although the vast majority of newborn infants do not require intervention, nearly 1 million babies die each year because they do not breathe normally. Hence neonatal resuscitation is life-saving for many newborn babies.

Definition: birth asphyxia is defined by WHO as "the failure to initiate and sustain breathing at birth" (WHO 2012). According to the American Academy of Pediatrics (AAP) and ACOG[3], all of the following criteria must be present (AAP & ACOG 1996):

- Profound metabolic or mixed academia (pH< 7.0) in umbilical cord blood
- Persistence of low Apgar scores (less than 3) for more than 5 minutes
- Signs of neonatal neurological dysfunction (e.g. seizures, encephalopathy, tone abnormalities)
- Evidence of multiple organ involvement (such as that of kidneys, lungs, liver, heart and intestine).

6.4.2 Aim

To provide prompt and effective resuscitation measures to prevent brain damage or death of neonates.

Many asphyxiated babies will respond to the initial steps of resuscitation (drying, stimulating, wrapping). Some will require assistance with breathing, preferably with a bag and mask. A few will require chest compressions as well. A very small number will require intubation or medication.

Babies need to be assessed to determine their need for one or more of the following actions in sequence (Perlman et al. 2010):

i. Initial steps in stabilisation (dry and provide warmth, position, assess the airway, stimulate to breathe)
ii. Ventilation
iii. Chest compressions
iv. Medication or volume expansion.

If providers are trained, Apgar score can be performed at 1 and 5 minutes after birth, and is a good way to assess the newborn's well-being. Do not wait for an APGAR score when confronted with a baby that does not cry at birth. One minute is too long to wait when an asphyxiated baby is born.

Helping Babies Breath (HBB) is a simplified neonatal resuscitation protocol, developed by AAP for resource limited settings (AAP 2016). HBB is focused on the first minute of birth, also called the Golden Minute, when either stimulating or ventilating with bag-and-mask can save a life. Application of HBB neonatal resuscitation techniques has been shown to reduce neonatal mortality by up to 47 per cent and fresh stillbirths by 24 per cent (Msemo et al. 2013). NRP, developed by AAP, is used for initial and advanced steps of resuscitation (Perlman et al. 2010). In Nepal, the HBB protocol is being used in the curriculum for SBAs and for Integrated Management of Newborn and Childhood Illness (IMNCI) training in the initial steps of resuscitation.

NMS III 2020 recommends the adaptation of HBB and NRP for initial and advanced neonatal resuscitation at birth. (See Annex VIII for flow chart.)

6.4.3 Standard for resuscitation of asphyxiated babies at birth

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Preparation for birth	Preparation of place, equipment and drugs for resuscitation should be done for every delivery		
Initial steps of resuscitation	Immediate drying should be done for all babies before assessment of breathing[5]	Pulse oximetry should be used for evaluation of oxygenation because assessment of colour is unreliable	Assessment of colour in initial steps Routine suctioning of the mouth and nose routinely before initiating positive-pressure ventilation
Suctioning		If newborn does not start breathing after thorough drying, suctioning of the mouth and then nose should be done only if the mouth or nose is full of secretions	Routine suctioning of mouth and nose
Stimulation		Newly born babies who do not breathe spontaneously after thorough drying should be stimulated by rubbing the back 2 to 3 times before clamping the cord and initiating positive-pressure ventilation	
Cord clamping	After 1 to 3 minutes of birth	When newly born term or preterm babies require positive-pressure ventilation, the cord should be clamped and cut immediately to allow effective ventilation to be performed	
Positioning	Keep the baby's head in sniffing position to make airway straight		
Suctioning		If suctioning has not already been performed and newborn does not start breathing after thorough drying and rubbing the back 2 to 3 times, suctioning of the mouth and nose should be performed only if the mouth or nose is full of	

		secretions	
Positive-pressure ventilation		Positive-pressure ventilation should be started in non breathing baby within one Golden Minute using bag-and-mask ventilation. For babies more than 35 weeks of gestation, ventilation is done without added oxygen, and for those <35 weeks, bagging is done using 30% oxygen if blender available; if it is not available ventilation is done in room air If chest does not rise, readjust mask and reposition head to open airway Rate of positive pressure ventilation is 40 breaths per minute Positive pressure ventilation is continued for one minute before assessment (AAP 2016)	
Endotracheal intubation		Intubation should be performed only if: Equipment and skilled staff are immediately available Baby does not respond to positive-pressure ventilation via face mask and expert person is available There is presumed or confirmed diaphragmatic hernia	
Assessment	In babies requiring resuscitation, ECG monitoring can be used to provide a rapid and accurate estimation of heart rate (Perlman et al. 2015)	After 1 minute of effective ventilation, baby is assessed for breathing and heart rate (AAP 2016, Msemo et al. 2013) If baby is breathing regularly and heart rate is ≥100 BPM, positive-pressure ventilation is stopped and baby is monitored regularly If baby is not breathing and heart rate is ≥100 BPM, then positive-pressure ventilation	

		is continued and assessed after one minute If baby is not breathing or gasping or heart rate is <60 BPM, call for help, continue positive-pressure ventilation and start chest compression	
Chest compression		The two-thumb, encircling-hands method of chest compression is preferred, with a depth of compression one-third the anterior–posterior diameter of the chest and sufficient to generate a palpable pulse. Compressions should be centered over the lower third of the sternum The chest compression-ventilation ratio should remain at 3:1 (Perlman et al. 2010). Continue chest compression and ventilation for 1 minute then reassess for respiration and heart rate. Stop chest compression if heart rate is >60 BPM. Continue ventilation until heart rate >100 BPM and respiration spontaneous	
Medication		If after adequate ventilation and chest compressions for 1 minute, heart rate remains <60 BPM, then Injection (Inj) of adrenaline/epinephrine is indicated at a dose of 0.01 to 0.03 mg/kg (0.1–0.3 mL/kg of 1:10,000) and should be administered IV as soon as possible and continue intermittent positive-pressure ventilation and chest compression. If intravenous access is not available, then it is administered through endotracheal route, at a larger dose (0.05 mg/kg to 0.1mg/kg). Volume expansion: Early volume replacement with NS (10 mL/kg) or red cells is indicated for babies with blood loss or who are not	Sodium bicarbonate

		responding to resuscitation	
Stopping resuscitation	Babies with no detectable heart rate after 10 minutes of effective ventilation: resuscitation should be stopped (WHO 2017)	In babies who continue to have a heart rate below 60 BPM and no spontaneous breathing after 20 minutes of resuscitation, resuscitation should be stopped after consultation with family members (AAP 2016, WHO 2017)	
Post-resuscitation procedure	Stop ventilation once adequate ventilation and circulation established Closely monitor the baby for breathing difficulties and signs of asphyxia Inform the mother/family about the condition of the baby Anticipate need for further care and make arrangements to transfer the baby to special care baby unit or NICU as required	If resuscitation is not successful: provide emotional and psychological support to the mother and the family and declare the baby's death	
Recording and reporting	Record steps of resuscitation performed and finding of the newborn baby		

6.4.4 Post-resuscitation Care

Management of asphyxiated neonates is mainly supportive and involves maintaining optimum oxygenation, ventilation, perfusion, metabolic milieu and control of seizures (Agrawal et al. 2019).

Babies are transferred to NICU if:

- Apgar score at 1 minute is less than 3
- Prolonged bag-and-mask ventilation (60 seconds or more) was required
- Chest compressions were required.

Even neonates transferred to mother should be monitored frequently in the first 48 to 72 hours for development of features suggestive of HIE.

6.4.4.1 Standard for post-resuscitation care

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Maintain normal temperature	Maintain normal body temperature between (36.5–37.5°C); hyperthermia should		Hyperthermia

	be avoided		
Therapeutic Hypothermia (TH) (Jacobs et al. 2013)		If possible, TH is done in babies >35 weeks/>2kg, <6 hours of age and: Apgar score at 5 minutes is 5 or less, or Need for intermittent positive-pressure ventilation till 5 minutes of birth, or Cord arterial blood or blood obtained within 1 hour of birth has pH <7.0, or Cord arterial blood or blood obtained within 1 hour of birth: base deficit > 16.0, or In case of moderate to severe encephalopathy	Head or whole-body cooling outside well-resourced, tertiary NICUs, because there is potential for harm from this therapy in low-resource settings
Maintain normal oxygenation and ventilation	Maintain saturations between 90% and 95%	Keep under oxygen hood, if needed	Hyperoxia or hypoxia
Ensure normal perfusion	Capillary refill time of less than 3 seconds, absence of tachycardia and metabolic acidosis, normal blood pressure, and adequate urine output	Start IV fluids in neonates with Apgar scores <4 at 1 minute or <7 at 5 minutes of age or if the neonate is sick If tissue perfusion is inadequate, infuse NS bolus of 10 ml/kg over 5 to 10 minutes	Routine fluid restriction
Maintain normal haematocrit and metabolic milieu	Maintain blood glucose levels between 75 mg/dL and 100 mg/dL Maintain haematocrit between 45% and 55% Maintain pH above 7.30 Maintain serum calcium concentration in the normal range	IV glucose infusion should be considered as soon as practical after prolonged resuscitation to avoid hypoglycaemia; partial exchange transfusion using normal saline if haematocrit is above 65% In case of severe asphyxia, provide calcium in a maintenance dose of 4 mL/kg/day of 10% calcium gluconate for 1 to 2 days as a continuous infusion or	

		as 1:1 diluted boluses, slowly under cardiac monitoring; maintain serum calcium concentration in the normal range	
Treat seizures		If baby develops seizure, injection Phenobarbitone is given IV as first-line treatment at the dose of 15–20 mg/kg slowly over 15–20 minutes and kept in maintenance dose of 3–5 mg/kg/day	
Nutrition	Oral feeding is started once the neonate is haemodynamically stable		

6.5 Care of LBW Babies

6.5.1 Overview

Babies weighing less than 2500 g at birth are considered LBW. Babies weighing less than 1500 g are called Very Low Birth Weight (VLBW), while those less than 1000 g are called Extremely LBW (ELBW). Overall, 15 to 20 per cent of all births worldwide are LBW. Globally, of the 20.5 million LBW babies born in 2015, more than half were born in Asia, with more than 96 per cent in LMIC countries.

Regional estimates of LBW include 28 per cent in south Asia, 13 per cent in sub-Saharan Africa and 9 per cent in Latin America (UNICEF 2019, WHO 2015). Every year, 1.1 million babies die from complications of preterm birth; prematurity is the most common direct cause of neonatal mortality.

According to NDHS 2016, the prevalence of LBW in Nepal was 12 per cent. Globally, LBW caused by prematurity and/or restricted growth in utero is also a major contributor to newborn and child deaths, as well as disability and NCDs. LBW may directly or indirectly contribute to 60–80 per cent of all neonatal deaths.

VLBW babies should be stabilised and transferred to a facility with specialised care.

6.5.2 Aim

To identify LBW babies and classify them into preterm or small for gestational age (SGA) babies; to identify factors associated with LBW babies and to prevent and/or manage the problems associated with PT and SGA babies.

LBW babies may be either:

- Preterm babies: babies born before 37 weeks or equivalent in locally used gestational age calculation, e.g. born more than 3 weeks before expected due date
- SGA also called Small-for-date babies - babies who are undernourished in utero and have birth weights that are below the 10th centile for their gestational age.

6.5.3 Problems of preterm/LBW babies

Preterm/LBW babies are more prone to:

- Poor breathing at birth/asphyxia
- Hypothermia
- RDS
- Infections
- Hypoglycaemia
- Hypocalcaemia
- Apnoeic attacks
- Newborn haemorrhagic disease
- Feeding difficulties
- Hyperbilirubinaemia
- Retinopathy of Prematurity (ROP).

6.5.4 Causes of Preterm birth

Maternal causes:

- Medical: Severe uncontrolled DM; Hypertension, including eclampsia; cardiovascular diseases
- APH
- PROM
- Incompetent cervix
- Infections
- Rh incompatibility and hydrops foetalis
- Previous history of preterm delivery

Foetal and foeto-placental:

- Multiple gestation
- Congenital malformation
- Extreme IUGR
- Foetal hypoxia

Iatrogenic cause.

6.5.5 Causes for IUGR babies

Environmental factors:

- Race and ethnicity
- Geographic location
- Lower socioeconomic status
- Nutritional insufficiency

Maternal factors:

- Short stature of mother
- Primigravida or grand multipara
- Young/adolescent mother
- Low pre-pregnant weight

- Smoking and tobacco or alcohol abuse
- Maternal illness; anaemia, heart disease, malaria
- Complications of pregnancy – pre-eclampsia, hypertension
- Previous similar baby

Placental factors:

- Improper implantation
- Abruptio placentae
- Structural or functional anomalies of placenta

Foetal factors:

- First-born babies are generally smaller
- Genetic or chromosomal aberrations
- Multiple pregnancy
- Intrauterine infections.

6.5.6 Diagnostic modality

History, clinical examination, including Modified Ballard Scoring for gestational age estimation, laboratory parameters – random blood sugar, Hb, Packed Cell Volume (PCV) or haematocrit.

6.5.7 Standard for Care of preterm/LBW babies

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Protection from infection	Minimal handling Hand washing before and after touching the baby Wearing gloves before every procedure and using aseptic technique		Many people handling the baby
Prevention from hypothermia	The room should be kept at least above 25°C The baby should be well-wrapped and kept dry The baby should be kept with the mother in skin-to-skin contact whenever possible (Kangaroo Mother Care (KMC) should be started in stable LBW babies as early as possible) Incubators, if available, should be reserved for infants below 1000 g and in situations where kangaroo/maternal care is not possible	Preterm <28 weeks may be received in polythene wrap at birth and kept in pre-warmed incubator and managed in Level-III care unit (Perlman et al. 2010)	
Feeding/fluid management Prevention of hypoglycaemia	Early and frequent breastfeeding in all stable newborn.	<28 weeks (ELBW infants): ideally started on parenteral nutrition from day one of life If not available, started on IV fluids 28–31 weeks: start with Orogastric (OG) tube feeding then cup/paladai feeding 32–34 weeks: feeding by paladai/cup >34 weeks: breastfeeding (WHO 2017) The ideal way in a given infant would be to evaluate if the feeding skills expected for his/her gestation are present and	

		then decide accordingly Newborn with severe IUGR with antenatally detected Doppler flow abnormalities, enteral feed is delayed for 24 hours (Dorling et al. 2005) Blood sugar should be monitored	
Fortification with HMF		In VLBW babies, fortification of expressed breast milk with Human Milk Fortifier (HMF) increases the nutrient content of the milk without compromising its other beneficial effects. The Cochrane review on fortification found short-term improvement in weight gain, linear and head growth without any increase in adverse effects such as Necrotising Enterocolitis (NEC) (Agrawal et al. 2019)	
Nutritional supplementation	Once babies are in enteral feed of 100 mL/kg/day Phosphorus: 70–80 mg/kg/day Calcium: 140–160 mg/kg/day Vitamin D: 400- 1000 IU/day Iron: 2 mg/kg/day at 4 weeks of life		Routine oral Vitamin A and Zink supplementation.
Management of apnoea of prematurity		Treatment with methyl xanthine is indicated, when apnoeic episodes are frequent or if the baby requires positive-pressure ventilation for apnoea that is unresponsive to tactile stimulation Treatment is continued until 34 weeks post-menstrual age and stopped thereafter if no	Cochrane evidence does not support the use of prophylactic therapy for apnoea of prematurity (Kuschel et al. 1998)

		episode of apnoea has occurred in the last 7 days Drugs: there are two drugs, caffeine and aminophylline (theophylline). Caffeine has lesser side effects and better dosage convenience, as it requires once-daily administration compared to thrice-daily dosing of aminophylline	
Growth monitoring	Standard practice is to weigh the LBW infant daily for the first week of life or until discharge from hospital, then twice a week or weekly until term, and then monthly until 12 months of chronological age		

6.5.8 Trophic feedings or minimal enteral nutrition

Trophic feeding or minimal enteral nutrition refers to intragastric milk feeds in the first few days of life in sub-nutritional quantities, e.g. 5–10 mL/kg/day on the first day of life. All stable LBW infants, irrespective of their initial feeding method, should be put on their mothers' breast. The immature sucking observed in preterm infants born before 34 weeks might not meet their daily fluid and nutritional requirements but helps in rapid maturation of their feeding skills and also improves the milk secretion in their mothers.

Fluid requirements of newborn

Day of life	Fluid requirements (mL/kg)	
	Birth weight ≥1.5 kg	Birth weight <1.5 kg
1.	60	80
2.	75	95
3.	90	110
4.	105	125
5.	120	140
6.	135	150
7.	150	150

Requirements met by enteral feeds and/or IV fluids or a combination of the two

6.5.9 Choice of milk for LBW infants

There is strong and consistent evidence that feeding mother's own milk to LBW infants of any gestation is associated with a lower incidence of infections and NEC, and improved neurodevelopmental outcome as compared with formula feeding. All LBW infants, irrespective of their initial feeding method, should receive only breast milk. This can be ensured even in those infants who are fed by paladai or OG tube by giving Expressed Breast Milk (EBM).

Donor human milk: Feeding with donor human milk rather than standard or LBW infant formula to LBW infants of <32 weeks' gestation reduces the incidence of necrotising enterocolitis (Edmond & Bahl 2006). It can be practised where optimal milk-banking facilities are available.

Preterm formula: In special circumstances when mothers are sick or there is contraindication to breastfeeding, specialised preterm formula can be used.

Discharge of preterm/LBW baby: International groups recommend early discharge of LBW infants when the babies are gaining weight, maintaining temperature, are competent at suckle feeding and physiologically mature, and with family and community readiness to provide the necessary support for their home care (Edmond & Bahl 2006).

6.5.10 KMC

KMC is a method of care of preterm or LBW neonates by placing them in skin-to-skin contact with mother or other caregiver in order to ensure their optimum growth and development. KMC is now considered as the standard of care for LBW neonates in all settings (Conde-Agudelo et al. 2016, WHO 2003, Agrawal et al. 2019).

Benefits of KMC

- Improved exclusive breastfeeding at discharge or 40 to 41 weeks' postmenstrual age. Reduction in the risk of mortality
- Reduction in nosocomial infection/sepsis
- Reduction in hypothermia
- Reduction in length of hospital stay
- Increase in weight gain
- Less stress in mother
- Better bonding with mother.

Components of KMC: includes skin-to-skin contact and exclusive breastfeeding.

Eligibility criteria for KMC:

a. Neonate

All stable neonates over 1800 g, KMC to be started from the first day of life.

Stable neonates of 1200–1800 g after initial observation for few days.

<1200 grams initially managed in NICU for few weeks because of risk of developing complications of prematurity. Intermittent KMC can be started once stable.

KMC can be provided while the neonate is being fed via OG/nasogastric tube or on oxygen therapy.

b. Mother

Willingness: The mother must be willing to provide KMC. Health care providers should counsel and motivate her.

General health and nutrition: The mother should be free from serious illness to be able to provide KMC.

Hygiene: The mother should maintain good hygiene: daily bath/sponge, change of clothes, hand washing, short and clean fingernails.

6.5.10.1 Standard for initiation of KMC.

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Counselling	When the neonate is ready for KMC, arrange a time with mother and her mother/mother-in-law, husband or any other member of the family Demonstrate to her the KMC procedure		
Mother's and baby's clothing	Mother can wear any front-open dress as per local culture. This may include sari, a blouse or chaubandi cholo, front open gown, or a simple shirt Baby is dressed with cap, socks, nappy, and a front-open sleeveless shirt		
Kangaroo positioning	The neonate should be placed between the mother's bare breasts in an upright position The head should be turned to one side and kept in a slightly extended position. The hips should be flexed and abducted in a "frog" position; the arms should also be flexed Support the baby's bottom with a sling/binder/3.5-metre cloth or cotton sari		
Monitoring	Make sure that airway is straight and clear, breathing is regular, colour is pink and the neonate is maintaining temperature Daily weight is monitored		
Feeding	Exclusive breastfeeding should be done Mother may express milk while the neonate is still in KMC position. The neonate could be fed with paladai or tube, depending on his/her clinical condition		

Duration of KMC	The length of skin-to-skin contacts should be gradually increased up to 24 hours a day, interrupted only for changing diapers The mother can sleep with her baby in kangaroo position in reclined or semi-recumbent position about 30 degrees from horizontal. This can be done with an adjustable bed or with pillows on an ordinary bed		
Discharge criteria	The standard policy of the unit for discharge from the hospital should be followed Baby's general health is good. Gaining weight at least 15–20 g/kg/day for three consecutive days Maintaining body temperature satisfactorily for at least three consecutive days at room temperature. Feeding well and exclusively breast feeding. The mother and family members are confident to take care of the baby at home		
Post-discharge follow-up	Initially followed once or twice a week till 37–40 weeks of gestation or until he/she reaches 2.5 to 3 kg of weight. Thereafter, follow-up every 2 to 4 weeks until baby is 3 months old Later the baby should be seen at an interval of 1 to 2 months during first year of life. The baby should gain adequate weight (15–20 g/kg/day up to 40 weeks of post-conception age and 10 g/kg/day subsequently). More frequent visits should be made if the baby is not growing well or his/her condition demands. The first screening for ROP should be performed at 4 weeks Postnatal Age (PNA)		

6.5.11 Follow-up evaluation of preterm/LBW babies

S.No	Evaluation	Frequency	Details
1.	Anthropometry with growth monitoring	Every visit	Weight and head circumference each visit and length every 3 months Use postnatal growth charts meant for preterm

			babies
2.	Breastfeeding	Every visit	Check for attachment, positioning and problems
3.	Counselling	Every visit	Feeding, hygiene, KMC. Ask mother about her concerns
4.	Development Screening	At 3, 6, 9 and 12 months PNA	Use standard screening tools and refer for detailed development assessment if needed
5.	Eye evaluation	No later than 4 weeks PNA (3 weeks for very preterm babies) for ROP screening Detailed examination at 9–12 months of age	Emphasis on ROP screening by a skilled ophthalmologist
6.	Cranial USG	Prior to discharge and at 40 weeks post-menstrual age	To rule out periventricular leukomalacia and other abnormalities
7.	Hearing	At 40 weeks post-menstrual age; if questionable, repeat at 6 weeks of PNA	Automated Auditory Brainstem Response (AABR) is preferred over Otoacoustic Emission (OAE)
8.	Immunisation	As per schedule with no modifications needed	

Adapted from Government of India. Home-based newborn care: operational guidelines (revised 2014). New Delhi: Ministry of Health and Family Welfare, 2014.

6.6 Hypothermia in neonates

6.6.1 Overview

Hypothermia is defined by WHO as a core temperature < 36.5°C (97.7 F) and is sub-classified into three grades: mild (36.0–36 .5°C), moderate (32.0–35.9°C) and severe (<32.0°C) hypothermia.

All newborn babies are at risk of hypothermia and need to be kept warm. Hypothermia must be prevented to ensure survival and reduction of morbidity and mortality in the neonatal period.

In premature infants, hypothermia increases morbidity and mortality. Hypothermia may be purely environmental or represent intercurrent illness (e.g. sepsis).

6.6.2 Aim

To prevent hypothermia in newborn and to identify and manage hypothermia to prevent further complications.

If hypothermia persists there is a risk of developing neonatal cold injury, in which case the infant usually becomes lethargic with slow, shallow and irregular respiration and a slow heart rate (bradycardia) corresponding to the degree of fall in body temperature. Hypoglycaemia and metabolic acidosis may develop. There is a real risk of death.

All four mechanisms of heat loss, namely conduction, convection, evaporation and radiation, play a role in the development of hypothermia in newborns.

Risk factors for development of hypothermia:

- Preterm/LBW babies
- Perinatal asphyxia
- Severe sepsis
- Infants delivered of mothers who received anaesthetic drugs during delivery
- Environmental risk factors.

Prevention of Hypothermia: maintenance of warm chain:

- Warm delivery room
- Immediate drying and wrapping
- Warm resuscitation
- Skin-to-skin contact with mother/KMC for LBW babies
- Breastfeeding
- Bathing postponed for more than 24 hours
- Appropriate clothing
- Mother and baby together
- Warm transportation
- Professional alert.

6.6.3 Standard for management of neonatal hypothermia

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Re-warming the baby	Ensure warm room	Re-warming babies that are already hypothermic by skin-to-skin contact if mild hypothermia If not improved or moderate to severe hypothermia, management under radiant warmer or incubator	
Early breastfeeding/ fluid management	Babies should be started on early breastfeeding	If unable to feed or sick babies, start IV dextrose drip	
KMC		KMC is started in stable preterm babies	
Management in radiant warmer		For sick babies: Rapid rewarming until 34°C then slow rewarming to 36.5°C. Regular monitoring is to be performed	

Management in incubators		Preterm VLBW babies can be managed in incubator if available	
Treatment of underlying conditions	Maintain Oxygen Saturation (SpO2) between 90–95% Maintain blood glucose above 50mg/dl	Possible oxygen if needed Start IV fluids:10% dextrose Check whether the baby received Inj vitamin K or not Injectable antibiotics: for babies with severe hypothermia or babies with septicaemia	

6.7 Respiratory distress in neonates

Respiratory distress is one of the common problems causing morbidity and mortality in neonates and occurs in about 7 per cent of deliveries.[1] Respiratory distress in the newborn is recognised as one or more signs of increased work of breathing, such as tachypnoea (respiratory rate> 60/minute), nasal flaring, chest retractions, grunting , apnoea or gasping.

6.7.1 Aim

To identify the cause of breathing difficulties in the newborn; and to provide appropriate management depending on the cause.

The causes of respiratory distress in a newborn are diverse and multi systemic. Common respiratory causes of respiratory distress include:

- Neonatal/congenital pneumonia
- MAS
- RDS (hyaline membrane disease)
- Transient Tachypnoea of the Newborn (TTN)
- Persistent Pulmonary Hypertension of the Newborn (PPHN)
- Congenital heart defects, airway malformations, diaphragmatic hernia and inborn errors of metabolism are less common aetiologies.

6.7.2 Diagnostic tools

Detailed history and clinical examination, including respiratory distress scoring (Rusmawati et al. 2016), and SpO2 monitoring by pulse oximetry and lab marker which includes:

- CBC with differential count
- C-reactive Protein (CRP)
- Blood culture
- Chest X-ray
- Blood glucose
- Arterial blood gas analysis (ABG).

6.7.2.1 Downe's score for grading severity of respiratory distress

Feature	Score 0	Score 1	Score 2
Cyanosis	None	In room air	In 40% FiO2
Retractions	None	Mild	Severe
Grunting	None	Audible with stethoscope	Audible without stethoscope
Air entry	Normal	Decreased	Barely audible
Respiratory rate	<60	60–80	>80 or apnoea

Score of $\geqslant$ 6 for at least 2 hours during the first 8 hours of life denotes clinical respiratory distress. Score of $\geqslant$ 6 is an indication for ventilatory assistance.

Pulse oximeter is an important device that can measure SpO2, which is also referred to as the sixth vital sign. SpO2 below 90 per cent indicates hypoxia.

6.7.3 Management of respiratory distress

Management of neonatal respiratory distress should be both generalised and disease-specific.

General management:

- Provide warmth: Management of newborn in thermoneutral environment reduces the newborn's energy requirements and oxygen consumption
- Adequate oxygenation: Oxygenation can be maintained by delivering oxygen via bag-and-mask, nasal cannula, and oxygen hood. Baby might require Continuous Positive Airway Pressure (CPAP) or ventilator support depending on the severity of respiratory distress
- Adequate fluid and electrolyte balance should be maintained. Breastfeed, if respiratory problem is not severe. Oral feedings are withheld if the respiratory rate is high to prevent aspiration
- If severe, start IV fluids according to baby's age and weight
- Monitoring; respiratory rate, appearance or disappearance of severe signs of respiratory distress (chest in -drawing, grunting, cyanosis, nasal flaring).

Management of specific problems:

i. RDS (Agrawal et al. 2019, Subramaniam et al. 2016, Perlman et al. 2015)

Newborns born before 34 weeks' gestation may have respiratory distress secondary to surfactant deficiency and lung immaturity. RDS is more common in males and newborns born to mothers with DM. Birth asphyxia, maternal chorioamnionitis and Caesarean delivery are other risk factors for RDS (Anadkat et al. 2012).

Symptoms of RDS (i.e., tachypnoea, grunting, retractions and cyanosis) occur immediately after birth and progress for 48 hours, are static for the next 48 hours and then improve. However, surfactant therapy modifies the course with early resolution. Chest radiography shows low-volume lungs, reticulogranular pattern, a diffuse ground-glass appearance with air bronchograms and hypo-expansion; blood gas measurements show hypoxaemia and acidosis.

6.7.3.1 Standard for management of RDS

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Supportive care	This includes maintenance of thermoneutral environment by caring for the infant under radiant warmer or in an incubator, ensuring normal blood glucose levels with enteral and/or parenteral nutrition, and monitoring vitals, including SpO2 monitoring		
Antenatal corticosteroid		Given between 24 and 34 weeks' gestation, decreases RDS risk	
Antenatal magnesium sulfate ($MgSO_4$) for neuroprotection		Indicated for pregnant women <31 weeks' gestation with imminent preterm birth (active labour with 4 cm of cervical dilation, with or without PPROM and planned preterm deliveries for foetal or maternal indications)	
Resuscitation at birth (Perlman et al. 2015)		Infants needing positive-pressure ventilation are to be provided with Peak Inspiratory Pressure (PIP) and Positive End-expiratory Pressure (PEEP) using T-piece device. Initial settings on the device are 15/5. If prompt improvement in heart rate or chest movement is not obtained, then higher pressures to achieve effective ventilation may be used. If possible. 30% oxygen is used. Use pulse oximeter is used for assessing oxygen target CPAP used in the delivery room continued in the NICU. Early institution of CPAP has been shown to decrease the need for mechanical ventilation	

CPAP		Recommended for the treatment of preterm newborns with RDS CPAP is started as soon as the diagnosis of RDS is made with Positive End Expiratory Pressure (PEEP) 5 cm of water and titrated Fraction of inspired Oxygen (FiO2) to achieve target SpO2 between 90–95%	
Ventilator		Intubation and mechanical ventilation can be initiated if there is hypercapnia (PCO2 >60 mmHg), decreased respiratory drive or acidosis or if surfactant replacement therapy is planned	
Surfactant replacement therapy		In health care facilities where intubation, ventilator care, blood gas analysis, newborn, nursing care and monitoring are available, surfactant replacement therapy is recommended for intubated and ventilated newborns with RDS In neonates with signs and symptoms of RDS, if FiO2 requirement exceeds 40%, early rescue surfactant by INSURE (INtubation, SURfactant therapy, Extubation) technique is indicated. INSURE to Nasal CPAP (N-CPAP) results in decreased duration of mechanical ventilation, air leak and lower incidence of chronic lung disease.	Administration of surfactant before the onset of RDS (prophylactic administration) in preterm

ii. MAS (Agrawal et al. 2019, Goldsmith et al. 2008, Goel 2017)

Meconium-stained amniotic fluid is present in approximately seven to 20 per cent of deliveries; two to nine per cent develop MAS. In utero excretion of meconium often represents foetal maturity: MAS occurs in term and post-term newborns. Meconium is a conglomeration of desquamated cells, bile pigments, pancreatic enzymes and amniotic fluid. Although meconium itself is sterile, it can lead to bacterial infection, irritation, obstruction and pneumonia.

Meconium aspiration syndrome presents at birth as marked tachypnoea, grunting, retractions and cyanosis. Examination may reveal a barrel-shaped chest, with rales and rhonchi heard on auscultation. Chest radiography may show bilateral fluffy densities with hyperinflation. Treatment includes N-CPAP and supplemental oxygen. Ventilator support may be needed in more severe cases.

6.7.3.2 Standard for management of MAS.

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Intrapartum care		Positive pressure ventilation needs to be provided if apnoeic or gasping or heart rate is <100 BPM and not improving.	Routine oropharyngeal suction and endotracheal suctioning
Respiratory support		Oxygen is delivered via hood or cannula, or CPAP if FiO2 requirement exceeds 40%	
Mechanical ventilation		Mechanical ventilation should be considered when newborn with MAS demonstrates significant hypoxia (PaO2 <50mm Hg), hypercarbia (Partial Pressure of Carbon Dioxide (PaCO2) >60mm Hg), or acidosis (pH <7.25) with FiO2 >0.80	
Inhaled Nitrous Oxide (iNO) therapy with high-frequency ventilation		In severe cases with hypoxaemic respiratory failure, early institution of high-frequency ventilation along with iNO therapy may decrease the use of ECMO and improve outcomes	

iii. Neonatal pneumonia/sepsis

Respiratory distress in newborn due to infection (sepsis or pneumonia) is common problem, especially in developing countries. Every newborn is susceptible to infection at any age. There are some risk factors for early onset, such as prolonged membrane rupture, maternal fever, chorioamnionitis, uncleaned vaginal examinations etc.

Chest X-ray may show homogeneous or heterogenous opacities in one or both lungs.

6.7.3.3 Standard for management of pneumonia

Interventions	Recommendation

	Recommended for All	Context-specific	Not Recommended
Supportive	Supportive management is very important; it includes temperature maintenance, oxygen therapy, whenever necessary with appropriate respiratory support, and vasopressor support, whenever needed		
Definitive treatment	Appropriate injectable antibiotics are the mainstay of treatment		

iv. TTN

TTN results from delayed reabsorption and clearance of alveolar fluid. TTN predominantly occurs in late preterm and term newborns. Babies born by CS and infants of diabetic mothers are at risk of TTN.

Respiratory distress occurs at or soon after birth and improves gradually by one to five days. X-ray findings include: hyperinflated lungs, perihilar streaking, fluid in minor fissures and pleural effusions. Blood gases may show hypoxaemia, hypercapnia, or respiratory acidosis.

Because TTN is self-limited, treatment is supportive. Respiratory support may involve oxygen therapy, while some babies may require CPAP to distend the alveoli and aid the absorption of the extra lung fluid. Very rarely, mechanical ventilation is necessary.

6.8 Neonatal infections

Sepsis remains a leading cause of neonatal mortality and morbidity, especially during the first few days of life: Globally, almost 1 million neonatal deaths each year are because of infectious causes, including neonatal sepsis, meningitis, and pneumonia (Black et al. 2010). The majority of these deaths usually occur in low-income countries. Sepsis-related mortality is largely preventable with prevention of sepsis itself, timely recognition, rational antimicrobial therapy and aggressive supportive care.

According to the European Medicines Agency Report on The Expert Meeting on Neonatal and Paediatric Sepsis (2010), neonatal sepsis can be defined by the presence of at least two clinical symptoms and at least two laboratory signs in the presence of, or as a result of, suspected or proven infection (positive culture, microscopy or PCR).

6.8.1 Aim

To identify local or systemic bacterial infection in neonate; and to plan investigation, manage with appropriate antibiotics, and refer as required.

According to WHO's Integrated Management of Childhood Illness (IMCI) guidelines (2014), infection in newborn is classified as local bacterial infection and systemic infection as Possible Serious Bacterial Infection (PSBI).

Local bacterial infections include: ophthalmia neonatorum, umbilical infection, oral thrush and skin infections. Clinical signs of PSBI are defined as the presence of any one of a history of difficulty feeding, history of convulsions, movement only when stimulated, respiratory rate of 60 or more breaths per minute, severe chest retractions, or a temperature of ≤35.5 °C. or ≥37.5 C.

Neonatal sepsis can be classified into two categories depending up on the onset of symptoms (WHO 2013):

Early-onset Neonatal Sepsis (EONS) is defined as appearing in the first 72 hours after birth. The source of infection is generally the maternal genital tract. Some maternal/perinatal conditions have been associated with an increased risk of EONS. Knowledge about these potential risk factors would help in early diagnosis of sepsis.

Risk factors for EONS: Membranes ruptured >18 hours before delivery, mother had fever >38°C before delivery or during labour, or amniotic fluid was foul-smelling or purulent, LBW or prematurity, single unclean or >3 sterile vaginal examination(s) during labour, prolonged labour (sum of 1st and 2nd stage of labour >24 hrs), perinatal asphyxia (Apgar score <4 at 1 minute).

Presence of foul-smelling liquor or three of the above-mentioned risk factors warrant initiation of antibiotic treatment. Infants with two risk factors should be investigated and then treated accordingly.

Late-onset Neonatal Sepsis (LONS) is onset at or after 72 hours after birth. The source of infection in LONS is either nosocomial (hospital-acquired) or community-acquired and neonates usually present with septicaemia, pneumonia or meningitis. Various factors that predispose to an increased risk of nosocomial sepsis include LBW, prematurity, admission to NICU, mechanical ventilation, invasive procedures, administration of parenteral fluids and use of stock solutions.

6.8.2 Diagnostic tools

Clinical examination, laboratory tests, radiology.

6.8.3 Clinical features

Non-specific features: The earliest signs of sepsis are often subtle and nonspecific with the following symptoms and signs:

- Hypothermia or fever (former is more common in preterm LBW infants)
- Lethargy, poor cry, refusal to suck
- Poor perfusion, prolonged capillary refill time
- Hypotonia, absent neonatal reflexes
- Bradycardia/tachycardia
- Respiratory distress, apnoea and gasping respiration
- Bleeding from any site.

Specific features related to various systems:

- Central Nervous System (CNS): Bulging anterior fontanelle, vacant stare, high-pitched cry, excess irritability, stupor/coma, seizures, neck retraction. Presence of these features should raise a clinical suspicion of meningitis
- Cardiac: Hypotension, poor perfusion, shock
- Gastrointestinal: Feed intolerance, vomiting, diarrhoea, abdominal distension, paralytic ileus, NEC
- Hepatic: Hepatomegaly, direct hyperbilirubinemia (especially with UTIs)
- Renal: Acute renal failure
- Haematological: Bleeding, petechiae, purpura
- Skin changes: Multiple pustules, abscess, sclerema, mottling, umbilical redness and discharge.

6.8.4 Investigations

Blood culture-The diagnosis of neonatal sepsis can be established only by a positive blood culture, hence it should be performed in all cases of suspected sepsis prior to starting antibiotics. A positive blood culture with sensitivity of the isolated organism is the best guide to antimicrobial therapy.

Septic screening: All neonates suspected to have sepsis should have a septic screen to corroborate the diagnosis.

- Total leukocyte count: <5000/mm^3
- Absolute neutrophil count: Low counts less than 1800/mm^3
- Immature/total neutrophil: >0.2
- Micro-erythrocyte Sedimentation Rate (Micro-ESR) >15 mm in first hour
- CRP: >1 mg/dL

If two (or more) parameters are abnormal, it should be considered as a positive screen and the neonate should be started on antibiotics.

Lumbar Puncture (LP): In early onset sepsis, LP may be deferred in a neonate with RDS without any risk factor for sepsis and indicated in the presence of a positive blood culture or if the clinical picture is consistent with septicaemia. In situations of LONS, LP is to be done in all infants prior to starting antibiotics. LP is postponed in a critically sick neonate.

Urine culture: Obtained by catheter or bladder tap should be included in the sepsis evaluation for LONS.

Chest X-ray: Performed in neonates with respiratory distress or apnoea.

Other inflammatory markers: Procalcitonin, interleukins.

6.8.5 Treatment

Common Local Infections

Infection	Signs and Symptoms	Treatment
Ophthalmia neonatorum (conjunctivitis due to gonococcal infection)	Mother has symptoms/signs of a STI Both eyes of the baby are red, swollen, and draining a large amount of pus	Ceftriaxone injection 50mg/kg IM for baby Clean eyes frequently Apply tetracycline eye ointment in both the eyes twice a day Treat mother and her partner as well
Umbilical infection	Baby's umbilical cord is red or draining pus, but skin around it is normal (not red)	Clean cord and apply antiseptic cream Oral amoxicillin for 5 days
Oral thrush	White patches on the tongue and inside the mouth of baby. Baby has feeding difficulty	Apply clotrimazole suspension or 0.25% Gentian violet to the baby's mouth and tongue four times daily

Skin infection	Presence of pustules fewer than 10 in number	Clean daily using antiseptic solution Oral amoxicillin for 5 days

The indications for starting antibiotics in neonates at risk of EONS include any one of the following (Agrawal et al. 2019):

- Presence of >3 risk factors for early onset sepsis
- Presence of foul-smelling liquor
- Presence of 2 antenatal risk factor(s) and a positive septic screen and
- Strong clinical suspicion of sepsis.

The indications for starting antibiotics in LONS include:

- Positive septic screen and/or
- Strong clinical suspicion of sepsis.

Antimicrobial therapy (WHO 2013): The choice of antibiotics depends on the existing flora in the given unit and their antimicrobial sensitivity.

The current WHO recommendation for management of infections in neonates (0–28 days old) is referral for hospital treatment with at least a seven-day course of a combination of two injectable antibiotics: benzylpenicillin or ampicillin (50 mg/kg every 12 hours for<7 days old and every 8 hours for >7 days old, given IM or IV) plus gentamicin 3–4mg/kg once a day for LBW infants and 5 mg/kg once a day for normal birth weight of <7 days old and 7.5 mg/kg once a day of >7 days old for normal-weight infants, given IM or IV.

If at greater risk of staphylococcus infection (extensive skin pustules, abscess or omphalitis in addition to signs of sepsis), give IV cloxacillin (25–50 mg/kg per dose every 12 hours for<7 days old and every 8 hours for >7 days old, given IM or IV) and gentamicin.

For meningitis, IV cefotaxime (50 mg/kg every 12 hours if <7 days or every 6–8 hours if >7 days of age), and gentamicin given for 3 weeks.

Where referral is not possible but newborn is without signs of critical illness, injectable gentamicin for 2 days and oral amoxicillin for 7 days may be given (Mir et al. 2016).

Second-line antibiotics decided according to culture and sensitivity reports.

Duration of treatment:

- Meningitis (with or without positive blood/cerebrospinal fluid culture): 21 days
- Blood culture positive but no meningitis: 14 days
- Culture-negative sepsis (screen positive and clinical course consistent with sepsis): 5–7 days.

6.8.6 Antibiotic stewardship

Antibiotic resistance is spreading throughout the world as a result of excessive use or misuse of antibiotics and is a major health crisis. Antibiotic exposure has also been shown to have adverse short- and long-term effects in newborn by disrupting the normal gut and lung microbiome: the risk of NEC

increased by 7 per cent for each additional day of antibiotics administered in the absence of culture-confirmed EONS (Puopolo et al. 2018).

Ideally, antibiotic use in the newborn could be targeted with precision so that only babies with proven infection receive antibiotics, and only the narrowest-spectrum effective antibiotic be used. These are fundamental principles of antimicrobial stewardship (Cantey et al. 2019).

At present there is no highly sensitive and specific test that confirms sepsis before antibiotic administration to a newborn who appears ill. Therefore, appropriate cultures must be obtained and empirical antibiotic therapy for a minimum of 24 to 48 hours is initiated before sepsis can be reliably excluded.

When initial blood culture results are negative, antibiotic therapy should be discontinued by 36 to 48 hours of incubation, unless there is evidence of site-specific infection (Puopolo et al. 2018). Persistent cardiorespiratory instability is common among infants with VLBW and is not alone an indication for prolonged empirical antibiotic administration.

Antibiotic therapy should use the narrowest spectrum of appropriate agents once antimicrobial sensitivities are known.

6.8.7 Supportive care

Supportive care is crucial in neonatal sepsis:

- Temperature maintenance to avoid hypo-/hyperthermia
- Oxygen if necessary, to maintain oxygen saturation
- IV fluids if haemodynamically unstable
- Volume expansion with crystalloids/colloids and judicious use of inotropes to maintain normal tissue perfusion and blood pressure
- Monitoring for hypo-/hyperglycaemia
- Packed red cells and FFP in newborn with anaemia or bleeding diathesis.

6.8.8 Prevention of Infection

Efforts must be made to prevent infection, especially in the neonatal unit, as infants are easily infected in this environment. The following measures will help reduce infections in the neonate:

- Hand washing before and after touching the baby
- Optimum nurse:patient ratio should be ensured in neonatal units to prevent health-care-associated infections
- Proper aseptic technique before performing any invasive procedure on the baby
- Use of disposables, such as feeding tubes, umbilical catheters, Endotracheal Tubes (ETTs) etc., which should be thrown out rather than reused
- Use of sterilised equipment only, and desterilising equipment once it has been used
- Use of sterile or at least clean and steam-ironed clothes for the baby
- Isolation of infected babies in a separate room
- Use of breast milk only for feeding, and using spoons and cups and not bottles to feed the baby if it cannot suck well
- Cleaning the unit every shift and fumigating it once a week or so
- Thorough cleaning of cots and mattresses after their use by a baby
- Fumigation of incubators at least once a week
- Regular antibiotic stewardship programme should be implemented in neonatal units

- Minimal handling of the baby.

6.9 Neonatal jaundice

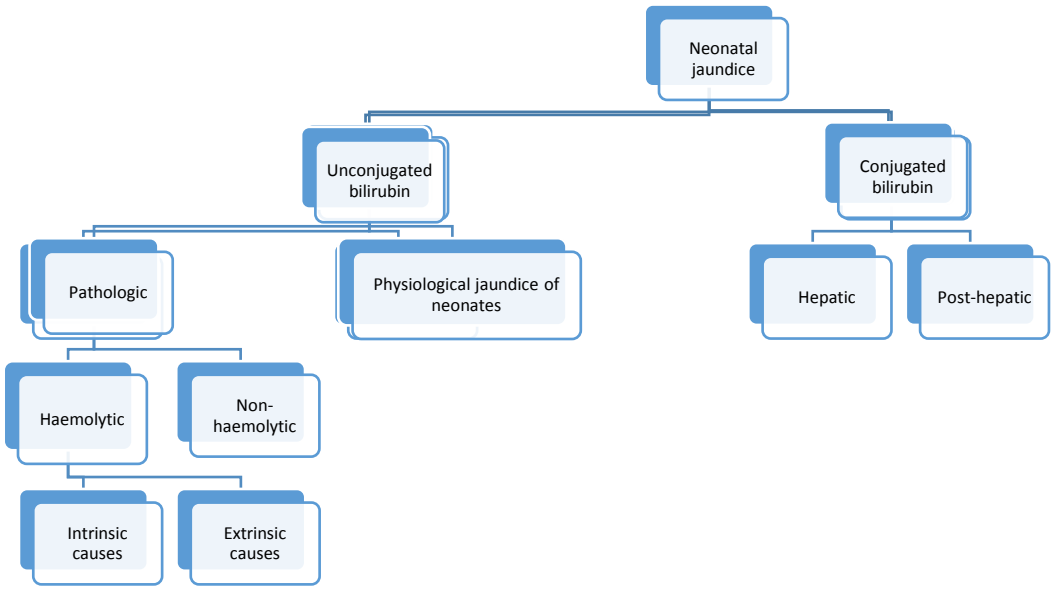
6.9.1 Overview

Jaundice is the most common presentation in the first week of life. About 60 per cent of term and 80 per cent of preterm babies develop jaundice in the first week of life (Rennie et al. 2010). Jaundice is the most common cause of readmission after discharge from birth hospitalisation. Jaundice in neonates is visible in skin and eyes when Total Serum Bilirubin (TSB) concentration exceeds 5 mg/dL. Approximately 5–10 per cent of them have clinically significant jaundice that require treatment to lower serum bilirubin levels in order to prevent neurotoxicity. The permanent damage of the cells of the brain stem and basal ganglia due to bilirubin deposition, or the bilirubin-induced neurological damage which is called "kernicterus" are the most important forms of neurotoxicity from hyperbilirubinaemia that are seen at autopsy.

6.9.2 Aim

To estimate severity of hyperbilirubinemia clinically, and plan to investigate and manage jaundice in newborns.

Neonatal jaundice can be grouped into the following categories.



Jaundice is classified as physiological and pathological jaundice.

Jaundice attributable to physiological immaturity of neonates to handle increased bilirubin production is termed ‘physiological jaundice’, where jaundice usually appears between 24 to 72 hours of age. TSB level usually rises in term infants to a peak level of 12 to 15 mg/dL by 3 days of age and then falls gradually.

‘Pathological jaundice’ is said to be present when TSB concentrations are not in ‘physiological jaundice’ range. Presence of one or more of the following conditions would qualify a neonate to have pathological jaundice.

- Visible jaundice in first 24 hours of life
- Yellow palms and soles at any time
- TSB concentration increasing more than 0.2 mg/dL/h or more than 5 mg/dL in 24 hours
- If TSB concentration is in >95th centile as per age-specific bilirubin nomogram
- Signs of acute bilirubin encephalopathy or kernicterus
- Direct bilirubin more than 1.5 to 2 mg/dL at any age
- Clinical jaundice persisting beyond 2 weeks in term and 3 weeks in preterm neonates.

Common causes of pathological jaundice include:

- Haemolysis: blood group incompatibility such as those due to ABO, Rh and minor groups, enzyme deficiencies such as Glucose-6-phosphate Dehydrogenase (G6PD), and autoimmune haemolytic anaemia
- Decreased conjugation due to liver enzyme immaturity
- Increased enterohepatic circulation due to lack of adequate enteral feeding that includes insufficient breastfeeding, or the infant not being fed because of illness, and gastrointestinal obstruction
- Extravasated blood: cephalohematoma, extensive bruising
- Conjugated hyperbillirubinaemia: hepatic causes: sepsis, hepatitis, TORCH infections ((T)oxoplasmosis, (O)ther Agents, (R)ubella, (C)ytomegalovirus, and (H)erpes Simplex), galactosaemia, idiopathic etc.; post-hepatic causes: biliary atresia, choledochal cyst.

6.9.3 Diagnostic tools

Perform visual assessment of jaundice: every 12 hours during initial 3 to 5 days of life, supported by Transcutaneous Bilirubinometry (TcB) if available.

Clinical clues for causes of jaundice.

Type of Jaundice	Timing	Signs and Symptoms
Physiological jaundice	Seen on the third or fourth day after birth and disappears within a week or 10 days (more prolonged in preterm and LBW babies)	The baby looks well otherwise and feeds well
Haemolytic disease of newborn	Appears within the first 24 hours of life	Jaundice progresses throughout, including palms and soles in short period
Serious bacterial infection	Related to onset of symptoms	Baby ill-looking, lethargic, and does not feed well
Neonatal hepatitis or biliary atresia	Jaundice appears later; continuous progression rather than resolution	Increased levels of conjugated bilirubin

If jaundice is visible, then supplement with total bilirubin estimation. Blood grouping and Rh typing of mother and baby, Coombs test, G6PD deficiency. In sick babies: conjugated bilirubin, Blood culture and sensitivity and urine culture and sensitivity.

6.9.4 Standard for management of neonatal unconjugated hyperbillirubinaemia

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Clinical assessment	Before discharge, every newborn needs to be assessed for jaundice clinically Visual estimation of jaundice is done using Kramer's rule if jaundice is present (see Annex XII) If appears high after clinical assessment, send blood for bilirubin estimation		
Phototherapy		In neonates who have photo-range bilirubin level, phototherapy is to be started (See Annex IX & XI) Discontinue phototherapy if two TSB values are below age-specific cut-offs. Measure TSB values 12 to 24 hours after stopping phototherapy to check for rebound	
Exchange transfusion		Double volume exchange transfusion is performed if the TSB levels reach age-specific cut-off for exchange transfusion or the infant shows signs of bilirubin encephalopathy irrespective of TSB levels (see Annex X & XI} In infants with Rh isoimmunisation exchange transfusion is done soon after birth if Cord bilirubin is 5 mg/dL or more, OR Cord Hb is 10 g/dL or less	
Intravenous immunoglobulin			Subsequent studies did not prove the efficacy of its use
IV hydration		In severe hyperbilirubinemia and	

		evidence of dehydration (e.g. excessive weight loss), extra IV fluid of 50 mL/kg of N/3 saline over 8 hours decreases the need for exchange transfusion	
Phenobarbitone			No benefit

Mild, physiological jaundice requires no treatment and is diagnosed by the timing and mildness of the jaundice.

For the purposes of clinical evaluation of jaundice, risk assessment and treatment decisions, neonates are divided into three groups: 1) term, >38 weeks; 2) late preterm, up to 37 weeks; 3) preterm, <35 weeks.

Risk factors for complication of jaundice include: presence of isoimmune haemolytic anaemia, G6PD deficiency, asphyxia, temperature instability, hypothermia, sepsis, significant lethargy, acidosis and hypoalbuminaemia. The AAP guideline is used for making decisions regarding phototherapy or exchange transfusion in these infants (see Annex IX, X, XI). Refer to Annex XI for making decisions regarding phototherapy or exchange transfusion in preterm babies <35 weeks.

Role of sunlight: Exposing the baby to sunlight does not help in treatment of jaundice and is associated with risk of sunburn and therefore should be avoided.

6.9.4.1 Phototherapy

Types of phototherapy lights include blue Compact Fluorescent Lamps (CFLs), high intensity Light-emitting Diodes (LEDs) and fibreoptic units with a minimum irradiance level of 30 $\mu W/cm^2/nm$ in the wavelength range of 460 to 490 nm.

6.9.4.2 Exchange transfusion:

Type and volume of blood for exchange transfusion:

- Rh isoimmunisation: Rh negative and blood group 'O' or that of baby suspended in AB plasma and cross-matched with baby's and mother's blood
- ABO incompatibility: Rh compatible and blood group 'O' suspended in AB plasma cross-matched with baby's and mother's blood
- Other conditions (G6PD deficiency, non-haemolytic, other isoimmune haemolytic jaundice): Baby's group and Rh type cross-matched with baby's and mother's blood
- Volume of blood: Twice the blood volume of baby (total volume: 160 to 180 mL/kg).

Treatment specific to the cause should be given if necessary.

6.10 Congenital anomalies and birth injuries

6.10.1 Overview

Congenital anomalies are also known as birth defects, congenital disorders or congenital malformations. Congenital anomalies can be defined as structural or functional anomalies (for example, metabolic disorders) that occur during intrauterine life and can be identified prenatally, at birth, or sometimes only

be later in infancy, e.g. hearing defects. Congenital anomalies are important causes of infant and childhood deaths, chronic illness and disability. Although approximately 50 per cent of all congenital anomalies cannot be linked to a specific cause, there are some known genetic, environmental and other causes or risk factors.

Preventive public health measures work to decrease the frequency of certain congenital anomalies through the removal of risk factors or the reinforcement of protective factors.

Birth injury is defined as the structural destruction or functional deterioration of the neonate's body due to a traumatic event at birth. Some of these injuries are avoidable when appropriate care is available, and others are part of the delivery process that can occur even when clinicians practise extreme caution (Akangire et al. 2016).

6.10.2 Aim

To identify congenital anomalies, give an appropriate plan of care for common congenital malformation and to refer to an appropriate centre where indicated. To provide counselling support and actions for the mother and family of a baby with a birth defect. And to recognise the predisposing factors and plan appropriately for the care of common birth injuries.

6.10.3 Standard for prevention of birth defects

Intervention	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Ensuring nutrition	Ensuring healthy diet for mothers and adolescent girls		
Supplementation and fortification	Adequate intake of folic acid or iodine can be achieved through fortification of staple foods	Supplementation of folic acid for all pregnant women	
Avoidance of harmful substances		Pregnant women and mothers should avoid tobacco and alcohol	
Diabetes control		Prior to and during pregnancy through counselling, weight management, diet and administration of insulin when required	
Vaccination		Against the rubella virus, for children and women	
Screening for infections and consideration of treatment	All pregnant women need to be screened, especially for rubella, varicella and syphilis		
Strengthening education	All health staff need to be oriented on birth defects and how to prevent them	Persons involved in promoting prevention of congenital anomalies need	

		to be educated	

6.10.4 Timely detection

Health care before and around the time of conception (preconception and peri-conception) includes basic reproductive health practices, as well as medical genetic screening and counselling.

Preconception screening: Includes obtaining family histories and carrier screening and is particularly valuable in families where consanguineous marriage is common.

Peri-conception screening: Screening for young or advanced maternal age, as well as screening for use of alcohol, tobacco or other risks. USG can be used to screen for Down's syndrome and major structural abnormalities during the first trimester and for severe foetal anomalies during the second trimester. Maternal blood can be screened for placental markers to aid in prediction of risk of chromosomal abnormalities or NTDs, or for free foetal DNA to screen for many chromosomal abnormalities. Diagnostic tests, such as chorionic villus sampling and amniocentesis, can be used to diagnose chromosomal abnormalities and infections in women at high risk.

Neonatal screening: Includes clinical examination; screening for disorders of the blood, metabolism and hormone production; and screening for deafness and heart defects.

6.10.5 Common Birth Defects

Externally visible major birth defects

- NTDs
- Oro-facial clefts: cleft lip/cleft palate
- Congenital Talipes Equinovarus (CTEV): club foot
- Limb reduction defects
- Hypospadias
- Exomphalos/omphalocele
- Gastroschisis
- Imperforate anus.

Others:

- Down's syndrome
- Congenital diaphragmatic hernia
- Congenital Heart Disease (CHD)
- Tracheoesophageal fistula
- Exstrophy of bladder
- Other defects.

6.10.6 Treatment and care

Paediatric surgery: For structural defects like cleft lip/palate, spina bifida, CTEV.

Early medical treatment: For children with functional problems such as thalassaemia (inherited recessive blood disorders), sickle cell disorders, and Congenital Hypothyroidism (CH, reduced function of the thyroid).

Management of newborn according to type of birth defect

Type of Defect		Management
	Skin tag/extra fingers or toes	Tie off skin tags or extra digits that do not have a bony Attachment.
	Club foot	Reassure the mother Refer to tertiary hospital within the first month of life for correction of deformity.
	Cleft lip/palate	If the baby is unable to breastfeed, teach the mother to feed with a spoon Provide emotional support to the mother Explain about importance of feeding for adequate weight gain prior to surgery at 3 months for cleft lip and at or before 1 year for cleft palate.
	Meningomyelocele	Cover defect with sterile moist warm gauze soaked in NS Organise transfer and referral of baby to tertiary hospital
	Omphalocele	Do not feed baby by mouth Establish IV line depending on the level of expertise. Cover with a sterile moist warm gauze soaked in NS Organise transfer and referral of the baby to a tertiary hospital
	Imperforate anus	Do not feed baby by mouth Insert nasogastric tube and ensure free drainage. Establish IV line, depending on the level of expertise. Organise transfer and referral of the baby to a tertiary hospital
	Tracheoesophageal fistula	Do not feed by mouth Establish IV line Nurse in a supine position with bed at an angle of 30–60° Frequent suction Start antibiotics if suspected aspiration Transfer for surgical care

6.10.7 Counselling and support for mother and family with a birth defect baby

- Explain gently to mother and family that the baby was born with a problem
- Point out normal features before discussing details of the abnormalities
- Explain that nobody is to blame for the abnormality
- Ask the mother and family if they would like to see and hold the baby
- If mother does not want to see her baby right away, do not force her
- When showing the baby, let the mother see the whole baby. Again, point out the baby's normal features first, and then discuss the abnormality
- Allow mother/family time alone with the baby, if possible and appropriate
- Explain prognosis and what can be done for the baby: if the baby has a correctable defect (cleft palate, club foot), explain this and reassure the mother and family.

6.10.8 Birth injuries

Usually, birth injuries are associated with history of difficult birth, breech delivery or use of forceps and vacuum. Newborns should be examined gently for injuries in such situations.

Risk Factors for Birth Trauma and Associated Injury (Akangire et al. 2016)

Risk Factors	Related Injuries
Forceps delivery	Facial nerve injuries
Vacuum extraction	Depressed skull fracture, sub-galeal haemorrhage
Forceps/vacuum/forceps + vacuum	Cephalohematoma, intracranial haemorrhage, shoulder dystocia, retinal haemorrhage
Breech presentation	Brachial plexus palsy, intracranial haemorrhage, gluteal lacerations, long bone fractures
Macrosomia	Shoulder dystocia, clavicle and rib fractures, cephalohematoma, caput succedaneum
Abnormal presentation (face, brow, transverse, compound)	Excessive bruising, retinal haemorrhage, lacerations
Prematurity	Bruising, intracranial and extracranial haemorrhage
Precipitous delivery	Bruising, intracranial and extracranial haemorrhage, retinal haemorrhage

Management of birth injury depends on the type and severity of the injury. Baby needs to be stabilised first before referring for specialised care.

6.11 Newborn triaging, stabilisation and referral

6.11.1 Overview

Triage is the process of deciding which patients should be treated first based on degree of sickness or severity of injury. Newborn triaging is sorting of a newborn to rapidly screen sick newborn for prioritising management.

Existing literature shows that delay in emergency treatment of sick neonates may increase the risk of mortality and long-term morbidities (Han YY et al. 2003; Mallick A et al. 2018). Babies who are received from outside are more vulnerable to death in comparison to inborn babies. These neonates might already be in a compromised state during referral, and further deteriorate in hospital while waiting in a queue. Many neonatal deaths can occur even after reaching the health facility if there is delay in initiating emergency treatment. This can be prevented by triaging of all newborn and identifying and managing the babies that require urgent treatment for life-threatening conditions.

6.11.2 Aim

To triage sick newborn. To prepare a management plan to stabilise sick newborn in an emergency. To counsel mother and family about baby's condition and management plan. And to stabilise and refer sick newborn to an appropriate place.

On arrival at the hospital, each neonate needs to be rapidly screened and categorised into one of the following groups: emergency, priority or non-urgent (See Annex XIII).

First, every neonate is assessed for emergency signs. Those with emergency signs require immediate emergency treatment. (National Neonatal Clinical Protocol 2016)

Newborns categorised as having emergency signs include:

- Hypothermia (temperature <36°C, 96.8°F)
- Apnoea or gasping respiration
- Severe respiratory distress (rate >70, severe retractions, grunt)
- Central cyanosis
- Shock (cold periphery, Capillary refill time (CRT) > 3 secs, weak and fast pulse)
- Coma, convulsions or encephalopathy.

Neonates with emergency signs are at high risk and require urgent intervention and emergency measures. After stabilisation, they are to be admitted to a Special Care Newborn Unit (SCNU) or NICU.

If emergency signs are not present, newborns are examined for priority signs. Those with priority signs are seriously ill and need immediate assessment and treatment.

Priority signs include:

- Cold stress (temperature 36.5–36°C, 97.7°F–96.8°F)
- Respiratory distress (rate>60, no retractions)
- Irritable/restless/jittery
- Abdominal distension
- Severe jaundice
- Severe pallor
- Bleeding from any site
- Major congenital malformation
- Weight less than 1.8 kg or more than 4 kg.

Neonates with no emergency or priority signs are treated as non-urgent cases; in such cases, proceed with further assessment and counselling.

The following conditions comes under non-urgent signs:

- Transitional stools
- Posseting
- Minor birth trauma
- Superficial infections
- Minor malformations
- Jaundice
- All cases not categorised as emergency/priority.

6.11.3 Standard for newborn stabilisation

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended

Rewarming of hypothermic babies (temperature <36°C, 96.8°F)	Make sure neonate is warm	If baby is hypothermic (temperature <36°C, 96.8°F): Rapidly re-warm (severe hypothermia, <32ºC, 89.6°F) up to 34°C, 95°F and then re-warm gradually Maintain blood glucose	Use of hot water bottles for rewarming
Respiratory support Maintain the airway: assist breathing	Make sure neonate is warm	If baby is: Not breathing or gasping Grunting; or has Central cyanosis or Severe respiratory distress Respiratory rate more than 70/minute Severe lower chest in-drawing Apneic spells Then manage airway: Place the child in sniffing position: place a shoulder roll under the shoulder to position the child Clear the airway of secretions by suctioning first the mouth first and then the nose Provide tactile stimulation if apnoeic If still apnoeic or gasping, provide positive-pressure ventilation (follow resuscitation protocol Annex VIII) Give oxygen	
Circulation	Make sure neonate is warm	If baby is in shock or has cold extremities, with: Capillary refill longer than 3 seconds, and weak and fast pulse (>160 BPM), then: Give oxygen Insert IV line and send blood for investigation, e.g. glucose, septic screening, culture. Give 10 mL/kg NS over 30 minutes Repeat if features of shock persist Initiate dopamine in a dose of 5–20 mcg/kg/min and then dobutamine at 5–20 mcg/kg/min if the neonate remains in shock despite fluid boluses Proceed immediately to full	

		assessment and treatment.	
Convulsions	Make sure neonate is warm	If baby is convulsing: Manage airway Check and correct hypoglycaemia/hypocalcaemia Give anticonvulsant: Inj Phenobarbitone 20 mg/kg over 20 minutes	

Once neonate is triaged and stabilised, decide whether baby needs admission to SNCU or NICU or requires referral to tertiary care facility.

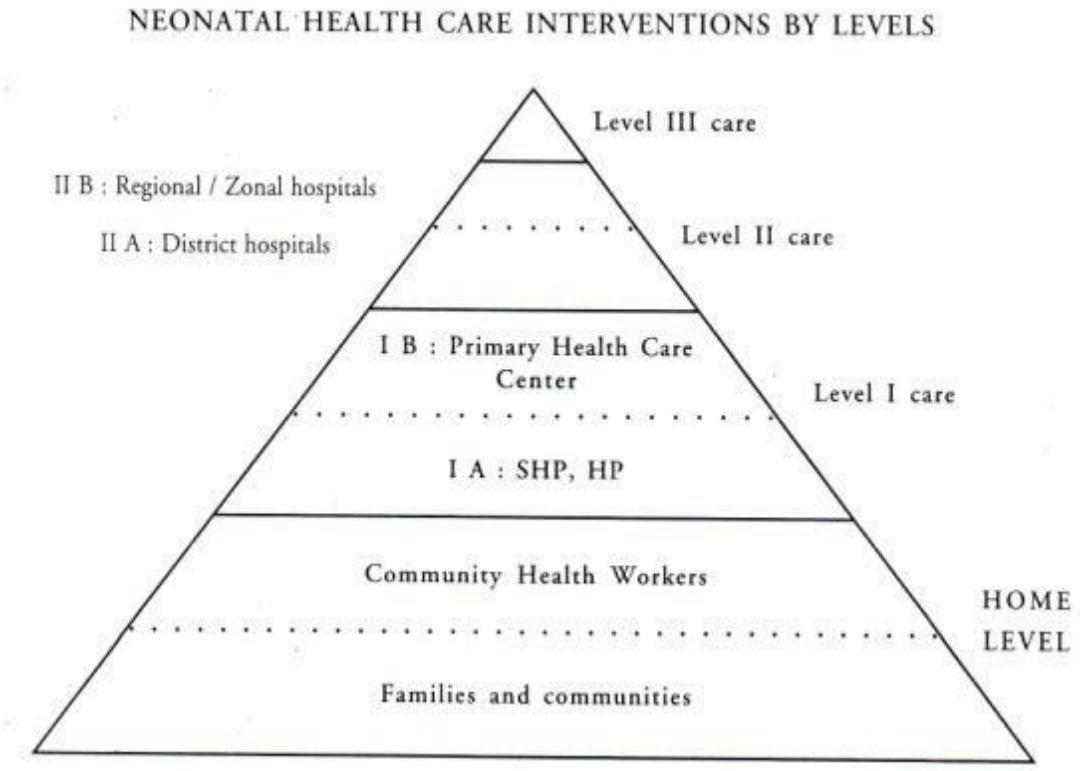
6.11.4 Standard for newborn referral when required

Interventions	Recommendations		
	Recommended for All	Context-specific	Not Recommended
Counsel mother and family	Discuss referral reason Discuss caring for baby during referral Be gentle and patient in answering all questions Remind them to plan about transportation and funds		
Stabilise the newborn before referral	Give any emergency treatment needed If the baby is alert, encourage breast milk by breastfeeding or the cup Keep the baby warm (skin-to-skin or close to the mother)	If the infection is serious, give the first dose of antibiotics before referral	
Arrange transport and notify referral centre	Send the mother and the baby together so that breastfeeding will continue Encourage only 1 or 2 support people to go (father and other friend or family member)	If possible, notify the referral centre about baby's condition and the estimated time of arrival	
Caring during transport	Keep the baby warm If the baby is alert, continue to give breast milk If it takes long time to reach the	Health worker to accompany, if possible Extreme preterm and ELBW should be transferred in transfer	

	higher centre, provide the doses of medicine for the road with careful instructions	incubator If route is long, stop during the transfer so that drip/medicine adjustment can be performed	
Document referral	Complete and send the referral note (Annex XIV) (examination findings, referral reason, treatments given, date and time, your name)	Send mother's antenatal and labour/delivery records, and baby's records, if available	
If referral delayed, impossible or family refuses	Continue to support the family Continue any treatment available	Expert opinion/advice can be sought by telephone or email (telemedicine)	

6.11.5 Neonatal health interventions by level

To improve health service delivery, The National Neonatal Health Strategy 2004 envisioned the implementation of specific levels of neonatal health care intervention.



NENAP proposed IMNCI and newborn services be delivered at different levels by different cadres of health workers. These services are detailed below:

Level	Service Categories	Programme	Cadre
Community (up to ward-level community)	Counsel the mother and caregiver on essential care for newborn, danger signs for newborn and postpartum women and place for management of sick newborn and women Provide CLX gel for pregnant women and counsel about its use Counsel about the importance of exclusive breastfeeding, supplementary foods and growth monitoring Assess babies with danger signs Provide zinc and Oral Rehydration Solution (ORS) if the baby has diarrhoea; refer the baby to health facility for further management if the baby has dehydration	Community-based Integrated Management of Neonatal and Childhood Illness (CB-IMNCI)	FCHVs (would be supported by local volunteers, social workers)

	and dysentery Refer the baby to health facility for treatment if the baby has pneumonia, ear infection, fever or any danger signs		
Primary Health Care Outreach (PHC/ORC)	Counsel the mother and caregiver on essential care for newborn, danger signs for newborn and postpartum women and place for management of sick newborn and women Provide CLX gel for application to baby's umbilical stump and counsel about its use Counsel about the importance of exclusive breastfeeding, supplementary foods and growth monitoring Assess the babies for danger signs – refer babies as per need Provide zinc and ORS if the baby has diarrhoea/dehydration, manage dysentery and provide vitamin A for chronic diarrhoea Provide amoxicillin if the baby has pneumonia Refer the baby to health facility for further management if the baby has severe diarrhoea and severe pneumonia Treat/manage child with measles and ear infection Refer baby with severe malnutrition	CB-IMNCI	Health Worker (Auxiliary Health Worker (AHW) and Auxiliary Nurse Midwife (ANM))
Community Health Unit (extended health workers)	Same as PHC/ORC with the additional facilities of: management of severe dehydration with IV fluid in severe diarrhoea	CB-IMNCI	Health workers (Health Assistant (HA), AHW and ANM)
Urban Health Clinic	Same services provided by Community Health Unit	CB-IMNCI	Health workers (HA, AHW and ANM)
Health Post without Birthing Centre	Same services provided by Community Health Unit	CB-IMNCI	Health workers (HA, AHW and ANM)
Health Post with Birthing Centre	Same services provided by Community Health Unit with the additional services of: Newborn Care Corner (in labour room): immediate newborn care; resuscitation for non-breathing babies; early initiation of breastfeeding; weighing the newborn; treatment and management of newborn	SBA	HA, AHW and SBA (ANM)

	infection; and refer as per need KMC counselling, skin-to-skin, feeding support		
Birthing Centre	Immediate Newborn Care Resuscitation for non-breathing babies Early initiation of breastfeeding Weighing the newborn Treat and manage newborn infection and Refer as per need KMC counseling, skin-to-skin contact, feeding support		HA, AHW and SBA (ANM)
Primary Health Care Centre <5 beds	Newborn Care Corner (in operating theatre and labour room): immediate newborn care; resuscitation for non-breathing babies; early initiation of breastfeeding; weighing the newborn; referral if the baby is sick KMC unit: KMC (skin-to-skin contact); on-demand breastfeeding; early discharge for babies weighing 1000–1800 g who are stable; referral if the baby is unstable Laboratory services: TSB, HbsAg/HIV test, blood grouping, total blood count, blood glucose and urine albumin for pregnant women	SBA	Medical Officer, HA, Staff Nurse, AHW, ANM and Lab Assistant
Sub-district Hospitals <15 beds	Free treatment for sick newborns Newborn Care Corner (in operating theatre and labour room): immediate newborn care; resuscitation for non-breathing babies; early initiation of breastfeeding; weighing the newborn; referral if the baby is sick KMC unit: KMC (skin-to-skin contact; on-demand breastfeeding; early discharge) for babies weighing 1000–1800 g who are stable. referral if the baby is unstable SNCU: Feeding support, warmth, IV fluids, infection management, safe oxygen, phototherapy, referral of babies of birth weight >1.5 kg, follow-up and management of sick newborns and referral of babies <1.5 kg who require CPAP and ventilation services SNCU: Laboratory services, plus: blood culture, renal function test and urine	SBA SNCU package	Medical Officer, HA, Staff Nurse, AHW, ANM and Lab Assistant

	culture		
District Hospital <25 beds	Free treatment for sick newborns Newborn Care Corner (in operating theatre and labour room): Immediate Newborn Care Resuscitation for non-breathing babies; Early initiation of breastfeeding; Weighing the newborn; Referral if the baby is sick KMC unit: KMC (skin-to-skin contact; on-demand breastfeeding; early discharge) for babies weighing 1000–1800 g who are stable. Referral if the baby is unstable Special Newborn Care Unit: Management of HIE, management of hyperbilirubinaemia, management of MAS, management of newborn sepsis, management of RDS, management of hypoglycaemia, management of stillbirth/VLBW babies without ventilation support Laboratory services, plus: X-ray and USG	SBA SNCU package	Paediatrician, Medical Officer, HA, Staff Nurse, AHW, ANM and Lab Technician
Regional and Zonal Hospitals 25–200 beds	Free treatment for sick newborns Newborn Care Corner (in operating theatre and labour room): Immediate newborn care resuscitation for non-breathing babies; early initiation of breastfeeding; weighing the newborn; referral if the baby is sick KMC unit: KMC (skin-to-skin contact; on-demand breastfeeding; early discharge) for babies weighing 1000–1800 gram who are stable. Referral if the baby is unstable SNCU/NICU: Management of HIE, management of hyperbilirubinaemia, management of MAS, management of newborn sepsis, management of RDS, management of hypoglycaemia, management of stillbirth/VLBW babies without ventilation support Laboratory services, plus LP	SBA Special Newborn Care Unit package	Paediatrician, Medical Officer, HA, Staff Nurse, AHW, ANM and Lab Technologist and Lab Technician
Speciality and Academic Hospitals >200 beds	Newborn Care Corner (in operating theatre and labour room): immediate newborn care resuscitation for non-breathing babies; early initiation of breastfeeding; weighing the newborn; referral if the baby is sick	SBA	Paediatrician, Medical Officer, HA, Staff Nurse, AHW, ANM and Lab Technologist and Lab Technician

	KMC unit: KMC (skin-to-skin contact; on-demand breastfeeding; early discharge) for babies weighing 1000–1800 gram who are stable. Referral if the baby is unstable NICU: Management HIE, management of hyperbilirubinaemia, management of MAS, management of newborn sepsis, management of RDS, management of hypoglycaemia, management of stillbirth/VLBW babies with ventilation support Laboratory services (as for regional and zonal hospital)	SNCU package	

The recommended different levels of newborn care according to the level of complexity of care provided in the new Federal system are presented below.

Home/Community level:

Level I: Health Post, Ward clinic, Birthing Centre, with newborn care corner.

Level I has capability to: provide neonatal resuscitation at birth; evaluate and provide PNC for well neonates weighing more than 1800 g or with gestational maturity of 34 weeks, including KMC for LBW babies; Examine and manage common newborn problems, recognition of danger signs and appropriate referral of neonate.

Level II: Special Care Baby Unit in minimum 15-bed Hospital in local level, municipality and Metropolitan city

Level II has capability to manage neonates weighing 1500–1800 g or with gestational maturity of 32–34 weeks and also moderately sick newborn, with: management of HIE, management of hyperbilirubinaemia, management of MAS, management of newborn sepsis, management of RDS, management of hypoglycaemia, and management of stillbirth/VLBW babies without ventilation support Level II also has KMC beds.

Level III A: NICU – Province Level

Level III A NICU has capability to manage neonates weighing between 1000–1500 g or with gestational maturity of 28–32 weeks, and also critically ill newborns requiring CPAP support, life support with conventional mechanical ventilator or exchange transfusion, and to manage sick VLBW babies.

Level III B: NICU – Federal level

Level III B NICU has capability to manage neonates weighing less than 1000 g or with gestational maturity <28 weeks and also critically ill newborns requiring advanced ventilators (e.g. high-frequency ventilator), and to manage ELBW babies requiring surfactant therapy or advanced imaging facilities.

Level III C: NICU- Central level

Level III C NICU (sometimes called Level IV NICU) has the capabilities of a level IIIB NICU and ~~a~~lso has the capability to care for babies at the lowest ages of viability and babies requiring wide variety of surgeries,

including heart surgery requiring bypass and may also provide extra corporeal membrane oxygenation (ECMO).

6.12 Newborn screening

Newborn screening is the practice of testing all babies in their first days of life for certain disorders and conditions that can hinder their normal development. Some babies are born with some conditions that might not be clinically evident in the newborn period but are treatable. There is not yet an official policy for newborn screening.

Newborn screening guidelines are intended to screen infants for disorders that are serious or life-threatening, treatable, and have well-understood stages of disease. Screening tests thus have the potential both to prevent severe disabilities and to save lives. This will provide immeasurable benefits to patients, parents and society as people can be productive members of society because of early diagnosis and treatment through newborn screening.

Newborn screening is an integral public health programme, in which newborns can be screened for more than 50 potential disorders. Most countries opt to screen depending on the incidence/prevalence of specific disorders, natural history, phenotypic spectrum, and optimal treatment algorithms in their countries.

Many metabolic disorders have been reported in Nepal individually, spanning carbohydrate and lipid metabolism, lysosomal storage disease, CH, and haemoglobinopathies (Karki et al. 2016, Pandey et al. 2019). Though we have few scattered data on newborn screening, there is an urgent need to implement a Newborn Screening Programme in Nepal.

6.12.1 Aim

To identify infants at risk for these conditions early enough to confirm diagnosis and provide intervention that will alter the clinical course of the disease and prevent or ameliorate the clinical manifestations.

To begin with, Nepal can start with few important screening tests in newborns to decrease mortality and morbidity and to improve the quality of their survival.

This can be under two domains:

- Metabolic/endocrinal, including CH, Congenital Adrenal Hyperplasia (CAH) and haemoglobinopathies by DBS
- Functional, including Critical Congenital Heart Disease (CCHD) and hearing test.

6.12.2 Endocrine system

The most commonly included disorders of the endocrine system are CH and CAH. Testing for both disorders can be done using blood samples collected on the standard newborn screening card.

6.12.3 Haemoglobinopathies

Any condition that results in the production of abnormal haemoglobin is included under the broad category of haemoglobinopathies.

Early identification of individuals with sickle cell anaemia and other haemoglobinopathies (thalassaemia) allows treatment to be initiated in a timely fashion.

6.12.4 Hearing loss

Hearing loss ranks as the fourth leading cause of years lived with disability, and 80 per cent of the estimated 1.1 billion people living with hearing loss globally reside in LMICs. Most neonatal hearing loss is sensorineural (Global Burden of Disease Study 2013).

Undiagnosed hearing loss in a child can have serious effects on many developmental areas, including language, social interactions, emotions, cognitive ability, academic performance and vocational skills, any combination of which can have negative impacts on the quality of life. The serious impacts of a late diagnosis, combined with the high incidence (estimated at 1–3 per 1000 live births, and as high as 4 per cent for NICU patients) have been the driving forces behind screening programmes designed to identify infants with hearing loss as early as possible. Early identification allows these patients and their families to access the necessary resources to help them maximise their developmental outcomes. Critical period for identification and remediation of hearing loss is before the age of 6 months.

Newborn hearing testing is done at the bedside using transiently evoked OAE, or AABR, or a combination of both techniques. A two-step screening procedure can be implemented in Nepal as a cost-effective and accurate approach. This includes the faster and less expensive OAE as the first test in newborns with no risk factors, followed by AABR in newborns who do not pass the OAE. The AABR can be recommended in infants with the following risk factors:

- Family history of permanent hearing loss
- Craniofacial abnormalities, including those involving the external ear
- Congenital infections, including bacterial meningitis, cytomegalovirus, toxoplasmosis, rubella, herpes and syphilis
- Physical findings consistent with an underlying syndrome associated with hearing loss
- NICU stay >2 days, or with any of the following regardless of the duration of stay: ECMO; assisted ventilation; ototoxic drug use; hyperbilirubinemia requiring exchange transfusion.

6.12.5 CCHDs

Newborn screening for CCHDs involves a simple bedside test called pulse oximetry. This test estimates the amount of oxygen in a baby's blood. Low levels of oxygen in the blood can be a sign of a CCHD. The test is done using a machine called a pulse oximeter, with sensors placed on the baby's skin. Pulse oximetry is a bedside screening test for CCHD done at 24 to 48 hours after birth. However, not all heart problems can be detected by this method, which relies only on blood oxygen levels. When a baby tests positive, urgent subsequent examination, such as echocardiography, is done to determine the cause of low oxygen levels. Babies diagnosed with CCHD are then referred to cardiologists for further management.

6.12.6 Diagnostic tools

6.12.6.1 Blood sample collection

Newborn screening tests for endocrine disorders and haemoglobinopathies are most commonly done from whole blood samples by heel prick, collected on specially designed filter paper, originally designed by Robert Guthrie. The filter paper is often attached to a form containing required information about the infant and parents. Newborn screening samples are collected from the infant between 24 hours and 7 days after birth, and it is recommended that the infant has fed at least once.

6.12.6.2 Screening CCHD

Screening done at 24 to 48 hours after birth or before discharge, with pulse oximetry, SpO2 of right upper limb and either of the feet is taken for interpretation; if abnormal (screening fails), the baby is referred for echocardiography (Ewer et al. 2016, Kemper et al. 2011). (See Annex XV – Algorithm.)

6.12.6.3 Hearing assessment by OAE

A miniature earphone and microphone are placed in the ear, sounds are played and a response is measured. If a baby hears normally, an echo is reflected back into the ear canal and is measured by the microphone. When a baby has a hearing loss, no echo or a reduced echo can be measured on the OAE test

Another method is AABR: this testing is the best test available for newborns and infants up to 6 months of age that can provide information about the softest level of sound the ear can hear. Sounds are played to the baby's ears and band-aid-like electrodes are placed on the baby's head to detect responses. Sounds are presented to the ears using small earphones. The electrodes pick up responses from the hearing nerve and a computer measures the responses to identify babies who have a hearing loss.

Hearing screening is best performed in infants older than 24 hours before discharge, with a minimum 34 weeks' corrected gestational age (Patel et al. 2011). The best time for hearing screening is before 1 month; if positive, hearing assessment will be performed by 3 months and interventions commenced before 6 months of age.

Chapter 7: Anaesthetic care

7.1 Background

After the adoption of the UN MDGs, maternal survival improved significantly from 1990 to 2015, mostly in Upper-Middle Income Countries (UMICs) and High-income Countries (HICs (Alkema et al. 2016). But in Nepal, maternal mortality and infant mortality still remain high; until recently, maternal mortality due to anaesthesia was also quite high. Improvement in the basic understanding of physiological changes in pregnant patients, availability of qualified and trained anaesthesiologists and availability of monitoring equipment and drugs have led to drastic improvement in the rate of mortality due to anaesthesia.

The standards and care described in this chapter are for hospitals with trained anaesthesiologists. For all hospitals providing obstetric care, certain optimal anaesthesia goals should be sought.

7.2 Aims

To standardise and enhance the quality of anaesthesia care for obstetric patients; to reduce the incidence and severity of anaesthesia-related complications, and to increase patient satisfaction.

7.3 Prerequisites

7.3.1 Level of health care facility

Normal delivery and uterine evacuation can be performed in hospitals with at least Level-I facilities. CS should be carried out in hospitals with at least Level-II facilities (Gelb et al. 2018) or in Comprehensive Emergency Obstetric and Newborn Care (CEONC) sites with the facilities to carry out general anaesthesia.

7.3.2 Service provider

- Anaesthesiologist with Master's Degree or Diploma in Anaesthesia
- Health workers (Staff Nurse/HA) trained in Anaesthesia for at least 1 year under the supervision of an anaesthesiologist or Medical Doctor in General Practice (MDGP) at government-designated Comprehensive Emergency Obstetric Care (CEOC) sites only.

7.3.3 Team Approach

Good interpersonal relations between obstetricians and anaesthesiologists are important. Joint meetings between the two departments should be encouraged. Anaesthesiologists should recognise the special needs and concerns of the obstetrician and obstetricians should recognise the anaesthesiologist as a consultant in the management of pain and life-support measures. Both should recognise the need to provide high-quality care for all patients (see Annex I).

7.3.4 Equipment and supplies

Appropriate facilities and equipment should be present wherever anaesthesia and recovery are undertaken.

These should include:

- Dedicated space for pre-operative assessment of a patient
- Operating room with adequate illumination for patients, machines, and monitoring equipment that includes battery-powered illuminating system or process
- Work surface and storage for equipment and medications

- Tilting operating table
- A reliable source of oxygen (e.g. pipeline or oxygen concentrator) and at least one full E-cylinder for back-up
- Sufficient space to accommodate monitoring devices, which should include pulse oximeter, electrocardiogram, temperature, non-invasive blood pressure monitor with appropriate-sized cuffs and, if possible, carbon dioxide detector with continuous waveform capnography
- An adequate source of suction
- Self-inflating bags, if used, should be capable of delivering positive-pressure ventilation with at least 90 per cent oxygen concentration.
- Bain's breathing circuit
- Complete anaesthesia machines with oxygen, air and nitrous gas flow, and vaporisers (TEC 4).
- An adequate and reliable waste anaesthetic scavenging system (if possible)
- Oropharyngeal airways, different sizes of facemask, laryngoscope with appropriate-sized laryngoscope blades, appropriate-sized ETTs, Laryngeal Mask Airways (LMAs)
- Intubation aids (e.g., Magill forceps, bougie, stylets, tube introducers)
- Sufficient electrical outlets labelled and properly grounded and connected to emergency power supplies
- Emergency cart available with defibrillator, necessary drugs, and other Cardiopulmonary Resuscitation (CPR) equipment
- Reliable means of two-way communication to the necessary personnel in other facility locations
- Appropriate testing of equipment as per manufacturer specifications
- Sufficient back-up power to last at least 120 minutes
- Appropriately sized medical equipment for neonatal resuscitation.

7.4 Components of care

Table: Anaesthetic Implications of the Physiological Changes in Late Pregnancy

System	Clinical Implication
Circulatory System: Blood volume – increased cardiac output Cardiac size: Enlarged due to hypertrophy and dilatation BP: Usually normal or a little low. Aortocaval compression: both the inferior vena cava and lower aorta are compressed by the gravid uterus when laid supine Blood constituents: Leucocytosis, hypercoagulable state, and fibrinolytic activity are reduced Venous distensibility: 15% risk of vascular damage, decrease extradural and intradural space	Strain may precipitate pulmonary oedema. Low cardiac reserve Aortocaval compression and its sequel Thromboembolism Requires less volume of spinal anaesthetic agent
Respiratory System: Respiratory tract-capillary engorgement causes swelling of mucosa of nose, oropharynx, larynx, and trachea Ventilation: Increase in minute ventilation lung volume – total lung capacity is decreased slightly with	Hastens the rapidity of induction with inhalation agents Accelerates the fall in arterial oxygen tension even with short apnoea

20% reduction of expiratory reserve volume, residual volume and functional residual volume Respiratory gases: Oxygen consumption is increased resulting in cardiac and respiratory overwork	Anticipate difficulty in airway
Gastrointestinal system: Increase in intragastric pressure; incompetent gastro-oesophageal junction; gastric emptying time is delayed. Gastric volume is increased and PH is reduced	Possibility of regurgitation Possibility of acid aspiration and pneumonitis

7.4.1 Pre-anaesthetic care

One anaesthesia provider should be dedicated to each patient and be present in the anaesthetising location throughout each anaesthetic procedure (general anaesthesia, moderate or deep sedation, regional anaesthesia). A trained assistant (anaesthesia assistant preferable or operating room nurse or technician) should be available to assist the anaesthesia provider.

Anaesthesia provider is responsible for determining the medical status of a patient, for appropriate development and documentation of anaesthesia care plan, and for making sure that the patient or responsible adult is informed about the anaesthesia care plan.

7.4.1.1 Anaesthesia care plan

The anaesthesia care plan is based on:

- A review of the medical records available
- Medical history
- Prior anaesthetic experiences
- Drug therapies
- Medical examination and assessment of all physical conditions that might affect decisions about perioperative risk management
- A review of medical tests and consultations that might reflect on the anaesthesia administration
- A determination related to appropriate perioperative medications needed for the conduct of anaesthesia
- Providing appropriate preoperative instructions and other preparation as needed.

7.4.2 Peri-anaesthetic care

Peri-anaesthetic evaluation and preparation for CS include focused history and a physical examination, an intrapartum platelet count, a blood type and screen, and peri-anaesthetic recording of FHR.

7.4.2.1 Focused history and a physical examination

The consulting anaesthesiologist should assess:

- Maternal health history
- Anaesthesia-related history
- A relevant obstetric history specifying the presence or absence of complications, stage of pregnancy or labour
- Time of last solid and liquid food intake
- The airway

- A baseline BP and other vital signs (temperature, respiratory rate and pulse)
- Cardiovascular and respiratory system examination
- Good peripheral vein
- The back (if a regional anaesthetic is planned).

Recognition of significant anaesthetic risk factors should encourage consultation with the obstetrician.

7.4.2.2 An intrapartum platelet count

In cases of PIH, platelet count may indicate the severity of a patient's PIH, and help to plan and reduce the risk of anaesthesia-related complications.

7.4.2.3 Blood type and screen

A routine blood cross-match is not necessary for healthy and uncomplicated parturient for vaginal or assisted delivery. Anaesthesiologist's decision to order or require a blood type and screen or cross-match should be individualised and based on anticipated haemorrhagic complications (e.g. placenta previa in a patient with previous uterine surgery).

7.4.2.4 Perioperative recording of FHR

FHR should be monitored by a qualified individual before and after administration of regional analgesia for labour as well as CS as FHS patterns may change after administration of neuraxial analgesia and anaesthesia.

7.4.2.5 WHO safe surgery checklist

WHO surgical safety checklist for maternity cases should be completed during three vital phases of care: prior to the induction of anaesthesia, prior to skin incision and before the team leaves the operating room. (Annex V)

Table: Standard for peri-anaesthetic care

Intervention	Recommendation		
	Recommended for All	Context-specific	Not Recommended
Focused history	To all patient		
Physical examination	To all patient		
Intrapartum platelet count		Based on maternal history, anticipated haemorrhagic complications (e.g. placenta accrete, placenta previa and previous uterine surgery), Local institutional policies	
Blood type and screen		Maternal history, anticipated haemorrhagic complications and local institutional policies	
Peri-anaesthetic recording FHR patterns	To all patient		

WHO safe surgery checklist	To all patient		

7.4.2.6 Aspiration prevention in the Obstetric Patient

Due to physiological changes in the gastrointestinal system, all pregnant women have possibility of regurgitation, which ultimately leads to possibility of acid aspiration and pneumonitis. Measures to decrease the aspiration risk must therefore be taken. Aspiration prevention includes timely intake of clear liquids, solids and Proton Pump Inhibitors (PPIs) or H2-receptor antagonists, and metoclopramide.

Clear Liquids: The oral intake of modest amounts of clear liquids may be allowed for uncomplicated labouring patients. Examples of clear liquids include, but are not limited to, water and fruit juices without pulp, carbonated beverages, clear tea, and black coffee.

Solids: The fasting period for solids of six to eight hours is preferable for uncomplicated parturients undergoing elective CS.

Table: Standard for aspiration prevention in the obstetric patient

Intervention	Recommendation		
	Recommended for All	Context-specific	Not Recommended
Clear liquid	Moderate amounts of clear liquids may be allowed for uncomplicated labouring patients	Uncomplicated patient undergoing elective surgery (e.g. scheduled CS or postpartum tubal ligation) may have moderate amounts of clear liquids up to 2 hours before induction of anaesthesia	
Solids	The patient undergoing elective surgery (e.g. scheduled CS or postpartum tubal ligation) should undergo a fasting period for solids of 6 to 8 hours depending on the type of food ingested (e.g. fat content)	Labouring patients with additional risk factors for aspiration (e.g. morbid obesity, DM, and difficult airway) or patients at increased risk for operative delivery (e.g. no reassuring FHR pattern) may have further restrictions of oral intake	
PPI/H2-receptor antagonists, and metoclopramide	Before surgical procedures (e.g., CS or postpartum tubal ligation), consider the timely administration of PPI/H2-receptor antagonists and/or metoclopramide for aspiration prophylaxis		H/O allergy

7.4.2.7 Anaesthesia monitoring

Monitoring is applicable to all anaesthetic procedure, though in emergency circumstances, life support measures take preference. Continuous monitoring can minimise the risk of unfavourable outcome. Not

all monitoring equipment listed might be available. Hence the anaesthesiologist should be highly vigilant.

Patient monitoring during anaesthesia will consist of:

Clinical observation:

- Continuous clinical observation (e.g. a finger on the pulse, direct observation of the patient, precordial stethoscope) is an essential component of monitoring an anaesthetised patient

Oxygenation assessed by:

- O_2 analyser if an anaesthesia machine is used during general anaesthesia (should also include a working alarm for low O_2 concentration) (if available)
- Pulse oximeter
- Assessment of patient colour/blood colour during surgery

Ventilation as noted by:

- Chest excursion and feeling of expired air by palm
- Movement of bag reservoir
- Auscultation of breath sounds
- Monitoring of end tidal expired CO_2 including volume by capnography is ideal
- Proper position of the ETT or LMA
- The mechanical ventilator should have a continuous use device which indicates a disconnection via an audible signal
- Clinical signs are evaluated by continuous observation during regional/sedation analgesia

Circulation monitored by:

- Continuous ECG during procedure
- Arterial blood pressure every 5 minutes (minimum) – Non-invasive Blood Pressure (NIBP)
- Heart rate (continuous monitoring)
- Pulse oximeter
- Heart auscultation
- Intra-arterial pressure – if needed and available
- Urine output: ≥ 1 mL/kg/h

Temperature:

- Should be monitored when clinically significant changes in body temperature are intended, suspected or anticipated.

7.4.3 Post-Anaesthetic Care

All patients who have received general anaesthesia, regional anaesthesia, or sedation/analgesia must be managed in a Post-anaesthetic Care Unit (PACU).

7.4.4 Record keeping

A record including details of the preoperative assessment, the anaesthetic plan, and intra- and postoperative management, including any complications that occurred during each anaesthetic procedure, should be made and preserved with the patient's medical record.

7.4.5 Monitoring during transportation to the post-operative recovery area

After completion of any procedure and when patient is awake (in case of general anaesthesia or when sedation is used) and haemodynamic status is also stable, patients need to be transferred to the post-operative recovery area accompanied by the responsible anaesthesia provider, until the patient is handed over to a responsible person in the recovery room. A brief summary of the case and proper instructions should be explained to the person in charge. Continuous clinical observation is a must during the transfer and pulse oximetry should be employed if needed.

7.4.6 Monitoring in the post-operative recovery area

Provision for immediate management of patients recovering from effects of anaesthesia should be in place in the post-operative recovery area: every patient shall have continuous monitoring of at least ECG, pulse oximetry, NIBP and pain score, using appropriate pain scale.

7.4.7 Management of Complications

Management of haemorrhagic emergencies

Institutions providing obstetric care should have resources available to manage haemorrhagic emergencies to reduce maternal, foetal and neonatal complications. In an emergency, the use of type-specific or O negative blood is acceptable in the parturient. In a true emergency, when a woman's blood type is not previously known, type O blood (negative or positive) can be life-saving.

Airway emergencies

Labour and delivery units should have equipment and personnel readily available to manage airway emergencies. Basic airway management equipment should be immediately available during the initial provision of regional analgesia. In addition, portable equipment for difficult airway management should be readily available in the operative area of labour and delivery units.

CPR

Basic and advanced life-support equipment should be immediately available in the operative area of labour and delivery units. Standard required equipment is listed in section 7.3.4. If cardiac arrest occurs during labour and delivery, standard resuscitative measures and procedures, including Left Uterine Displacement (LUD) should be taken. In cases of cardiac arrest, follow the American Heart Association recommendation (see Annex XX and XXI).

The decision to perform a perimortem CS should be made rapidly, with delivery effected within 4 to 5 minutes of the arrest.

7.5 Anaesthesia and labour

The role of anaesthesiologists in obstetric cases has expanded: they are not limited to providing anaesthesia during CS and can play a vital role in providing analgesia to mothers during labour. Labour epidural is taken as the standard technique for labour analgesia. It does not increase CS rates but marginally prolongs the second stage of labour and increases assisted vaginal delivery rates (Gaiser et al. 2005). Labour analgesia services can be provided only if there is adequate manpower providing 24-hour anaesthesia services.

Specific circumstances when labour epidurals may be beneficial (Obstetric Anaesthetists' Association (OAA) 2016):

- Pre-eclampsia (without severe thrombocytopenia or coagulopathy)
- High BMI
- Anticipated difficult airway or other risk factors for general anaesthetic
- High risk for assisted vaginal delivery, e.g. breech or multiple gestation
- Trial of labour after previous CS
- Maternal cardiovascular, cerebrovascular or respiratory disease
- Spinal disorders when 'urgent' neuraxial anaesthesia placement may be difficult, for example with scoliosis.

7.5.1 Criteria for initiation of epidural analgesia

There are certain criteria to be fulfilled before providing epidural analgesia to the patient on labour:

- No foetal distress (an assessment of foetal well-being should be performed in consultation with obstetrician)
- Established labour (the patient is in labour and the obstetrician is committed in delivering her)
- Absence of coagulopathy.

Lumbar epidural analgesia is generally administered only when labour is well established. It may, however, be advantageous to place an epidural catheter early when the patient is comfortable and can be positioned easily. Patient request alone is a good indication to provide epidural.

7.5.2 Preparation

- Detailed pre-anaesthetic evaluation, which includes an assessment of patient's medical, surgical and anaesthetic history
- Blood investigations should include at least CBC, blood sugar, Prothrombin Time (PT), international normalized ratio (INR), HIV, HBsAg and HCV
- Consent from patient and patient's visitor and risks of regional analgesia should be discussed
- Appropriate equipment and supplies for resuscitation should be checked and made immediately available during administration of regional analgesia.

7.5.3 Minimum resuscitation equipment and medications for provision of safe LEA

(Kodali et al. 2014)

- Supplemental oxygen source
- Suction supply and related equipment
- Self-inflating bag and mask, able to provide positive-pressure ventilation
- Airway equipment (for maintaining airway patency and for intubation)
- Oropharyngeal airways: Size 3 and 4 face mask; Bain circuit; laryngoscope with different blades; Endotracheal Tube (ETT) sizes 6–7 mm internal diametre; laryngeal mask airway *(*LMA) size 3, 4; i-gel size 3, 4)
- Monitors: All patients should have CTG, NIBP monitoring, ECG, heart rate and SpO2 monitoring prior to performance of the block
- Intravenous catheter (in situ), with fluids, tubing, syringes, and needles available
- Drugs: Thiopentone, suxamethonium, atropine, mephentermine, adrenaline, ephedrine, phenylephrine, calcium gluconate, sodium bicarbonate, naloxone, 20% lipid emulsion (intralipid), fentanyl, 0.5% plain bupivacaine, 0.5% or 0.75% ropivacaine, 2% lidocaine with adrenaline 1:200,000, 2% lidocaine
- Defibrillator or "crash cart" (must be immediately available).

7.5.4 Equipments

- Sponge holder, 2 galipots, 3 cotton ball, 4 pieces of gauze, eye towel and hand towel
- Epidural catheter set, 18G needle and 20G catheter
- Sterile gloves.

Establish intravenous access with minimum 18G cannula.

Before the procedure preload with 500 mL intravenous bolus of lactated Ringer's injection.

7.5.5 Technique

The patient's skin should be appropriately prepared and draped. A trained anaesthesia assistant is a prerequisite. Ensure that patient's hair is well kept by using surgical cap.

- The patient should be placed in either lateral decubitus or sitting position
- The epidural space is identified under aseptic technique with a loss of resistance technique at the level of L3–L4 or L4–L5
- Epidural catheter is threaded 3–5 cm into the epidural space
- Drug administration according to protocol
- The patient is cared for in any position comfortable to the patient. If in the supine position, ensure LUD to avoid aortocaval compression.

7.5.6 Dosing

Various local anaesthetic drugs and opioids alone or in combination can be used to provide epidural analgesia. Modern labour epidural dosing regimens (e.g. 0.0625% to 0.1% bupivacaine with 2–4mcg/mL fentanyl or 0.4mcg/mL) reduce the total local anaesthetic dose required and decrease motor block experienced, potentially allowing the parturient to be ambulatory (Sunil T 2010).

7.5.7 Monitoring

- After the block has been performed, BP should be taken every 5 minutes for the first 30 minutes, then every 15 minutes for the next 30 minutes, after which hourly BP monitoring should be instituted
- Pain score: Visual Analogue Scale (VAS) should be used to assess the pain score and should be documented before and 15 minutes after the initiation of epidural. After which hourly charting should be instituted
- Document lower-limb weakness using Bromage score and block level dermatomes (if present)
- CTG should be continuously monitored after performance of the block
- FHR monitoring should be performed.

7.6 Anaesthesia in CS

CS is the most frequently performed obstetric surgical procedure and may be performed under Spinal Anaesthesia (SA), epidural, Combined Spinal Epidural (CSE) or General Anaesthesia (GA). In this section we will discuss SA and GA as our standard technique.

7.6.1 SA for CS

SA is the commonest type of anaesthesia used for CS. Because it is quicker and easier to perform, with a definite end point with a high success rate, SA is preferred to epidural or GA in CS. Moreover, babies born to mothers who underwent spinal (or epidural) anaesthesia may be more alert and less sedated than those born to mothers under GA as they have not received any GA agents through placental

circulation. As the mother's airway is not compromised, there is a reduced risk of aspiration of gastric contents causing chemical pneumonitis (Mendelson's syndrome).

There are, however, also disadvantages. It may be difficult to perform the spinal injection as lumbar flexion may be impeded by the pregnant uterus and, if labour has started, the mother may be unable to remain still when having contractions. Unless small-gauge needles (25, 26, 27G) are used, the incidence of Post-dural Puncture Headache (PDPH) may be unacceptably high.

Subarachnoid blocks can be used in both elective and emergency procedure. After the patient of CS is received:

- Pre-operative evaluation with a focus on eliciting co-existing diseases, anaesthetic and obstetric history and contraindications to SA, as well as a thorough examination of the patient, including back and airway assessment
- Open IV line preferably with IV cannula not less than 18 G with good flow; site should be above diaphragm
- Preparation of the patient, including methods to reduce the chance of aspiration as described above
- Check for tipping table, running suction, monitors (pulse oximeter, NIBP, ECG), oxygen supply, anaesthesia workstation or Ambu bags, emergency drugs (see Annex XXI), equipment for airway management, and items required for intubation in case of emergency
- Attempt to reduce aortocaval compression either by tilting the table by 15 degrees or by inserting a wedge. If there is marked hypotension due to suspected aortocaval compression, LUD should be performed by using either single hand or both hands
- Preload the patient with 15 to 20 mL/kg of crystalloid (e.g. Ringer's lactate or NS). In case of emergency, co-loading can be done using crystalloid
- Block to be performed in sitting or lateral position
- Approach to the subarachnoid space is either mid-line or lateral
- Space chosen is either L3–L4 or L4–L5
- Spinal set should contain at least a galipot, a kidney trey, a sponge holder, four pieces of small gauze and an eye towel large enough to cover the back
    - Use either 10% povidone iodine solution or 2% chlorhexidine-alcohol based solution to clean the back of the patient
- Use thin-gauge spinal needle (sizes 25 to 27G), pencil-point needles (Sprotte or Whitacre type) or Quinke type
- Pregnant women need smaller volumes of spinal anaesthetic solution than non-pregnant women in order to obtain a given height of block. For a CS, anaesthesia should extend to T4–T6 to be completely successful. This can usually be achieved with the following regimes: 2.0-2.5 mL of a hyperbaric solution of 0.5% bupivacaine
- Aim to block up to the umbilical level. Maximum up to T4 level
- Oxygen inhalation can be given until delivery of the baby in case of foetal distress
- Monitor pulse, BP, respiration, level of anaesthesia, oxygen saturation and blood loss
- Inj ephedrine or mephenteramine or phenylephrine (if BP falls by 20 mmHg or <100 mmHg systolic) 5–6 mg IV is given and titrate for further dose as necessary
- Inj atropine if pulse is below <60 BPM: 0.3 mg to 0.6 mg IV
- Inj oxytocin is preferred as a first line uterotonic. Give oxytocin 3U to 5U IV slowly over 15 to 30 seconds. Consult with operating surgeon for the second-line uterotonic if there is still uterine relaxation.

7.6.1.1 Advantages

- Risk of aspiration of gastric contents is reduced

- Risk of failure to intubate is avoided and there is no hypoxia
- Mother is awake and alert, so early bonding and breastfeeding
- Avoids the risk of exposure to anaesthetic drugs.

7.6.1.2 Disadvantages

- Unexpectedly high or total blocks
- Post-dural Puncture Headache (PDPH)
- Occasional inadequacy of the block.

7.6.1.3 Contraindication

Absolute contraindications to SA:

- Hypovolaemic shock where there is no time to correct the volume loss
- Coagulopathy (H/O bleeding disorder, clinical evidence or lab-confirmed coagulopathy).

7.6.2 GA for CS

GA for CS carries the risk of life-threatening complications, such as difficult airway management and aspiration pneumonia, and it is therefore recommended that it be avoided whenever possible in favour of neuraxial anaesthesia (Hawkins et al. 1997)

7.6.2.1 Preparation

CSs are frequently performed as emergencies in unprepared patients, such as those with a full stomach, severe haemorrhage, pre-eclampsia, or foetal distress etc.

- Prepare and check equipment and drugs for obstetric anaesthesia in advance
- As intubation may be difficult, it is a wise precaution to have an introducer and a smaller size (6.5- or 7-mm ID) of ETT ready
- A trained assistant must be available during induction for help as well to apply cricoid pressure.
- The patient is positioned with the table tilted to 15 degree or with a wedge under the right hip
- Insert a large intravenous cannula (>20 G) above diaphragm with good flow and infuse crystalloid
- Confirm that blood has been sent for cross-matching and will be available for emergency transfusion
- Patients with PIH or eclampsia may require treatment for their high BP prior to induction. Increments of hydralazine 5mg or labetolol 5–10mg IV may be given at 5-minute intervals until the diastolic pressure has been reduced to around 90–100 mmHg. It should be remembered that beta blockers are contra-indicated in asthma.
- Passive regurgitation of stomach contents into the pharynx may lead to aspiration pneumonia. Methods to reduce the chance of aspiration (as described in Section 7.4.2.6) should be carried out.

7.6.2.2 Induction of GA

Steps for standard GA for CS: equipment should be prepared and ready (see table below).

Table Equipment Necessary for Airway Management

No.	Device	Comment
1	Airways :Oropharyngeal, nasopharyngeal	Three sizes of each
2	Eschmann bougie, gum-elastic (a long introducer inserted blindly underneath the epiglottis, with the ETT "railroaded" over it)	
3	ETTs	Three different sizes: 6.0, 6.5, 7.0
4	Laryngoscopes two sises of curved (Macintosh) and straight (Miller) blades, preferably short handles	Size 3 and 4
5	LMA i-gel and combitube (if available)	Size 3 and 4 LMA Size 3 and 4 i-gel
6	Suction device	
7	Fiberoptic bronchoscope (if available)	
8 9	Jet injector (If available) Percutaneous cricothyrotomy kit (if available)	
10	Drugs for topical anaesthesia: lidocaine, ephedrine	
11	Drugs for GA: thiopental, ketamine, propofol, succinylcholine, opiates etc.	
12	Drugs for CPR: atropine, epinephrine etc.	
13	Monitoring equipment ECG, pulse oximeter, noninvasive blood pressure, capnograph (detection of expired CO_2 indicates the correct placement of the ETT), disconnection alarm	
14	Oxygen: oxygen concentrator, oxygen cylinder	

The challenge of anaesthetising a pregnant patient is complicated further by difficulties in airway management. Early consultation between the obstetrician and an experienced anaesthesiologist is one of the governing principles of management. Another element, for successful and safe management of patients at risk for difficult intubation/ventilation, is the overall provision for regional rather than general anaesthesia:

- Patient's position: Left lateral tilt (15 degrees) to avoid supine hypotension; for airway, head should be in "sniffing" position
- Monitoring: Attach ECG, BP, pulse oximeter, capnography and temperature probe
- Sign-in: Time-outs are implemented following the WHO checklist
- Preoxygenation (denitrogenation): 3– 5 min of 100% O_2 with normal breathing, or 4 deep breaths of 100% O_2 if there is no time for the first option
- Another assistant available for help, for cricoid pressure, and for unexpected difficult intubation
- Induction of anaesthesia: Thiopentone 3–5 mg/kg or propofol 2mg/kg or ketamine 2mg/kg is then injected, followed by rocuronium, 0.9–1.2 mg/kg or suxamethonium 1.5mg/kg. Apply cricoid pressure before the patient loses consciousness. Wait for 40–60 seconds and intubate the trachea. Inflate the tube's cuff. Confirm the tube's correct position (by capnography if available). Release cricoid pressure and continue with GA.
- If intubation cannot be performed, however, facemask ventilation will be necessary to maintain oxygenation. This situation is termed "failed intubation". Always have a plan available in case this happens.

7.6.2.3 Maintenance of Anaesthesia

Anaesthesia can be maintained with a 50% mixture of nitrous oxide and oxygen, supplemented with a low concentration of a volatile agent, i.e. 0.5 minimum alveolar concentration (MAC) in order to avoid the possibility of awareness (Chin KJ 2004). Halothane 0.5% or isoflurane 0.5% is suitable. High concentrations of volatile agents should be avoided as they may decrease uterine tone, increasing bleeding at operation, and may depress the neonate.

Further relaxation can be achieved by use of a non-depolarising relaxant. Most non-depolarising relaxants do not cross the placenta to any great extent, except gallamine, which should be avoided until after the cord is clamped. Dose of non-depolarising muscle relaxant is to be reduced if patient is receiving magnesium sulfate. After delivery of baby, Inj oxytocin is preferred as a first-line uterotonic. Give oxytocin 3U to 5U IV slowly over 15 to 30 seconds. Consult with operating surgeon for the second-line uterotonic if there is still uterine relaxation. Be cautious in use of Inj ergometrine in case of hypertension and Inj carboprost in case of airway diseases. Once the umbilical cord is clamped, an opioid such as fentanyl/pethidine/morphine can safely be given slowly intravenously. At this point the inspired oxygen concentration can be reduced to 30–35%.

In situations where no nitrous oxide is available, target anaesthetic concentration to 0.8 MAC of the volatile agent; this avoid the possibility of awareness and allows for adequate uterine contraction (Yildiz et al. 2005). After the cord has been clamped, intravenous opioids should be administered and the concentration of volatile agents reduced to minimise relaxation of the uterus.

At the end of surgery muscle relaxation is reversed using neostigmine 50–70 mcg/kg + atropine 15–20mcg/kg or glycopyrrolate 4mcg/kg (or effect of suxamethonium should be allowed to wear off), and the patient turned on to her left side in the head down position. The ETT is removed only when laryngeal reflexes have returned and spontaneous respiration has resumed. Oxygen is administered by face mask for at least 30 minutes following surgery, during which time the patient should remain on her side. The intravenous infusion is continued into the post-operative period to ensure adequate hydration and to retain venous access. Analgesia is prescribed, usually in the form of an opiate such as fentanyl, morphine or pethidine. Antiemetics such as ondansetron, metoclopramide or phenergan can be added.

7.6.2.4 Failed intubation drill

A clear plan must be available in the event of failed intubation. There is a serious risk of hypoxia if the situation is mishandled. An appropriate course of action is as follows:

- Maintain cricoid pressure
- Oxygenate using facemask
- Turn the patient on to her left side into a head down position and allow her to wake up
- Proceed with local anaesthetic block when the patient has regained consciousness
- If the operation is needed very urgently (e.g. for foetal distress or APH), re-establish spontaneous respiration after the suxamethonium has worn off, and continue the anaesthetic under a facemask using nitrous oxide, oxygen, and halothane/isoflurane
- If possible, maintain cricoid pressure during the anaesthetic condition
- If problems are encountered with the airway, it may be necessary to wake the patient up and use a regional technique
- At all times, ensure that the patient is well oxygenated
- (see Annex XXVI and XXVII)

7.6.3 Summary of Anaesthetic Choices for CS

Anaesthetic Options	Potential Complications	Common Side-effects	Routine Precautions
Spinal	Hypotension, high block, inadequate block, utero-placental insufficiency	Post-anaesthesia headache, nausea, itching	Left lateral tilt of mother Platelet count in hypertensive disease Adequate volume replacement
General Endotracheal Anaesthesia (GETA)	Difficult/failed intubation Maternal and foetal hypoxia Aspiration Overmedicated/ depressed newborn	Sore throat	Left lateral tilt of mother Preoxygenation prior to intubation
Ketamine	Hypertension, bradycardia, apnoea Excessive salivation	Vivid dreams/ hallucinations	Premedicate with: atropine, benzodiazepine

7.7 Ketamine anaesthesia

Ketamine is an IV GA agent related in structure and action to phencyclidine. It was first safely used in childbirth in 1966 (Chodoff et al. 1966). In the 1970s, ketamine used to be widely used in obstetric anaesthesia, either as a sole anaesthetic agent or in combination with inhalational anaesthetics in vaginal as well as caesarean delivery. However, in the 1980s and early 1990s the trend of using ketamine in obstetric cases was decreased due to widespread acceptance of safer and more effective neuraxial analgesia/anaesthesia and application of new IV anaesthetics, such as propofol (White 1982). Nevertheless, ketamine continues to be used in obstetric cases for various purposes. No teratogenic or other adverse foetal effects have been observed in reproduction studies during organogenesis.

Ketamine rapidly crosses the placenta. It has very good analgesic effect and there is only slight impairment of pharyngeal and laryngeal reflexes. It is a mild cardiovascular stimulant and bronchodilator, but does not relax the uterine muscle but produces excessive salivation. It also produces hallucination. Among the maternal and newborn complications reported with ketamine are: oxytocic properties, an increase in maternal blood pressure, newborn depression, and an increased tone of newborn skeletal musculature. These adverse effects were usually related to higher doses (1.5–2.2 mg/kg IV) administered during early studies rather than to the lower doses now commonly used (0.2–0.5 mg/kg IV).

There is marked increase in maternal blood pressure of up to 30–40 per cent in both systolic and diastolic during ketamine induction. An increased maternal heart rate is usually observed. These effects are dose-related with the greatest increases occurring when 2–2.2 mg/kg IV was administered, but smaller elevations of pressure and pulse have been noted with lower IV doses.

Maternal ketamine anaesthesia may cause depression of the newborn. The use of ketamine in low doses apparently has little effect on foetal cardiovascular status or acid–base balance as evidenced by neonatal blood gases.

Ketamine doses of 2 mg/kg IV have been associated with excessive neonatal muscle tone, sometimes with apnoea. In some cases, the increased muscle tone makes endotracheal intubation difficult. In contrast, lower doses (e.g. 0.25–1 mg/kg) have not been associated with this complication (Bovill et al. 1971).

In summary, although ketamine anaesthesia close to delivery may induce dose-related, transient toxicity in the newborn, these effects are usually avoided with the use of lower maternal doses. No reports of malformations in humans attributable to ketamine have been located.

Atropine or glycopyrrolate premedication may be necessary for ketamine anaesthesia: 1 to 2 mg/kg of ketamine is given intravenously for induction. Ketamine can also be given in dose of 5–10 mg/kg IM as an induction agent and maintained later with ketamine in IV or drip. Supplementary dose of ketamine 0.5 mg/kg is given as necessary, or ketamine in the drip is prepared 1 mg/mL and is given at rate of 1 to 2 mg/min. At the end of the procedure, patient is recovered in lateral position and in a quiet place.

7.7.1 Clinical use of ketamine in obstetric patients

7.7.1.1 Pain management

Low-dose ketamine 0.25-1 mg/kg IV (Maduska et al. 1978) in incremental dose of 0.2 mg/kg over 30 mins at the onset of labour pain, followed by an infusion of 0.2 mg/kg/h until delivery of the baby (Joel et al. 2014) can be used as both an analgesic drug in obstetric population for pain control during labour, and a intraoperative rescue analgesic during regional anaesthesia and postoperative pain management. In order to avoid GA, IV ketamine at 5–10 mg or 0.2–0.4 mg/kg is effective as supplemental analgesic in incomplete spinal or epidural block during CS (Chestnut 2014)

7.8 Anaesthesia for other obstetric problems

There are few other problems in obstetrics where anaesthesia is needed. This is usually in peripartum haemorrhage which is also a major cause of maternal mortality.

7.8.1 APH

7.8.1.1 Placenta previa/abruptio placentae

- Preparation and monitoring as for CS
- IV line is opened with two large-bore cannulas for resuscitation
- Cross-matching for blood transfusion may be needed
- Preparation for ketamine anaesthesia or spinal or general anaesthesia depending upon the patient condition.

7.8.2 Intrapartum Haemorrhage

7.8.2.1 Uterine Rupture

Management (as for hypovolaemic patient) should be prepared for general anaesthesia. If the patient general condition is very poor, local infiltration and ketamine supplement anaesthesia is preferred.

7.8.2.2 Vasa Previa

Depending on patient's vital status, plan for either spinal or general anaesthesia.

7.8.3 PPH

7.8.3.1 Retained placenta

In the absence of hypovolaemia due to bleeding, SA is a simple and safe alternative to GA for manual removal of a retained placenta. It does not produce uterine relaxation and if this is required, a GA with a volatile agent may be preferred.

Regional anaesthesia with reduced dose of local anaesthetic agent is good if not hypovolaemic.

Ketamine anaesthesia or GA.

7.8.3.2 Uterine Atony

Need for emergency hysterectomy. Anaesthetic management as for emergency CS.

Chapter 8: Clinical Governance for Maternal and Newborn care

This chapter describes the clinical governance for maternal and newborn health care. Clinical governance is a concept used to improve the management, accountability and provision of quality health care (Braithwaite & Travaglia 2008). For provision of quality maternal and newborn care each level of health facility must have standard of structure and human workforce, equipment and supplies, logistics management, patient record keeping, and audit related to the care of mother and newborn during pregnancy, labour and childbirth, and postpartum period. Recommendation made in NMS Volume III 2020 is the minimum required standard.

8.1. Structure and human workforce at each levels of facility

Recommended structure and human workforce are the at the minimum side. Without this much of input it would be almost impossible to deliver the quality maternal and newborn care.

8.1.1 Aim

Aim is that hospitals and providers achieve at least 80 per cent on performance standards and that key interventions be implemented for 100 per cent of eligible pregnant women in each level of government and private health facilities.

8.1.2 Approach

Bottom-up, value-driven approaches are effective to ensure the highest possible quality care and safety of patients. Striving for high-quality and safe health care is underpinned by continuous learning, shared responsibility and good relationships and collaboration between health care professionals, managers and patients (Gepke et al. 2017).

8.1.3 Standard statement, readiness and application

There should be a system through which health professionals are accountable for continuously improving the quality of maternity services and safeguarding high standards of care, by creating an environment in which excellence in clinical care will flourish (Scally & Donaldson 1998).

Readiness

- Leaders at all levels in the health facility set up and use clinical governance systems to improve the safety and quality of health care for patients
- Safety and quality systems are integrated with governance processes to enable health facilities to actively manage and improve the safety and quality of health care for patients
- The workforce has the right qualifications, skills and supervision to provide safe, high-quality health care to patients
- The environment promotes safe and high-quality health care for patients
- Continuous clinical education is provided for health managers
- Audit, risk management, mechanisms to monitor the outcomes of care are in place.

Application of standards

Maternal and newborn care is organised into various facility levels: Level I: accredited birth centre; Level II: primary health care and municipality; Level III: province and district speciality; and Level IV: federal perinatal health care centre. Maternal and newborn care at each level is integrated care, such that Level-

III or Level-IV facilities provide education and consultation (training for quality improvement initiatives and severe morbidity and mortality case review, and a streamlined system for maternal transport) when necessary to Level-I and Level-II facilities, in addition to evidence-based services at each level.

Accredited birth centres (Level I)

Accredited birth centres (freestanding facilities that are not hospitals) form an integral part of many regionalised care units of maternal and newborn health care. Accredited birth centres offer basic maternity services for most women in the nearby community who are giving birth in the centre.

8.1.3.1 Standard for structure/human workforce for accredited birthing centres

Input/Structure	Human Workforce	Process/Quality Care	Outcome/Reduction
Care for low-risk women (uncomplicated, term, singleton pregnancies) who are expected to have normal vaginal birth 24-hour ambulance service/Newborn Care Corner	Midwivess/trained SBA and newborn-care-trained nursing staff Community midwives Nurse lab assistant Intrahospital care nurse or health care provider Ambulance driver Biomedical assistant	Plan and drill to provide humanised birthing practices, continuity of care and selective use of technology Skilled care	Death Disability Disease Discomfort Dissatisfaction

The establishment of birthing centres helped to shift childbirth from home to institution. In Nepal, this shift has happened exceptionally quickly over the past decade, encouraged by a well-funded and well-publicised national safe delivery incentive programme. The GoN has operates more than 1800 accredited birth centres all over the country.

PHC facilities (Level II)

Each local level should have Level-II facilities, at minimum a hospital with 15 beds or more.

Since 2006, the following shifts in institutional deliveries have been observed: a decline in domiciliary deliveries to less than 1 per cent; a four-fold increase in deliveries at PHC clinics; a marginal decline in secondary- and tertiary-hospital deliveries; and, surprisingly, a 10-point decline in private-sector deliveries, despite equal access to all categories of health facilities (WHO 2009).

8.1.3.2 Standard of structure and human workforce for PHC clinics

Input/Structure	Human workforce	Process/Quality care	Outcome/Reduction
Care of low-risk to moderate-risk pregnancies with ability to detect, stabilise, and initiate management of unanticipated maternal, foetal and newborn problems that occur during the peripartum period, until the patient can be transferred to a facility at which maternal care is available 24-hour ambulance service	ASBA medical officers/ medical officer midwives/ SBA nurse Newborn-care-trained nurse/doctor Paramedics Community midwives/nurses Anesthesia assistant Lab technician Intrahospital care nurse or health care provider Ambulance driver Biomedical technician	Plan and drill to provide humanised birthing practices, continuity of care, selective use of technology and skilled care	Death Disability Disease Discomfort Dissatisfaction

Establishment of Neonatal Care Corner and SCBU			

The following conditions are necessary in order to increase further attendance at birthing centres and PHC clinics: user-friendly, positive attitude of staff, good infrastructure, availability of qualified, well-trained staff and relative absence of informal payments.

Municipality facilities (Level II)

Each local level should have Level-II facilities, at minimum a hospital with 15 beds or more.

In accordance with the Constitution of Nepal (2015), several structural (legislative) measures have shifted elements of health care decision-making downwards to municipality level.

8.1.3.3 Standard for structure and human workforce for municipalities

Input/Structure	Human Workforce	Process/Quality Care	Outcome/Reduction
Local Policy, planning, budgeting Health workforce training heath workforce safety Skilled workforce recruitment and deployment Local-level incentives Temporary waiting Homes for pregnant woman and family with skills-base training and reproductive-health-related health information and training, e.g. FP, nutrition, kitchen gardening, food preservation Effective food and other substantial supplementation scheme in addition to the existing government safe delivery incentive ORC service/home visit/referral Audit and feedback	Municipality chief Local administrator Health division/Unit chief Account officers Chief Ward representatives/ members Gynae/Obs MDGP Paediatricians Anaesthesiologist/anaesthesia assistants Midwives Nursing chiefs Lab technicians/assistants Medical record keeper Public health experts/officers	Set municipality-level goals and targets Coordinate province and PHC facility levels to achieve targets and goals Planning and strategy development for care on the principles of: humanised birthing practices, continuity of care, selective use of technology, and skilled care	Death Disability Disease Discomfort Dissatisfaction

Municipalities establish health agreements between municipality, and local and provincial levels concerning cooperation/coordination within the health sector.

Province/district specialty care (Level III)

The province/district health system is a key interlocutor between national policy and guidance and implementation at the frontline of many health systems and is often the most decentralised level of governance and management in health systems.

8.1.3.4 Standard for structure/human workforce for province/district speciality care

Input/Structure	Human Workforce	Process/Quality Care	Outcome/Reduction
Surgical obstetrics Anaesthesia Blood replacement Medical treatment Medical procedure Establishment of NICU	Obstetrician/gynaecologist MDGP Paediatricians/newborn-care-trained Nurses Anaesthesiologist Physicians Surgeons Psychiatrist Pathologist Radiologist Psychosocial counsellors Midwives and nursing chiefs Lab technicians Paramedics Medical record keeper Public health experts Biomedical technician	Humanised birthing practice Continuity of care Selective use of technology Skilled care	Death Disability Disease Discomfort Dissatisfaction
Provincial-level: Ministry of Social Development			
Provincial policy and planning, budgeting Health workforce training Health workforce safety Skilled workforce recruitment and deployment Coordination between local and federal level Routine and back up support to local level	Provincial secretary Provincial Planning Chief Chief of Health Division Finance Chief Specialist Obstetrician/gynaecologist MDGP/paediatricians Anaesthesiologist Midwives and Nursing chiefs	Set provincial goals and targets Coordinate federal and municipality level to achieve targets and goals Planning and strategy development for care on the principle of humanised birthing practices Continuity of care Selective use of technology Skilled care	

There has been long-standing interest in the roles, decision-making power and required capacities of the district health system (Kwamie et al. 2016). It is about improving care using whatever method is the most suitable – for example, by identifying aspects of care that need improvement, making plans to improve them, and monitoring the success.

Federal perinatal health care centre (Level IV)

Along with providing tertiary care, the federal level simultaneously empowers municipalities and provinces, creating locally accountable planning structures for welfare, public health and health care services.

The federal level communicates with municipalities, provinces, and local levels to deliver coordinated care by eliminating duplications and insufficient or poorly handled (grey zone) health care and welfare services. Above all, it plays the central role in developing true partnerships – between managers and clinical staff and between clinical staff and patients.

8.1.3.5 Standard for structure/human workforce for federal perinatal health care

Input/Structure	Human Workforce	Process/Quality Care	Outcome/Reduction

On-site high-tech diagnosis and management, including medical and surgical care for critically ill mother and foetus throughout pregnancy and childbirth Screening for chromosomal anomalies Provincial-level, policy, planning, budgeting Health workforce training Health workforce safety Skilled workforce recruitment and deployment Coordination between local and federal level Routine and back-up support to local level NICU establishment/ advanced lab facility	Obstetrician/Gynaecologist MDGP Paediatrician/neonatologist Anaesthesiologist Physicians Critical care specialist Psychiatrist Midwives Nursing chiefs Pathologist Lab technologist Radiologist Psychosocial Counsellors Medical record keeper Public health experts Biomedical engineer	Plan and drill to provide: Humanised birthing practices Continuity of care Selective use of technology Skilled care	Death Disability Disease Discomfort Dissatisfaction
Federal Level: Ministry of Health/Department of Health Services			
Policy, planning, budgeting Donor and partner bilateral and multilateral coordination Set up standard of care Strategy and guideline development Manpower distribution and health facility development Health workforce training Heath workforce safety Referral airlifting National safe delivery incentive Audit and feedback	Minister Secretary Chief Specialist Planning Division Chief Director general Family Welfare Division Director Account Officer Obstetrician/Gynaecologist MDGP Paediatrician Anaesthesiologist Midwives/Nursing chiefs Public health experts Statistician Legal and human rights and social activist User-group representatives	Set national standard of care Fixed national targets to meet international commitments and goals Humanised birthing practices Continuity of care Selective use of technology Skilled care	Death Disability Disease Discomfort Dissatisfaction

Each facility should have a clear understanding of its capability to handle increasingly complex levels of maternal care and should have a well-defined threshold to transfer women to health care facilities that offer a higher level of care. In emergency situations, the nearest level-appropriate hospital should be used if added travel to a more distant level-appropriate hospital increases risk.

8.2 Equipment and Supplies, and Logistic management

Medical equipment and supplies, and logistics account for a high proportion of health care costs.

8.2.1 Aim

The aim of equipment and supplies, and logistics management is to move the inventory in a supply chain effectively and efficiently to extend the desired level of health service at the least cost.

8.2.2 Approach

The simplest and most effective approach is the delivery of smaller shipments to the point of consumption. This approach maintains time management.

8.2.3 Standard statement, readiness and application

Maternity care management in LMICs should choose appropriate supplies, equipment and drugs, in order to meet priority health services through minimum possible investment.

Readiness

- Effective and efficient procurement policy
- Central bidding and local purchasing policy
- On-time delivery
- Complete inventory
- Adequate financial provision.

Application of standards

Grouping of medical equipment

The equipment commodities are grouped according to the clinical area of the health care facility in which these are commonly used, such as an examination room or ICU etc. These medical device equipment groupings were then allocated to interventions across the continuum.

8.2.3.1 Standard list of medical equipment for medical examination and diagnosis

Input/Structure	Equipment/Supplies	Process/Quality	Output
Medical furniture	Bed screen on castors Double-door instrument cabinet Double-door medicine cabinet Two-step foot stool Infusion double-hook stand on castors Adjustable stool on castors Foldable stretcher Patient stretcher with side rails Examination table Gynaecology, delivery, table with accessories Stainless steel instruments trolley on castors Stainless steel dressing trolley with two trays Soiled linen trolley	Inventory: record keeping, regular maintenance, regular supplies, appropriate, on-time care, detection of high-risk cases and timely referral	Mother's comfort is maintained during examination
Anthropometric equipment	Portable infant-/child-length-/height-measuring board Electronic mother/child 150 kg x 100 g scale Infant 10 kg x 5g scale Beam-type infant 16k g x 10 g scale Beam-type adult 6-180 kg x 100 g scale		
Hospital equipment	Examination mobile light with accessories		
Medical diagnostic equipment	Portable ECG recorder with accessories Ophtalmoscope set Otoscope Mobile USG with accessories Child and adult aneroid sphygmomanometer Paediatric and adult binaural and foetal monaural stethoscope Clinical digital 32–43°C thermometer Timer, respiration, for Acute Respiratory Infection (ARI) Approx. 50 cm rubber tourniquet Wooden disposable tongue depressor		

	Fixed X-ray with accessories and infrastructure Mobile X-ray system with accessories X-ray viewer (negatoscope), 1 to 3 bodies		
Medical utensils	Polypropylene basin, kidney tray Stainless steel kidney tray Polypropylene bedpan Polypropylene bowl Hand brush, plastic scrub Polypropylene jar, forceps Polypropylene thermometer Stainless steel dressing tray, approx. 300x200x30mm		
Medical clothing and accessories	Non-woven surgical cap, woven white coat, surgical woven drape, plastic draw sheet, plastic approx. 90 x 180 cm, woven patient ICU, Operation Theatre gown		
Surgical instruments	Dressing cheron forceps, 250 mm Vaginal graves speculum, 75 x 20mm Vaginal graves speculum, 95 x 35mm Vaginal graves speculum, 115 x 35mm		
Surgical instrument set	Surgical instrument set Surgical dressing set		

Groupings correspond, to a certain extent, to the types of intervention performed in particular clinical areas. For example, basic medical examinations typically happen in an examination area or room, while ventilation typically occurs within an intensive care setting.

This checklist of essential emergency equipment for emergency preparedness and referral is recommended for three levels of facility (Levels I, II, and III), while additional equipment for the federal level is made under a separate heading as follows.

8.2.3.2 Standard list of medical equipment for emergency preparedness and referral

Input/structure	Equipment / Supplies	Process /Quality	Output
Medical furniture	Hospital bed screen on castors Stainless steel kick buckets on castors Double-door instrument cabinet Double-door medicine cabinet Two-step foot stool Double-hook infusion stand on castors Adjustable stool on castors Foldable stretcher Patient stretcher with side rails Examination table Stainless steel instruments table on castors Stainless steel dressing trolley with 2 trays Emergency trolley with drawers Medical furniture	Inventory Record keeping Regular maintenance Regular supplies Appropriate Care on time Detect high-risk cases on time and make timely referral	Prompt management of emergency and proper referral
Medical utensils	Polypropylene basin kidney Stainless steel basin kidney Polypropylene bedpan Polypropylene bowl Stainless steel round bowl approx. 4L Stainless steel bowl approx. 180 mL Stainless steel bowl approx. 600 mL Plastic hand brush and scrub Polypropylene jar, forceps, thermometer, stainless steel receptacle, waste with pedal action Stainless steel dressing tray, dressing approx. 300 x 200 x 30 mm		
Medical clothing and accessories	Protection plastic apron Surgical non-woven cap Plastic clogs Woven white medical coat, medical		

	Surgical woven drape Plastic drawsheet approx. 90 x 180 cm Regular size safety glasses, Woven patient gown Woven surgical gown Non-woven surgical mask Woven surgical trousers Woven surgical tunic		
Anthropometric equipment	Portable infant-/child-/length-/height-measuring board Electronic mother/child scale 150 kg x 100 g Scale, electronic, infant, 10 kg x 5 g Beam-type infant scale 6 kg x 10 g Beam-type adult scale 6–180 kg x 100 g Spring-type infant scale 25 kg x 100 g with set of weighing machine		
Hospital equipment	Mobile examination light with accessories Electrical suction pump with 1 bottle and accessories Electrical suction pump with 2 bottles and accessories		
Medical diagnostic equipment	Portable ECG recorder with accessories Ophthalmoscope set Otoscope set Andreoid adult sphygmomanometer Andreoid child sphygmomanometer Adult binaural stethoscope Monaural foetal stethoscope Paediatric binaural stethoscope Digital clinical thermometer 32–43°C Timer, respiration, for ARI Rubber tourniquet approx. 50 cm Wooden disposable tongue depressor Fixed X-ray system with accessories and infrastructure Mobile X-ray system with accessories X-ray viewer (negatoscope), 1 to 3 bodies		
Resuscitation/ anaesthesia equipment	CPAP system, with accessories Basic defibrillator with accessories Magill adult forceps Magill child forceps Newborn transport incubator with accessories Infusion pump with accessories Adult/child laryngoscope set Newborn laryngoscope set Portable patient monitor with accessories Nebuliser with accessories Oxygen concentrator with accessories Portable pulse oximeter with accessories Spot check pulse oximeter with accessories Foot-operated suction pump Newborn resuscitation pump operator Hand-operated adult resuscitator set Hand-operated child resuscitator set Hand-operated newborn resuscitator set Suction bulb Syringe pump with accessories Adult medical ventilator medical with accessories Adult medical transport ventilator with accessories Medical child/adult ventilator with CPAP and accessories Child/newborn medical ventilator Child/newborn transport ventilator with accessories Newborn warmer, heating pad, with accessories Newborn warmer, sleeping bag, with accessories Warmer, radiant heater, free-standing, with accessories		
Surgical instruments	Dressing cheron forceps 250 mm Sterile disposable scalpel blade no.22 with scalpel handle no.4 Sterile disposable scalpel blade no.10 with scalpel handle no.3		

	Graves vaginal speculum 75 x 20 mm Graves vaginal speculum 95 x 35 mm Graves vaginal speculum 115 x 35 mm		
Surgical instruments set	Surgical dressing set Surgical suture set		

Full utilisation of local resources should be encouraged to develop innovative systems to manage emergency and referral system at reasonable cost.

The labour room should be equipped with a wide array of medical instruments, ranging from simple delivery set to advanced resuscitation/anaesthesia equipment.

8.2.3.3 Standard list of medical equipment for labour, delivery and recovery

Input/Structure	Equipment/Supplies	Process/Quality	Output
Medical furniture	Bed, labour/delivery, with mattress and accessories Stainless steel bucket with kick on castors Double-door instrument cabinet Double-door medicine cabinet Two-step foot stool Double-hook infusion stand on castors Stand, single bowl, on castors Adjustable stool on castors Patient stretcher with side rails Baby dressing table Gynaecology, delivery, table with accessories Stainless steel instrument table on castors Stainless steel dressing trolley with 2 trays Emergency trolley with drawers Soiled linen trolley	Inventory Record keeping Regular maintenance Regular supplies Appropriate care, delivered on time Detect high-risk cases on time and make timely referral	Prompt management of emergency and proper referral
Medical utensils	Polypropylene basin kidney Stainless steel basin kidney Polypropylene bedpan Polypropylene bowl Stainless steel round bowl approx. 4 L Stainless steel bowl approx. 180 mL Stainless steel bowl approx. 600 mL Plastic brush, and hand scrub Polypropylene jar, forceps Polypropylene thermometer Stainless steel receptacle waste with pedal action Stainless steel dressing tray, approx. 300 x 200 x 30 mm		
Medical clothing and accessories	Plastic protective apron Surgical non-woven cap Plastic clogs Surgical woven drapes Plastic draw sheet approx. 90 x 180 cm Regular size safety glasses Woven patient gown Woven surgical gown Surgical non-woven mask Woven surgical trousers Woven surgical tunics		
Anthropometric equipment	Infant electronic scale 10 kg x 5 g Beam-type infant scale 16 kg x 10 g		
Hospital equipment	Mobile examination light with accessories Electrical suction pump with 1 bottle and accessories Manual bird vacuum extractor, complete set		
Medical diagnostic equipment	Partograph Mobile USG scanner with accessories		

	Aneroid adult sphygmomanometer Binaural adult stethoscope Monaural foetal stethoscope Digital clinical thermometer 32–43°C Rubber tourniquet approx. 50 cm		
Resuscitation/ anaesthesia equipment	Oxygen concentrator with accessories Portable pulse oximeter with accessories Spot check pulse oximeter with accessories Foot-operated suction pump Newborn resuscitation suction pump Adult hand-operated resuscitator Hand-operated newborn resuscitation set Suction bulb Newborn resuscitation table with accessories		
Surgical instruments	Cheron dressing forceps 250 mm Disposable sterile scalpel blade no.22 with scapel handle no.4 Graves vaginal speculum 75 x 20 mm Graves vaginal speculum 95 x 35 mm Graves vaginal speculum 115 x 35 mm		
Surgical instrument set	Surgical dressing set Surgical suture set		

Childbirth comes with the possibility of numerous challenges. Without a wide range of equipment, the ability to manage unexpected situations becomes more difficult.

Global public health initiatives have neglected the necessity for provision of surgery for decades. However, recently surgery is increasingly recognised as an important component of public health (Bae et al. 2011).

8.2.3.4 Standard list of medical equipment for surgery and anaesthesia

Input/Structure	Equipment/Supplies	Process/Quality	Output
Medical furniture	Double-door instrument cabinet Double-door medicine Two-step foot stool Double-hook infusion stand on castors Single bowl stand on castors Adjustable stool on castors Patient stretcher with side rails Baby dressing table Stainless steel instruments table on castors Stainless steel dressing trolley with 2 trays Emergency trolley with drawers Soiled linen trolley	Inventory Record keeping Regular maintenance Regular supplies Appropriate care, delivered on time Detect high-risk cases on time and make timely referral	Prompt management of emergency and proper referral
Medical utensils	Polypropylene basin kidney Stainless steel basin kidney Polypropylene bedpan Polypropylene bowl Stainless steel round bowl approx. 4 L Stainless steel bowl approx. 180 mL Stainless steel bowl approx. 600 mL Plastic hand brush and scrub Polypropylene jar, forceps Polypropylene thermometer Stainless steel receptacle waste with pedal action Stainless steel dressing tray approx. 300 x 200 x 30 mm		
Medical clothing and accessories	Plastic protection apron Non-woven surgical cap Plastic clogs Surgical woven drapes Plastic draw sheet approx. 90 x 180 cm		

	Regular size safety glasses Woven patient gown Woven surgical gown Non-woven surgical mask Woven surgical trousers Woven surgical tunic		
Hospital equipment	Electrosurgical unit with accessories Operating theatre with accessories Operating theatre ceiling lights with accessories Mobile operating theatre lights with accessories Electrical Vacuum Aspiration (EVA), complete set MV), complete set Electrical suction pump, suction with 1 bottle and accessories Electrical suction pump with 2 bottles, and accessories		
Medical diagnostic equipment	Aneroid adult sphygmomanometer Adult binaural stethoscope Rubber tourniquet approx. 50 cm Mobile X-ray system with accessories X-ray viewer (negatoscope), 1 to 3 bodies		
Resuscitation/ anaesthesia equipment	Free-standing basic anaesthesia system with accessories Anaesthesia unit with ventilator and accessories Basic defibrillator with accessories Magill adult forceps Adult/child laryngoscope set Portable patient monitor with accessories Oxygen concentrator with accessories Portable pulse oximeter with accessories Spot check pulse oximeter with accessories Foot-operated suction pump Newborn resuscitation suction pump Hand operated adult resuscitator set Hand-operated newborn resuscitation set Suction and bulb Newborn resuscitation set with accessories		
Surgical instrument	Cheron dressing forceps 250 mm Sterile disposable scalpel blade no.22 with sterile scalpel handle no.4 Graves vaginal speculum 75 x 20 mm Graves vaginal speculum 95 x 35 mm Graves vaginal speculum 115 x 35 mm		
Surgical instrument set	Basic surgery set Delivery surgery set D&E surgical set Surgical dressing set Early infant male circumcision surgical set Embryotomy surgical set Examination/suturing surgical set Vaginal/cervical suturing surgical set Surgical, intrauterine device insertion/removal, set Surgical, laparotomy (Gyn/Obs) set Surgical, suture set Surgical, vacuum aspiration set Surgical, vasectomy set Surgical, vasectomy non-scalpel set		

The common notion that surgery is too complex and too expensive to implement in public health interventions is changing. However, there is a significant disparity between surgical procedures performed in HICs and LMICs: only 3.5 per cent of the surgeries performed in the world are received by the poorest one-third of the world's population (Weiser et al. 2008).

Supply of modern equipment for inpatient care provides medical staff with new ways to enhance the quality of maternity inpatient care.

8.2.3.5 Standard list of medical equipment for inpatient care

Input/Structure	Equipment/Supplies	Process/Quality	Output
Medical furniture	Standard, adult, hospital beds with mattress Hospital bed mattress on castors Bedside cabinet standard Double-door medicine cabinet Hospital baby cot with bassinet on castors Double- hook stand on castors Patient stretcher with side rails Baby dressing table Stainless steel instrument table on castors Stainless steel dressing trolley, dressing with 2 trays Soiled linen trolley Adult wheelchair	Inventory: Record keeping Regular maintenance Regular supplies Appropriate care on time Detect high-risk cases on time and make timely referral	Prompt management of emergency and proper referral
Medical utensils	Polypropylene basin kidney Stainless steel basin kidney Polypropylene bedpan Polypropylene bowl Plastic hand brush and scrub Polypropylene jar Polypropylene thermometer Stainless steel receptacle waste with pedal action Stainless steel tray, approx. 300 x 200 x 30 mm		
Medical clothing and accessories	Woven medical coat Woven surgical drape Plastic draw sheet approx. 90 x 180 cm Woven patient gown		
Anthropometric equipment	Electronic mother/child scale 150 kg x 100 g Electronic infant scale 10 kg x 5 g Beam-type infant scale 16 kg x 10 g		
Hospital equipment	Mobile examination light with accessories		
Medical diagnostic equipment	Sphygmomanometer, adult, aneroid Stethoscope, adult, binaural Thermometer, clinical, digital 32–43 °C Timer, respiration, for ARI Rubber tourniquet approx. 50cm Wooden disposable tongue depressor Mobile X-ray system with accessories X-ray, viewer (negatoscope), 1 to 3 bodies		
Resuscitation/ anaesthesia equipment	Infusion pump with accessories Nebuliser with accessories Oxygen concentrator flow splitter for newborn/child Oxygen concentrator with accessories Portable pulse oximeter with accessories Spot check pulse oximeter with accessories Syringe pump with accessories Warmer, heating pad, newborn, with accessories Warmer, sleeping bag, newborn, with accessories Warmer, radiant heater, free-standing, with accessories		
Surgical instrument	Chenon dressing forceps 250 mm		
Surgical instrument set	Surgical dressing set		

Usually there is shortage of medical equipment in LMICs. The supplies and equipment listed above (8.2.3.5) are essential for emergency surgeries. In low- and middle-income countries at least 60 per cent of the surgical operations performed are for emergencies.

Equipment used in the ICU varies from general (blood pressure) to very specialised devices (bedside monitors or ventilators). ICU equipment may be used to monitor the patient and/or help treat their illness.

8.2.3.6 Standard list of medical equipment for intensive care

Input/Structure	Equipment/Supplies	Process/Quality	Input
Medical furniture	Hospital ICU bed with mattress Standard bed with mattress Hospital bed screen on castors Bedside cabinet standard Double-door instrument cabinet Double-door medicine cabinet Double-hook infusion stand, on castors Patient stretcher with side rails Baby dressing table Stainless steel instrument table stainless steel on castors Stainless steel dressing trolley with 2 trays Emergency trolley with drawers Soiled linen trolley	Inventory: Record keeping Regular maintenance Regular supplies Appropriate Care on time Detect high-risk cases on time and make timely referral	Prompt management of emergency and proper referral
Medical utensils	Polypropylene basin kidney Stainless steel basin kidney Polypropylene bedpan Polypropylene bowl Stainless steel round bowl, approx. 4 L Stainless steel bowl approx. 180 mL Stainless steel bowl approx. 600 mL Plastic brush and hand scrub Polypropylene jar, forceps Polypropylene thermometer Stainless steel receptacle waste with pedal action Stainless steel dressing tray approx. 300 x 200 x 30 mm		
Medical clothing and accessories	Non-woven surgical cap Plastic clogs Woven surgical drape Plastic draw sheet approx. 90 x 180 cm Woven patient gown woven Woven surgical gown Non-woven surgical mask Woven surgical trousers Woven surgical tunic		
Anthropometric equipment	Mid Upper Arm Circumference (MUAC) measuring tape, infant/newborn Electronic infant scale 10 kg x 5g Infant beam-type scale 16kg x 10g Spring-type infant scale 25 kg x 100 g with set of weighing trousers		
Hospital equipment	Mobile examination light with accessories Electrical suction pump with 1 bottle and with accessories		
Medical diagnostic equipment	Portable ECG recorder with accessories Aneroid adult sphygmomanometer Aneroid child sphygmomanometer Binaural adult stethoscope Binaural paediatric stethoscope Clinical digital thermometer 32–43°C Timer, respiration, for ARI Rubber tourniquet approx. 50cm Wooden disposable tongue depressor Mobile X-ray system with accessories X-ray, viewer (negatoscope), 1 to 3 bodies		

Resuscitation/ anaesthesia equipment	CPAP system, with accessories Basic defibrillator with accessories Adult Magill forceps Child Magill forceps Basic automatic newborn incubator with accessories Infusion pump with accessories Laryngoscope, adult/child, set Laryngoscope, newborn, set Portable patient monitor with accessories Newborn/child oxygen concentrator flow splitter Oxygen concentrator with accessories Portable pulse oximeter with accessories Spot check pulse oximeter with accessories Foot-operated suction pump Newborn resuscitation suction pump Hand-operated adult resuscitator set Hand-operated child resuscitator child, set Hand-operated newborn resuscitator set Suction bulb Syringe pump with accessories Adult medical ventilator with accessories Medical child/newborn ventilator with CPAP and accessories Warmer, heating pad, newborn, with accessories Newborn warmer, sleeping bag, with accessories Free-standing warmer, radiant heater with accessories		
Surgical instrument	Cheron dressing forceps 250 mm		
Surgical instrument set	Surgical dressing set		

Other equipment for specialised diagnostic or therapeutic procedures (e.g. renal replacement therapy, intra-aortic balloon counter pulsation, echocardiography, ECMO etc.) should be available when clinically indicated and in order to support the delineated role of the ICU.

Contents of surgical instrument sets

Surgical instruments are often packed into sets related to the surgical procedures for which they are required.

8.2.3.7 Standard sets of instruments for major surgery

Equipment/Supplies	Description
Laparotomy (Gynaecology/Obstetrics) set	4 x Clamp, towel, Backhaus, 130 mm 1 x Forceps, artery, Kelly, 140 mm, curved 2 x Forceps, artery, Kocher, 140 mm, straight 2 x Forceps, artery, Pean/Rochester, 200 mm, curved 2 x Forceps, artery, Pean/Rochester, 240 mm, curved 6 x Forceps, artery, Halsted-Mosquito, 125 mm, curved 1 x Forceps, artery, Mixter, 230 mm 1 x Forceps, dressing, standard, 155 mm, straight 1 x Forceps, dressing, standard, 250 mm, straight 1 x Forceps, dressing & polypus, Cheron, 250 mm 2 x Forceps, intestinal, clamp, Doyen, 230 mm, curved 2 x Forceps, uterine, haemostatic, Phaneuf, 215 mm, curved 1 x Forceps, uterine, vulsellum, Duplay, 280 mm, curved 2 x Forceps, tissue seizing, Allis, 150 mm 1 x Forceps, tissue & organ holding, Babcock, 200 mm 2 x Forceps, tissue holding, Duval, 230 mm 1 x Forceps, tissue, standard, 145 mm, straight 1 x Forceps, tissue, standard, 250 mm, straight 1 x Needle holder, Mayo-Hegar, 180 mm, straight 1 x Retractor, abdominal, Collin, 3 blades 1 x Retractor, abdominal, Balfour, 3 blades 1 x Retractor, Farabeuf, double-ended, 180 mm, pair 1 x Scalpel handle, no.4 1 x Scissors, Metzembaum/Nelson, 180 mm, curved, blunt/blunt 1 x Scissors, Metzembaum/Nelson, 230 mm, curved, blunt/blunt 1 x Scissors, Mayo, 170 mm, curved, blunt/blunt 1 x Scissors, Mayo, 230 mm, curved, blunt/blunt 2 x Spatula, abdominal, malleable, 270 mm 1 x Tube suction, Yankauer, 270 mm 1 x Bowl, stainless steel, 600 mL
Suture set	1 x Scissors, Deaver, 140 mm, curved, sharp/blunt 1 x Needle holder, Mayo-Hegar, 180 mm, straight 1 x Forceps, artery, Kocher, 140 mm, straight 1 x Scalpel handle, no.4 1 x Forceps, tissue, standard, 145 mm, straight 1 x Probe, double-ended, 145mm

The availability of proper instruments is critical to surgeons'' smooth and quick performance of surgical operations. The presence of both major and minor surgical sets is relevant.

8.2.3.8 Standard sets of instruments for minor surgery

Equipment/Supplies	Description
Basic surgery set	4 x Clamp, towel, Backhaus, 130 mm 2 x Forceps, tissue seizing, Allis, 150 mm 6 x Forceps, artery, Halsted-Mosquito, 125 mm, curved 1 x Forceps, artery, Kocher, 140 mm, straight 1 x Forceps, dressing, standard, 155 mm, straight 1 x Forceps, tissue holding, Collin, 160 mm 1 x Forceps, tissue, standard, 145 mm, straight 1 x Forceps, dressing & polypus, Cheron, 250 mm 1 x Needle holder, Mayo-Hegar, 180 mm, straight 1 x Probe, double-ended, 145 mm

	1 x Retractor, Farabeuf, double-ended, 120 mm, pair x Scalpel handle, no.4 1 x Scissors, Metzembaum, 140 mm, curved, blunt/blunt 1 x Scissors, Mayo, 140mm, curved, blunt/blunt 1 x Bowl, stainless steel, 180 Ml
Examination/suturing, vaginal/cervical set	1 x Scissors, Mayo, 170 mm, curved, blunt/blunt 1 x Needle holder, Mayo-Hegar, 180mm, straight 2 x Retractor, vaginal, Doyen, 45 x 85 mm 1 x Speculum, vaginal, Graves, 75 x 20 mm 1 x Speculum, vaginal, Graves, 95 x 35 mm 1 x Speculum, vaginal,Graves, 115 x 35 mm 2 x Forceps, dressing & polypus, Cheron, 250mm
Delivery set	1 x Scissors, Mayo, 140mm, curved, blunt/blunt 1 x Scissors, gynaecological, 200mm, curved, blunt/blunt 2 x Forceps, artery, Kocher, 140mm, straight
D&E set	1 x Dilators, uterine, tapered, up to 51 mm 1 x Forceps, dressing, ring 1x Forceps, uterine, ovum, Bierer, large 1x Forceps, uterine, ovum, Bierer, small 1x Forceps, uterine, ovum, Sopher, small 1 x Retractor, vaginal, Doyen, 45 x 85 mm 1 x Retractor, vaginal, Auvard, 38 x 80 mm 1 x Curette, postpartum flexible, large 1 x Forceps, tenaculum, atraumatic 1 x Speculum, vaginal, Graves, wide mouth 1 x Bowl, stainless steel, 180 mL
Vacuum aspiration set	1 x Dilators, uterine, Hegar, double-ended, 3–4mm to 17–18mm, stainless steel 1 x Forceps, dressing, ring 1 x Forceps, tenaculum, atraumatic 1 x Speculum, vaginal, Graves, 95 x 35 mm 1 x Bowl, stainless steel, 180 mL
Embryotomy set	1 x Cranioclast, Braun, 420 mm 1 x Perforator, Smellie, 250 mm 1 x Scissors, gynaecological, 200 mm, curved, blunt/blunt 1 x Hook, decapitation, Braun, 310mm

Minor surgery instrument set contains a large assortment of instruments. One particular set can often be used for multiple procedures, but only in emergency situations.

8.3 EPR

EPR, which has been recommended as a standard for maternal and newborn record keeping, is designed to provide access to information in a digital format that can be shared among the relevant multidisciplinary team anywhere at any time (O'Sullivan et al. 2011).

8.3.1 Aim

Aim of EPR is to ensure a complete and contemporaneous record of all the care the woman receives and that a full and accurate picture is provided to all care givers for coordinated, informed, continuous care without unnecessary duplication of care.

The following relevant legislative documents were reviewed while preparing the standard for keeping maternal and newborn health care records:

- Civil Penal Code (MulukiAin) (1963/64)

- Nepal Medical Council Act, 2020 B.S 1st, 2nd and 3rd amendments respectively 2044 B.S., 2047 B.S., and 2056 B.S. 5
- Evidence Act, 2031 B.S. 6. Drug Abuse Control Act., 2033 B.S. (1976)
- Medicine Act, 2053 B.S.
- Compensation for Torture Act 2053 B.S.
- Consumer Protection Act, 2053 B.S. (1997)
- Nepal Health Services Act, 2053 B.S.
- Constitution of Nepal (2015).

8.3.2 Approach

Implementing EPR can be challenging: the successfully implementation of an EPR system requires a multi-disciplinary approach, ranging from ensuring privacy and security compliance to rethinking practice workflows and training staff. There are two approaches for implementing EPR: immediate and incremental. The incremental approach is recommended for use, as it reduces productivity loss due to operational and workflow changes from EPR adoption and allows physicians and staff to gradually learn and master the capabilities of the system.

Comparison of the immediate and incremental approaches to EPR implementation

Stakeholder	Immediate	Incremental
Physicians and staff	Mobilise all physicians and staff to use the EPR on the first day of launch. This allows all users to access implementation resources and enables all users to gain proficiency in the EPR at the same time	Train physicians and staff with basic EPR functions and focus on optimisation after the launch is complete. This allows physicians and staff to acclimatise to their new system before bringing trainers back to provide additional/supplemental education
		Establish a mentorship programme that enables staff with similar roles to share their knowledge and experience with the system, rapidly increasing the level of EPR proficiency in the practice
		Start with an enthusiastic and prepared physician and/or staff member using the EPR the first week and gradually increase the number of physicians and staff using the system
Patients	Use the EPR for all patients in the practice. This approach can minimise variation of protocols used for different patients and appointment types	Use the EPR according to visit type (e.g. new patients only and patients that made appointments)
		Use the EPR according to number of patient visits per day (e.g. a few patients on the first day of implementation, increasing the number of patient visits documented in the EPR per day over time)

Source: American Medical Association. Practice improvement series: EPR implementation. 2015.

8.3.3 Standard statement, readiness and application

Record keeping in all maternity services should be of a high standard of EPR, to provide maximum benefit in patient management, to facilitate audit and record the process of obtaining valid consent.

Readiness

- Organisation has a clearly defined digital strategy that acknowledges the maternity service and the challenges it faces and is aligned to clinical and corporate objectives

- Implementation of the maternity component of the digital strategy is fully aligned to, and supported by, a service transformation programme within the maternity service
- Digital technology is used to support improved collaboration and coordination of care provision throughout the maternity pathway
- A recognised digital leader (trained GP) is in place within the maternity service
- Record-keeping audits are undertaken by staff as part of annual supervisory reviews. As a minimum, two record-keeping audit tools should be completed on an annual basis and discussed as part of the annual supervisory review
- As an integral part of the knowledge and skills framework, staff should be appraised annually to ensure competency in computer skills and the ability to access the current approved guidelines via the respective provincial Ministry of Social Welfare and Ministry of Health and Population.

Application of standard

While implementing EPR, issues such as confidentiality, legal issues and threats to information have to be taken seriously.

Confidentiality

- Be aware of legal requirements and guidance regarding confidentiality, and make sure your practice is in line with national and local policies
- Be aware of the rules governing confidentiality when supplying and using data for secondary purposes. Follow local policy and guidelines when using records for research purposes
- Do not discuss people in your care where you might be overheard, nor leave records, either paper or digital, where they might be seen by others
- Do not take or keep photographs of any woman or their family that are not clinically relevant.

EPR should be confidential except when:

- Women consent for their records to be shared with other agencies or caregivers
- If it is necessary to share information without consent to prevent or lessen a serious threat to the life or health of a mother or baby.

8.3.3.1 Standard for contents of EPR

Information entered into EPR by health care providers	
Antenatal history	History recorded early in pregnancy Patient demographics Demographic history Legal information Individual requirements Professional summary Appointment and attendance details Immunisations Allergies and adverse reactions Lab results Images Obstetric history Family history

	Relevant past medical, surgical and mental health history Clinical risk factors
Issues and plans	Identified medical and obstetric issues and management plans: Examination findings Medications and medical devices Pregnancy outcome delivery and birth Social context Problem list Safety alerts Drug allergies Anaesthetic allergies/problems Any adverse reactions Hearing or visual impairments Language issues Foetal loss (tear drop sticker) Another member of the family with the same name/initials A same-gender twin Safeguarding
Health care providers	Details about the providers of maternal care
Admission details	Annex I
Antenatal visits	Summaries of visits to clinicians for ANC
Test results	Results of laboratory and ultrasound tests
Labour details	Annex II
Postpartum details	Annex III
Newborn details	Annex IX to XVI
Discharge details	
Referral details	Annex IV, V, XIV
Details recorded by women	
Birth preferences	Preferences for birth and PNC
Accompany	Name of accompanied person

While there is no argument that electronic documentation of patient visits and data brings improved patient care there are also critical issues that could threaten the health care system:

Legal issue

There is increasing concern that electronic documentation could open physicians to an increased incidence of malpractice suits. Disabling physician alerts, selecting from dropdown menus, and the use of templates can encourage physicians to skip a complete review of past patient history and medications, and thus miss important data.

Issue of threats to information

There are several threats to EPR, such as human threats (employees or hackers), natural and environmental threats (earthquakes, hurricanes and fires), and technology failures (system crashing.)

8.4 Audit

Aspects of structure, processes, and outcomes of maternity care are systematically evaluated against an explicit standard, followed by implementation any changes at an individual, team, or service level with further monitoring to confirm improvement in health care delivery where indicated (NICE 2002).

8.4.1 Aim

The aim is to improve the quality of maternity care.

8.4.2 Approach

The simplest form of a review of the EPR is recommended.

8.4.3 Standard, readiness and application

The audit indicators identified should ensure that the best possible care is provided, given available resources, and they are based upon the best available evidence.

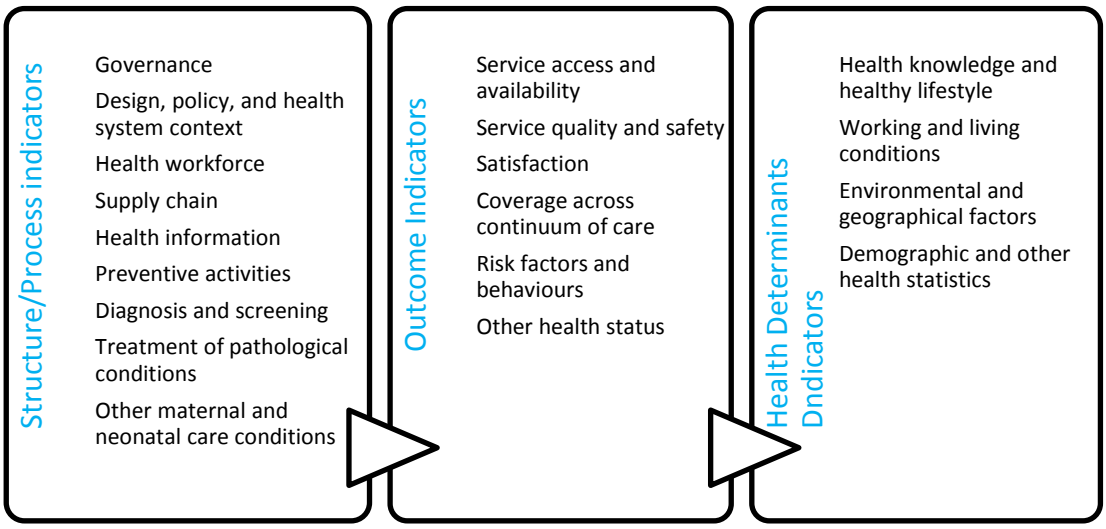
Readiness

- Guidelines/protocols in place
- Trained personnel
- Agreements with local health facility authority.

Application of standards

Maternal and newborn care providers should identify audit indicators most appropriate to the care they have been providing. Entry should be set locally to prioritise those areas that need further improvement. Chosen standards should be an integral part of the audit and commissioning process.

8.4.3.1 Standard for grouping of audit indicators



The following indicators can be used up to primary and hospital level (second or third level of care) and are grouped according to type, aspect of care measured and phase of the maternal and newborn continuum of care. These indicators serve as signal to measure whether the standard is being attained. A list of audit criteria and measurement indicators applicable to all levels of maternity care facility follows.

8.4.3.2 Standard for audit measurements of maternity services

Structure/Output	
Standard	Measurement
Every woman and newborn receives evidence-based continuum of care throughout preconception, birth preparedness and readiness, pregnancy, labour and childbirth and the postpartum period irrespective of their social status	• % of women receiving first ANC and 8ANC, provision of skilled birth attendance, postpartum care immediate, first follow-up contact (24 to 48 hours), second follow-up contact (7 to 14 days), and third contact (4 to 6 weeks) • % of newborns receiving essential new-born care immediately after birth intervention • % reduction of social and cultural barriers to maternal care, particularly through working FCHVs
Every mother and newborn receives evidence-based care in response to complications during pregnancy, labour and childbirth and the postpartum period at various levels of health facilities depending on the condition of mother and newborn	• % of health facilities with policies regarding safe pregnancy • % of mothers with mild complications receiving Level-II care • % of mothers with moderate complications receiving Level- II care • % of mothers with severe life-threatening complications receiving Level-III or Level-IV care • % implementation of standard diagnosis criteria and responses to labour challenges • % of newborns that are not breathing spontaneously receiving appropriate stimulation and resuscitation with bag-and-mask within one minute after birth, in accordance with WHO 2017 guidelines
Every mother and newborn with condition(s) that cannot be dealt with effectively with the available resources is appropriately referred	• % of mothers and newborns appropriately assessed on admission and during labour and the early postpartum period to identify the need for referral, with the decision to refer made without delay • % of women provided with transportation support, and inter-facility transfer • % of health facilities with appropriate referral mechanisms in place
Process/input	
Standard	Measurement
Provision of maternal and newborn care is respectful and in accordance with the human-rights-based approach to improve women's experience of pregnancy, labour and childbirth and postpartum period	• % of mothers that have privacy around the time of labour and childbirth, and whose confidentiality is respected • % of mothers or newborns subjected to mistreatment and disrespect, such as physical, sexual or verbal abuse, discrimination, neglect, detainment, extortion or denial of services • % of health facility policies and processes that support respectful, evidence-based clinical care during labour and childbirth • % of mothers making informed choices in the services they receive, and to whom the reasons for intervention or outcomes are clearly explained
Effective communication and engagement among health care providers, health service managers, women and representatives of women's groups and women's rights movements is essential to ensure that care is responsive to women's needs and preferences in all contexts and settings	• % of women involvement in decision making for their care • % of women and their families experiencing coordinated care with clear and accurate information exchange between relevant health and social care professionals • % of teams that are highly reliable and have better interprofessional communication at critical points in care • % of facilities collaborating with stakeholders and communities on issues related to maternal and newborn health

Ensure a respectful and dignified environment both for those both receiving care and for those providing care, acknowledging that staff may also experience disrespect and abuse in the workplace and/or violence at home or in the community	• % of health care providers in denial for respectful working environment • % supporting health care workers in providing respectful care to women and newborns and creating a healthy working environment
The health facility has an appropriate physical environment with appropriately trained clinical and managerial personnel, utilities, medicines, supplies and equipment for routine maternal and newborn care and management of complications	• % with functional, reliable, safe and sufficient water, energy, sanitation, hand-washing and waste-disposal facilities to meet the needs of staff, women and their families • % of consultant leads working in isolation and supported by consultant colleagues and a team of specialists in maternal newborn care to include associate specialists/speciality doctors, nurses and GPs • % of accredited consultants in their respective councils to ensure adequate quality of service provision, training, clinical governance and risk management across all three levels of service provision • % of SBAs and support staff with appropriate competencies and skills mix to meet needs during labour and childbirth and the postpartum period • % of health facility managerial and clinical leadership that is collectively responsible for creating and implementing appropriate policies and fosters an environment that supports facility staff to undertake continuous quality improvement • % adequate stock of medicines, supplies and equipment available for routine care and management of complications • % of health facilities with a competent health workforce to provide care during labour and childbirth • % of health facilities with appropriate physical environment for care during labour and childbirth
Record keeping in all services should be of a high standard, to provide maximum benefit in patient management, to facilitate audit and record the process of obtaining valid consent	• % of women and newborns with complete clinical records (relevant clinical findings; decisions made and actions agreed, and who is making the decisions and agreeing the actions; information given to patients; any drugs prescribed or other investigation or treatment; and details of who is making the record and when it was made throughout pregnancy, labour and childbirth) • % of health facilities with a mechanism in place for data collection, analysis and feedback, as part of its monitoring and performance improvement activities around the time of childbirth and accurate data on childbirth care is essential for monitoring progress • % clinical records kept confidential at all times (for those using paper notes these should be stored in a secure place as per your local guidelines and protection of EPR)
All services continually monitor and evaluate themselves in order to maintain and improve performance	• % of providers with a programme in place to regularly audit clinical service provision in terms of quality as well as access, process and outcome issues from a consumer viewpoint, including auditing complaints and near misses acted upon to ensure appropriate improvements in service provision • % of commissioners and local authority providers for maternal and newborn health, together with specialist services, with established structures and processes for the monitoring and evaluation of initiatives introduced to improve local sexual

	health care provision (identification of any inequality gaps that may exist within their local services through needs assessment; user involvement is essential in this process) • % of health facilities collecting, analysing and using data to support and improve care during labour and childbirth • % of services providing quarterly reports to the appropriate body in a timely manner • % of services working to WHO standards for risk management • % of health facilities that have developed and implemented a monitoring and evaluation framework

Audit quality indicators are a potential portfolio of quantitative measures that may provide new insights about how high-quality audits are achieved.

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Annex I: Standard form for antenatal record

Patient's Name	Age	Ethnic group	Address	
Phone(H)	W	Father of baby	Tribe/Ethnicity	Age

Pregnancy History

Gravida: Para: Term: Preterm: Abortion: Sponataneous: Induced: Living: Stillbirth: Neonatal Death:

Gestational Age Assessments:	**Laboratory Findings: First Prenatal contact**			**Laboratory Findings: 28 Wk & subsequent contact**		
LMP:…… Certain?...Yes ☐No .....☐.....	Date	Test	Result	Date	Test	Result
EDD		Hct/Hb			Hct	
		Blood Group & Rh Type			RPR/VDRL	
Use of Depo Yes ☐o ☐		Antibodies			Urine R/M	
Date of Last dose Taken ……		Serology			Urine C&S	
Ultrasound Scan:		HIV			Diabetes Screen/GCT	
		HepBsAg				
Date:……..		Rubella			GBS	
Gestational Age(weeks) by LMP…….. ……		Diabetes Screen: Random Blood Sugar				
Gestational Age (weeks) by USG……..						
EDD by USG		Urine routine and microscopy			AFP/Triple Screen	
		Urine C&S				
		Pap smear				
		Gonococcus				
Predicted EDD:		Chlamydia				
Reliability: Poor ☐Good ☐ Excellent ☐	Influenza Vaccine Date Given:…… Td Date Given…1st dose……2nd dose……					

Prenatal Record														
Ht (cm) Date														
Weeks of Gestation D/S														
Wt(Kg). Pre…….. Preg…….														
Blood Pressure (mm Hg)														
Fundal Height (Wk)/symphysiofundal measurement (cm)														
Lie/Presentation/Position/Engagement														
Foetal Movement														
Foetal Heart Rate (Pinard's/Doppler)														
Edema: site														
Urine: Protein/Albumin														
Risk Assessment/High risk factors														
Provider Initials														

Patient Identification	Signature Code: Initials	Signature & Title

	WIC Yes ☐o ☐edicaid Yes No ☐ ☐ Hospital/Health facility for Delivery:
	Labor support:
	Childbirth Education:

For risk scoring

Prenatal Risk Assessment:		Low Score =Score 0-2 Medium Risk= 3-6 Extreme Risk=Score 7			
Reproductive History		Associated Conditions		Present Pregnancy	
Age Under 16 or Over 35	1…..	Chronic Renal Disease	2……	Bleeding:< 20 weeks	1…….
Parity 0 or Over 5	1…..	Diabetes: Gestational	2……	After 20 weeks	1-3..
Habitual Abortion	1…..	Class B or Higher	3……	Anaemia Hematocrit<34	1……
Infertility	1…..	Cardiac Disease	1-3…..	Prolonged Pregnancy>42 weeks	3……
P P Haemorrhage, Manual Removal	1…..	Major Gyn Surgery, Cone Biopsy	2……..	Hypertension, Pre-eclampsia	2-3….
Previous Baby>9lbs(4050)gms)	1…..	……	1-3…..	Premature Rapture of Membranes	3……
<$5^{1/2}$ lbs(2500gms)	2…..	…….	1-3…..	Polydramnios	3……
Previous Toxemia, Hypertension	1…..	……	1-3…..	Small for Dates	3……
Previous Cesarean Section	3…..	Cigarette Smoking	1……..	Multiple Pregnancy	3……
Previous Stillbirth N N D	3…..	Teratogen/Drug Exposure	1-2…..	Breech >36 weeks	3……
Prolonged Labor (>30 Hrs.)or Difficult Delivery	1….	Significant Social problem……..	1-2…..	Rh Negative. Sensitised?	1-3..
…….	1…..	Alcohol Use Screens	1-2…..	Genital Herpes, active Excessive or inadequate weight gain	1-2..
……	1…..	Domestic Violence Screens……	1-2…..	……..	1-3

Annex II: Standard form for labour and childbirth record

			Record Number
Name		Age	Gravida, Parity
Address			
During labor	At or after birth-mother	At or after birth-Newborn	Planned Newborn treatment
Admission Date	Birth Time	Live birth ☐ Still birth Fresh ☐Macerated ☐	
Admission Time	Oxytocin-Time Given	Resuscitation No☐Yes ☐	
Time and date Active labor started	Placenta Complete No☐ Yes ☐	Birth Weight	
Time and date Membranes ruptured	Time and date Delivery of baby	Completed Gestation Weeks……. or Preterm	
Time and date second stage started		Second Baby	
Time and date expulsion of placenta and membranes	Estimated Blood Loss		
Perineum	Intact	1st degree/2nd degree tear/Episiotomy	3rd degree/4th degree tear
Entry Examination More than one foetus ☐ Specify Foetal lie: Longitudinal ☐ Transverse ☐ Foetal Presentation: Head☐Breech ☐Other Specify ☐			
Stage of labor Not in active labor ☐Active labor ☐			

Not in active labor													Planned Maternal Teratment
Hours since arrival													
Hours since ruptured membranes													
Vaginal bleeding (0 + ++)													
No. of Strong Contractions in 10 minutes													
Foetal heart rate (BPM)													
Temperature (Axillary)													
Pulse (BPM)													
Blood Pressure(Systolic/Diastolic)													
Urine Voided (mL)													
Cervical Dilatation(Cm)													

Problem	Time Onset	Treatments other than normal supportive care
If mother referred during labor or delivery, record the time, place of referral and explain the cause		

Annex III: Standard form for postpartum record

Hours in active labor	Every 5-15 min for 1st hour	2hr	4hr	8hr	12hr	16hr	20hr	24hr
Time								
Rapid assessment								
Bleeding (0, +, ++)								
Uterus Hard/Soft?								
Maternal: Blood Pressure								
Pulse								
Urine Voided								
Vulva								
Newborn: Breathing								
Warmth								

Planned Treatment	**Time**
Mother	
Newborn	

Advice and Counsel	Preventive Measures
Mother	For Mother
☐ Postpartum care and hygiene ☐ Nutrition ☐ Birth spacing and family planning ☐ Danger signs ☐ Follow-up visits Baby ☐ Exclusive breastfeeding ☐ Hygiene, cord care and warmth ☐ Special advice if low birth weight ☐ Danger signs ☐ Follow-up visits	☐ Iron /folate ☐ Calcium ☐ Albendazole ☐ ART For Baby ☐ Risk of bacterial infection and treatment ☐ BCG,OPV-O, Hep O ☐ RPR result and treatment ☐ TB test result and prophylaxis ☐ ART

Annex IV: Standard form for referral record

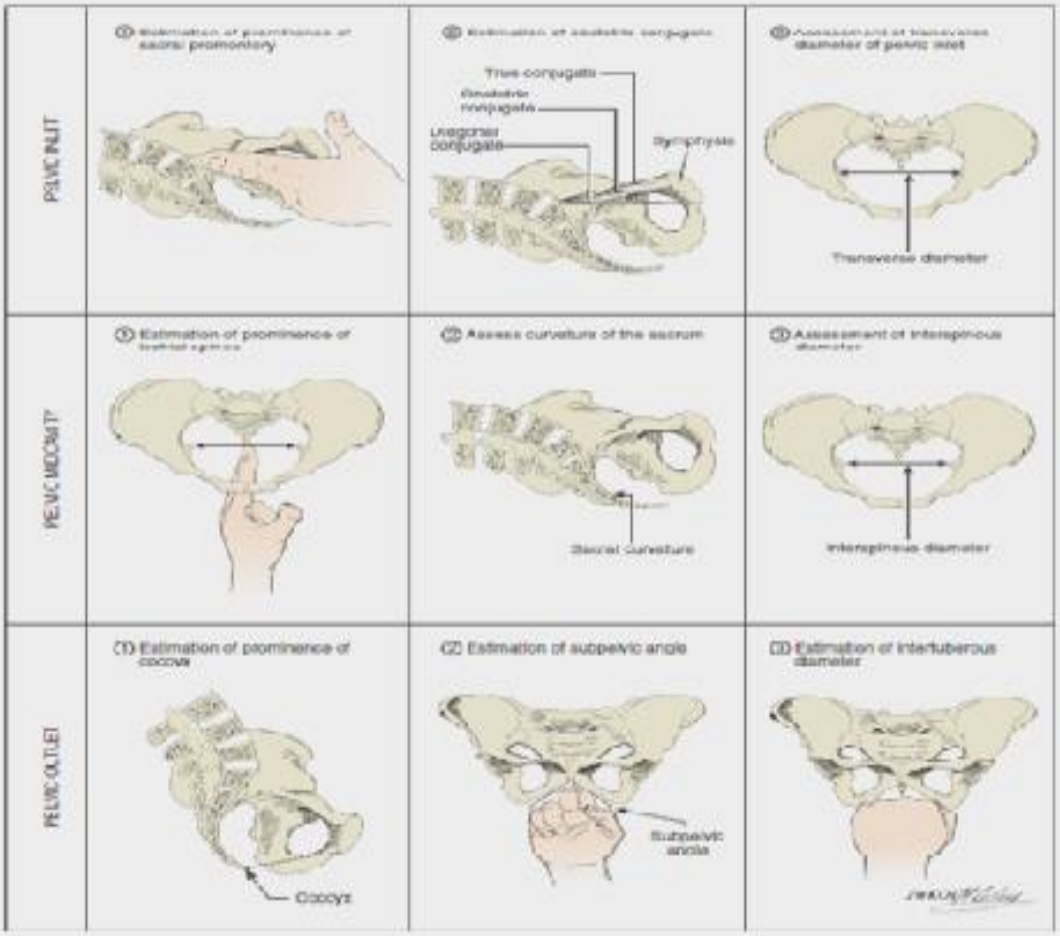
Referred by	Record Number	Referred Date	Time
Name		Arrival Date	Time
Facility			
Accompanied by the health worker			
Information given to the woman and companion about the reasons for referral		Information given to the woman and companion about the reasons for referral	

Annex V: Standard form for referral feedback record

Referred by	Record Number	Admission Date	Time
Name		Discharge Date	Time
Facility			
Woman	**Neonate**		
Name	Age	Name	Date of birth
Address		Birth weight	Age at discharge(days)

Main reasons for referral Emergency ☐ Non emergency☐ To accompany the mothe☐	Main reasons for referral Emergency ☐ Non emergency☐ To accompany the neonat☐
Diagnoses Treatments given and time	Diagnoses Treatments given and time
Treatments and recommendations on further care	Treatments and recommendations on further care
Follow –up visit When Where	Follow –up visit When Where
Preventative measures	Preventative measures
Preventative measures	Preventative measures
If death: Date Causes	If death: Date Causes

Annex VI: Clinical pelvimetry



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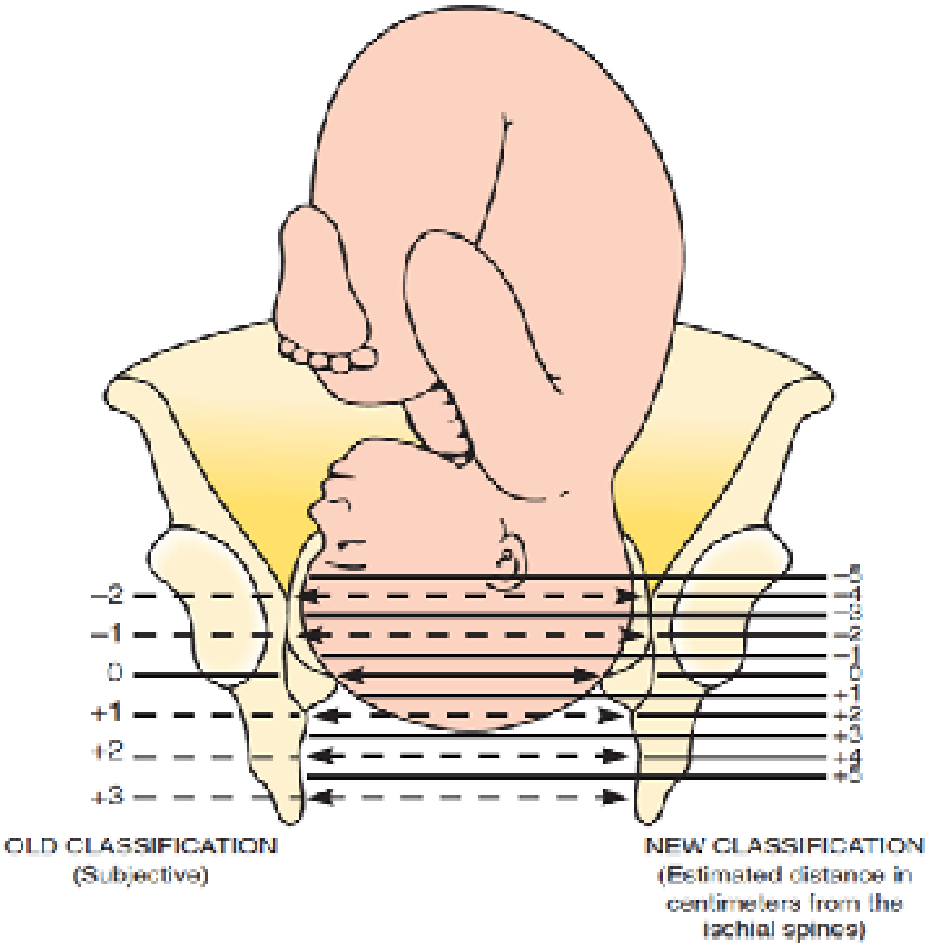
Annex VII: Foetal head station



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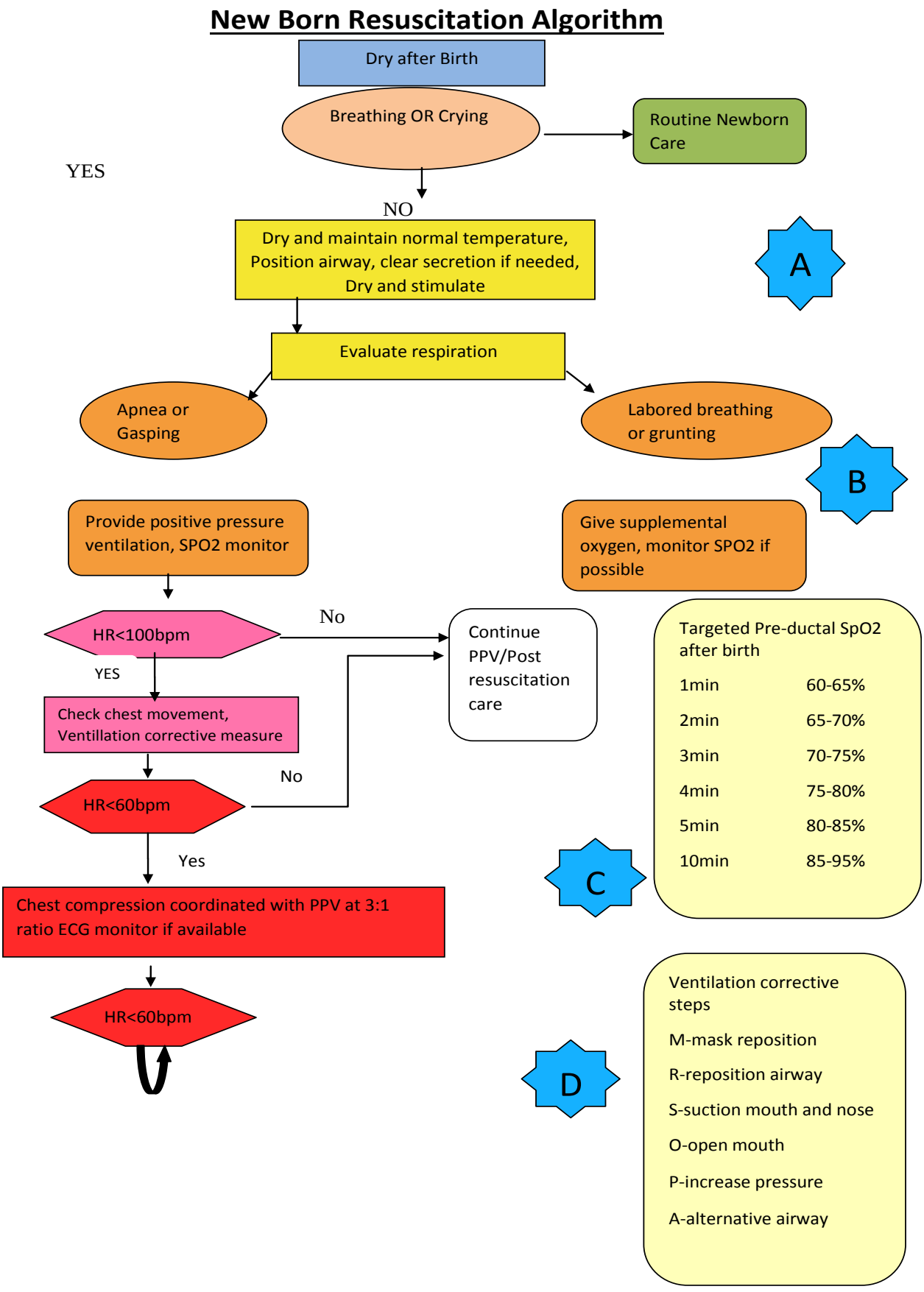
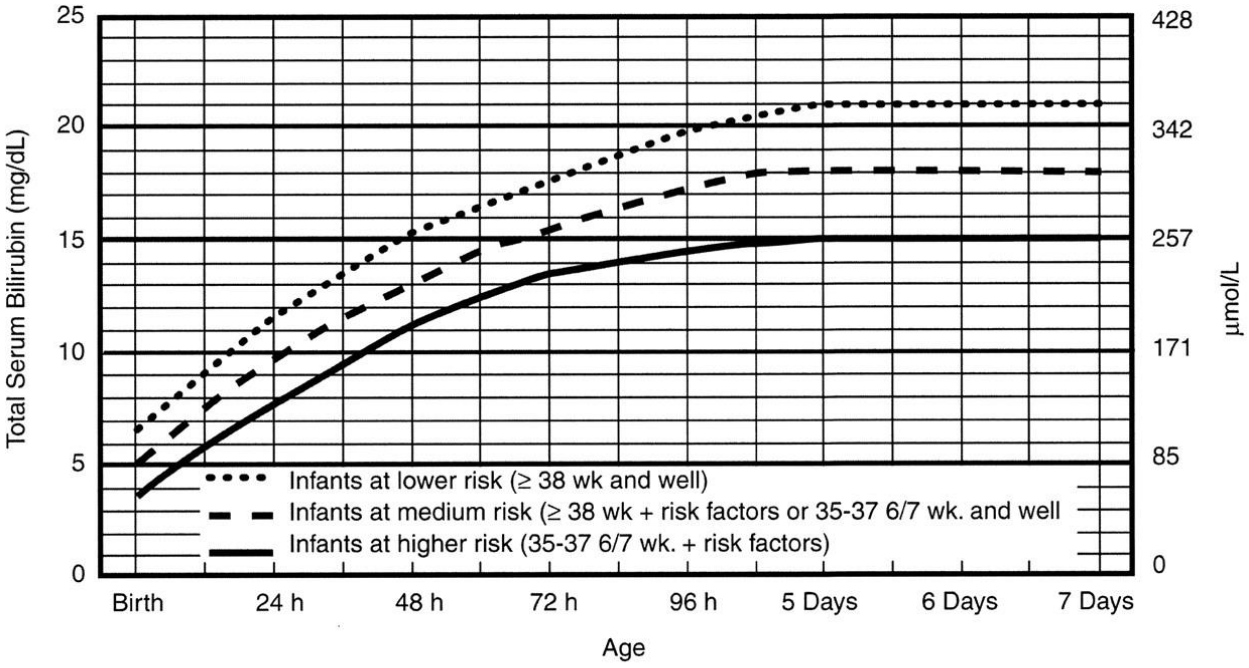
Annex VIII: Newborn Resuscitation Algorithm



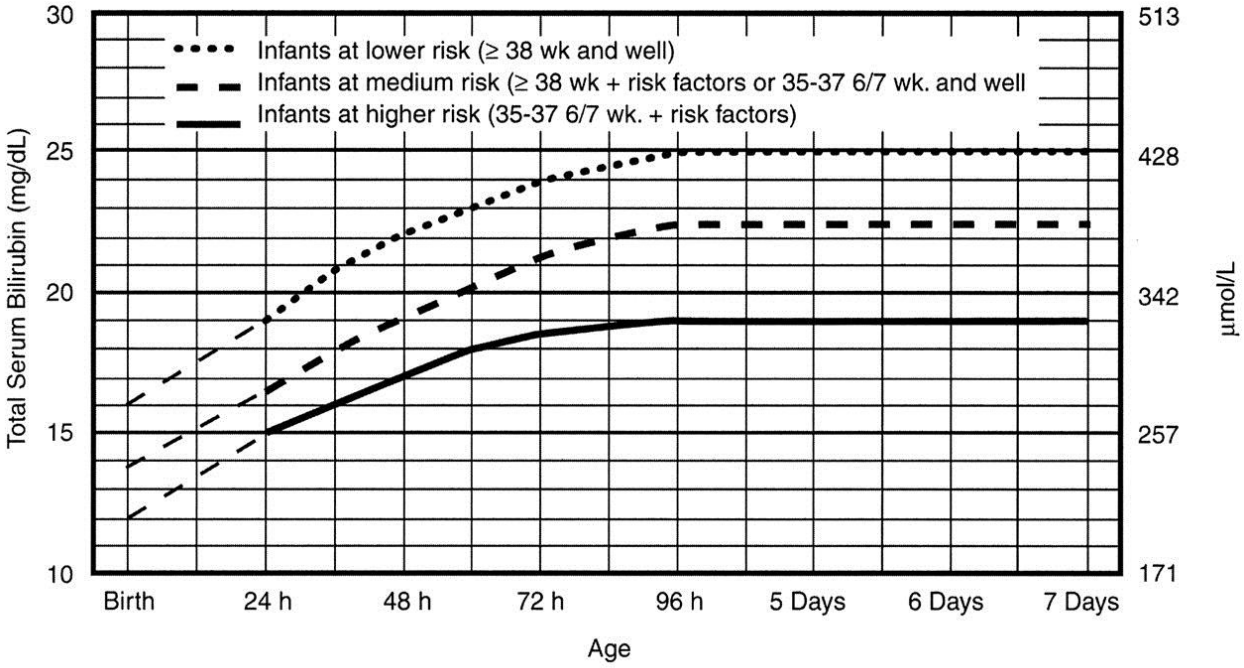
Annex IX: Guidelines for phototherapy in hospitalized infants of 35 or more weeks' gestation

Guidelines for phototherapy in hospitalized infants of 35 or more weeks' gestation.



- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin.
- Risk factors = isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis, or albumin < 3.0g/dL (if measured)
- For well infants 35-37 6/7 wk can adjust TSB levels for intervention around the medium risk line. It is an option to intervene at lower TSB levels for infants closer to 35 wks and at higher TSB levels for those closer to 37 6/7 wk.
- It is an option to provide conventional phototherapy in hospital or at home at TSB levels 2-3 mg/dL (35-50mmol/L) below those shown but home phototherapy should not be used in any infant with risk factors.

Annex X: Guidelines for exchange transfusion in infants 35 or more weeks' gestation.



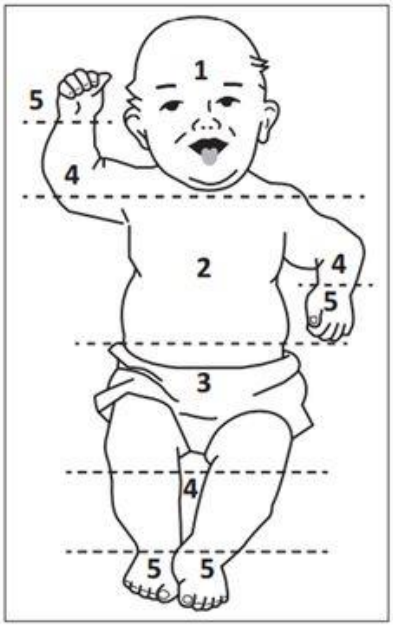
- The dashed lines for the first 24 hours indicate uncertainty due to a wide range of clinical circumstances and a range of responses to phototherapy.
- Immediate exchange transfusion is recommended if infant shows signs of acute bilirubin encephalopathy (hypertonia, arching, retrocollis, opisthotonos, fever, high pitched cry) or if TSB is ≥5 mg/dL (85 µmol/L) above these lines.
- Risk factors - isoimmune hemolytic disease, G6PD deficiency, asphyxia, significant lethargy, temperature instability, sepsis, acidosis.
- Measure serum albumin and calculate B/A ratio (See legend)
- Use total bilirubin. Do not subtract direct reacting or conjugated bilirubin
- If infant is well and 35-37 6/7 wk (median risk) can individualize TSB levels for exchange based on actual gestational age.

Annex XI: Phototherapy and exchange transfusion cut-offs for preterm babies

Birth weight	Total serum bilirubin (mg/dL)			
	Healthy baby		Sick baby	
	Phototherapy	Exchange transfusion	Phototherapy	Exchange transfusion
<1000 g	5-7	11-13	4-6	10-12
1001-1500 g	7-10	13-15	6-8	11-13
1501-2000 g	10-12	15-18	8-10	13-15
2001-2500 g	12-15	18-20	10-12	15-18

Annex XII: Krammer's rule for visual assessment of neonatal jaundice.

Area of the Body	Level	Range of Serum Bilirubin	
		µmol/L	mg/dL
Head and neck	1	68 - 133	4 - 8
Upper trunk (above umbilicus)	2	85 - 204	5 - 12
Lower trunk and thighs (below umbilicus)	3	136 - 272	8 - 16
Arms and lower legs	4	187 - 306	11 - 18
Palms and soles	5	≥306	≥18



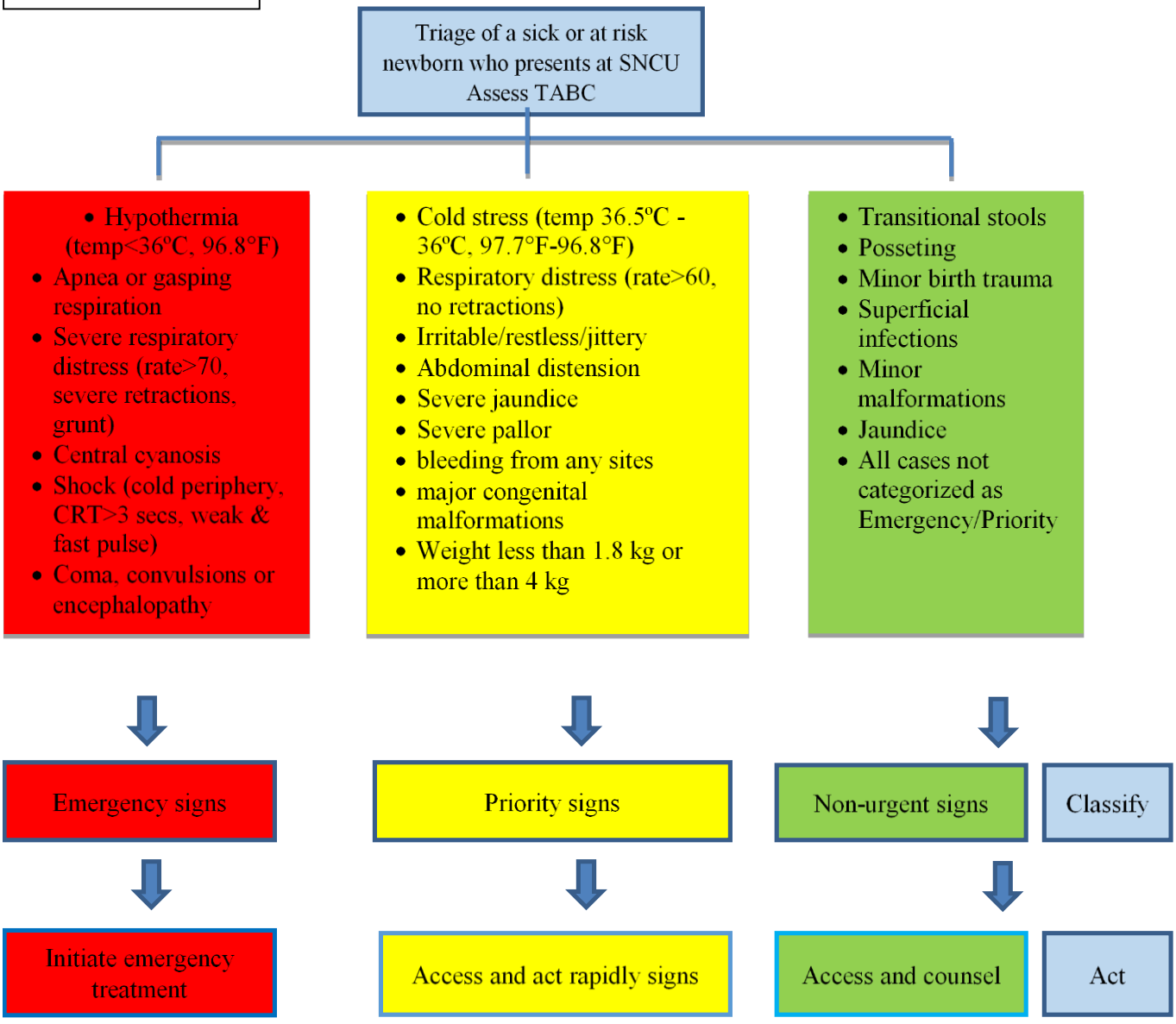
Annex XIII: Triage of a sick newborn

Triage of a sick newborn

Assess:
- Temperature
- Respiration
- Color
- Capillary refilling time
- Look for seizure and consciousness level

Triage of sick newborns

Triaging is sorting of a newborn to rapidly screen sick newborn for prioritizing management



*Newborns classified as "**emergency**" require urgent intervention and emergency measures. All such newborns will be admitted to SNCU after initial stabilization.
Newborns classified as "**Priority**" are sick and need rapid assessment and admission to SNCU.

Annex XIV: Sample newborn referral note

Date_____ Time_____
Address_____
_____
Name_____ Mother's name_____ Father's name_____
Date and Time of Birth_____ Sex_____ Mother's Blood GP: _____

Birth Details

Mode of Delivery_____ Place of Delivery_____
Time or 1st Cry_____ Apgar 1 min_____5 min_____10 min_____
Resuscitation details Initial steps/Free flow oxygen/Bag and Mask Ventilation / Chest compressions/ Medications
Duration of: O2_____, Bag and Mask Vent. _____, Chest compression _____
Birth weight _____grams

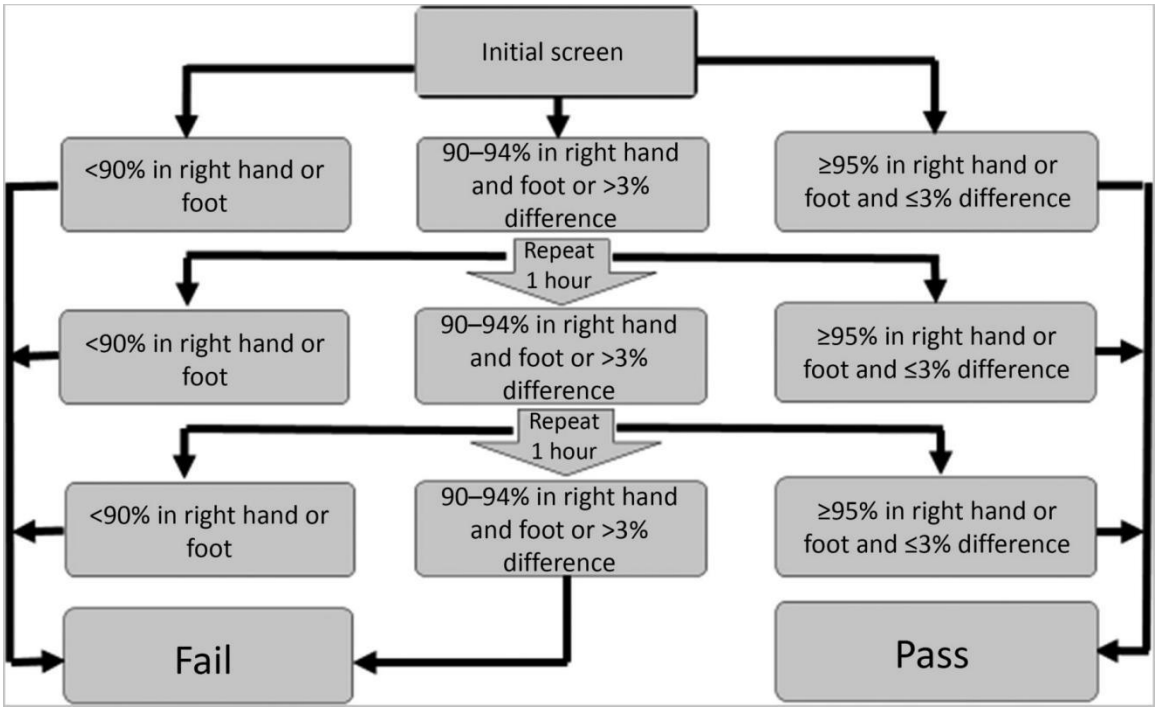
Clinical course

Feeding well Yes/No, Breastfeeds Yes/No, Spoon Feeds Yes / No
Type of feeds EBM / Formula / Any other milk Diluted Milk Yes / No
Passage of Urine Yes / No Stool Yes / No
Reason for transfer LBW / Respiratory distress / Not feeding well / Convulsions / Jaundice / Malformation / Birth asphyxia / Any other

Examination Findings

Jaundice Yes / No Any congenital malformation _____
Soles Warm/Cold, Trunk Warm/Cold, Temperature _____°C
Heart Rate_____/min Resp Rate___/min Chest Retractions Yes/No
Central Cyanosis Yes / No CRT < 3 sec / > 3 sec
Receiving oxygen Yes / No With Nasal Cannula / Face mask / Hoodbox
SpO2 ___% Blood sugar____ mg%
Time of last feed ____am/pm
Investigations with date
_____
_____
Treatment given
_____
_____
Place to which being referred_____

Annex XV: AAP CCHD screening algorithm for the well-baby nursery at ≥24 hours of age or just before discharge if <24 hours of age.



Adapted from Kemper AR, Mahle WT, Martin GR, et al. Strategies for implementing screening for critical congenital heart disease. Pediatrics. 2011;128(5)

Annex XVI: Routine national immunisation schedule

Vaccine	Dose	Target Age	Remarks
BCG	1	Birth or first contact	
bOPV	1	6 weeks	
	2	10 weeks	Minimum interval: 4 weeks
	~~3~~	14 weeks	Minimum interval: 4 weeks
DPT + Hep B + Hib	1	6 weeks	
	2	10 weeks	Minimum interval: 4 weeks
	3	14 weeks	Minimum interval: 4 weeks
PCV	1	6 weeks	
	2	10 weeks	Minimum intervals 4 weeks
	3	9 months	With MR 1st dose
FIPV	1	6 weeks	
	2	14 weeks	
Rota virus	1	6 weeks	
	2	10 weeks	
Measles-Rubella	1	9 months	
	2	15 months	
Japanese Encephalitis	1	12 months	

Source: Routine National Immunisation Schedule Nepal.

Annex XVII: Glossary related to Newborn Care

Apnoea: A pause in breathing for a short period. The baby may turn blue, become bradycardic. Common in premature babies.

Birth weight: The first of the foetus or newborn obtained after birth. For live births, birth weight should preferably be measured within the first hour of life before significant postnatal weight loss has occurred, recorded to the degree of accuracy to which it is measured.

Continuous Positive Airway Pressure (CPAP): A type of ventilation support that delivers oxygen or air under pressure to baby through their nose.

Cyanosis: Bluish or dusky colour of the skin, lips and nailbeds which we see when there is not enough oxygen in the blood such as during an apnoea.

Essential Neonatal Care (ENC): Encompasses key aspects of the management of the neonate, whether in the community or a health facility including warmth, cleanliness, breastfeeding, cord and eye care, and immunisations.

Extreme Low birth weight :Birth weight less than 1000 g

Foetal Death: Babies born dead after 22 weeks of gestation or birth weight between 500.

Grunting: Soft short sounds that a baby makes when breathing out. Grunting occurs when a baby is having difficulty breathing.

Infant Mortality Rate: The number of infant deaths per 1000 live births

Infant: A child under the age of one year.

Intrauterine Growth Restriction (IUGR):A process of growth restriction of foetus during pregnancy that results in the birth of a baby weighing less than expected for gestation.

Kangaroo Mother Care: An approach used in the care of both preterm and LBW babies based on continuous skin to skin contact with the mother designed to encourage breastfeeding and provide continuous warmth.

Late Foetal Death: Babies born dead after 28 weeks of gestation or birth weight over 1000 g

Low Birth Weight: Birth weight lower than 2500 g

Meconium Aspiration: The condition in which the baby breathes in meconium that is in the amniotic fluid.

Necrotising enterocolitis (NEC): A serious intestinal disorder of the gut causing bleeding into the gut, infection and occasionally perforation of the gut and peritonitis.

Neonatal Mortality Rate: The number of live born babies who die in the first 28 days after birth, per 1000 live births.

Neonate or Newborn: A live born infant from birth to before reaching 28 complete days of age

Non-Formal Caregivers: Those who possess the knowledge of a defined set of cognitive and practical skills that enables individuals to provide and assist in the appropriate care of mothers and newborns. They could be friends, relatives, family members, volunteers, and other individuals.

Perinatal Mortality Rate: The number of stillbirths (weighing 1000gm or 28 complete weeks or gestation) and deaths of neonates in the first seven days of life, per 1000 births (According to WHO definition.)

Phototherapy: Treatment with blue light used to treat jaundice. Phototherapy can be given by lights above the baby's bed or by a blanket the baby lies on.

Preterm/Premature Births: Live births before 37 weeks of gestation

Pulse Oximeter: A probe that wraps around a hand or foot, connected to a machine, which measures how much oxygen the blood is carrying.

Retinopathy of prematurity (ROP): Disorder of blood vessel formation in the back of eye of preterm babies

Sepsis: Infection in the blood or other body tissues.

Skilled Attendance: Skilled attendance refers to the process by which a pregnant woman is provided with adequate care during labour, birth, and the postpartum and immediate newborn periods. This requires the attendant to have the necessary skills, be supported by an enabling environment at the domiciliary, PHC or first referral levels where there must be adequate supplies of equipment and infrastructure as well as an efficient and effective system of communication and referral/transport (Inter-agency Group for Safe Motherhood, November 2000).

Skilled Attendant: A "professional care giver who possesses the knowledge and a defined set of cognitive and practical skills that enable the individual to provide safe and effective health care

during childbirth to women and their newborns in the home, health centre, and hospital settings" (WHO 2000). Skilled attendants include health personnel with midwifery and life-saving skills. In the context of Nepal, the Maternal and Child Health Worker, Auxiliary Nurse Midwife, Nurse, and Doctors are considered skilled attendants.

Small for Gestational Age (SGA): Refers to a baby whose weight is less than 10th per centile for gestation and gender.

Stable: Staying the same rather than getting worse.

Stillbirth: The death of a foetus weighing at least 500 g (or when birth weight is unavailable after 22 completed weeks of gestation or with a crown-heel length of 25cm or more), before the complete expulsion or extraction from its mother

Ventilator: Also known as a respirator; a machine used to deliver air and oxygen into the lungs with pressure to help the baby breathe.

Very Low Birth Weight: Birth weight less than 1500 g

Annex XVIII: Standards of medical care in anaesthesia

Standards of medical care are determined on the basis of all clinical information available for an individual case and are subject to change as knowledge advances.

The ultimate judgment with regard to a particular clinical procedure or treatment plan must be made by the clinician in light of the clinical information presented and the diagnostic and treatment options available.

General Duties

Daily duties

Check anaesthetic machines, difficult airway trolley, and defibrillator.

- Ensure that the bleep is working properly (replace batteries if indicated).
- Take time to ensure handover is comprehensive. You should acquaint yourself with all women on delivery suite with ongoing epidural analgesia, and any women on the wards with antenatal or postnatal problems (e.g., post-dural puncture headache).
- Check for any high-risk women who are either already in hospital or expected soon.
- In accordance with the current follow-up/audit regimen in the hospital in which you are working, collect forms, visit the women and return completed forms.

Be aware of what is happening on the unit.

The obstetric anaesthesiologist is part of a team, working closely with obstetricians, midwives, and paediatricians, and should take an active role in clinical management decisions.

- Act professionally.
- Familiarise yourself with the locations/ access to the ante/postnatal wards in case you're called there in a hurry.
- Remember that peripartum women can be particularly emotionally labile.
- Treat them with consideration.
- Consent of patient is essential.

Annex XIX: Key recommendations

- Dedicated obstetric anaesthesia services should be available in obstetric units. These services should be capable of taking responsibility for regional analgesia, general anaesthesia, recovery from anaesthesia and, the management and monitoring of IV fluid replacement therapy.
- Adequate advance notice of elective high-risk cases must be given to the obstetric anaesthetic service. The notice must be sufficient to allow the consultation, investigation, and assembly of resources needed for these cases, to take place.
- When presented with problem cases requiring special skills or investigations, obstetric anaesthesiologist should not hesitate to call on the assistance of anaesthetic colleagues in other subspecialties as well as colleagues in other disciplines.
- Invasive central venous and arterial pressure measurement can provide vital information about the cardiovascular system which can be life-saving. Invasive monitoring via appropriate routes should be used particularly when the cardiovascular system is compromised by haemorrhage or disease.
- Care of women at high risk of maternal haemorrhage must involve senior obstetric anaesthesiologist at the earliest possible time.
- Anaesthesiologist has a responsibility, as do all medical practitioners, to ensure that drugs are given in the correct dose, at the correct rate, by the correct route, and by the most accurate means.
- It seems not to be widely appreciated that syntocinon can cause profound and fatal, hypotension, especially in the presence of cardiovascular compromise. Administration should follow the guidance in the British National Formulary, Martindale and other standard formularies. When given as an IV bolus the drug should be given slowly in a dose of not more than 5IU.

Annex XX: Category of service provider (including training) obstetric anaesthesiology - training

Goals:

Patient Care

- Understand the management of anaesthetics for uncomplicated peripartum patients.
- Demonstrate ability to recognise complicated patients and initiate care plans in consultation with faculty.
- Exhibit the technical skills to carry out care plans for the peripartum patient.

Medical Knowledge

- Understand the physiological changes of pregnancy and the anaesthetic implications of these changes.
- Understand basic placental/foetal physiology and the potential impact of anaesthetics on the foetus.

Interpersonal and Communication Skills

- Show investment in teamwork and collaboration with other care providers.
- Demonstrate active engagement with patient and patient's family.

Professionalism

- Demonstrate responsibility and physical and mental attentiveness in a positive and constructive manner.
- Demonstrates willingness to show consideration and appreciation for patients and co-workers.
- Exhibits compassion, empathy, and supportin patient care and professional interactions.
- Demonstrates truthful and ethical standards in professional interactions and conduct.

Practice-Based Learning and Improvement

- Understand application of evidence-based medicine as it applies to the peripartum patient.
- Examine their individual patient experiences and demonstrate ability to assess and improve their practice from this process.

System-Based Learning

- Understand the needs and roles of social service and support services.
- Demonstrate a cost-effective approach to patient care.

Objectives

Patient Care

- Evaluate obstetric patients obtaining the appropriate information in an efficient manner.
- Design and execute an anaesthetic care plan for the management of the following (with minimal need for faculty modification):
    - A healthy patient for labour analgesia
    - A healthy patient for caesarean delivery
    - A healthy patient for assisted vaginal delivery
- Create a basic anaesthesia plan with consultation of a faculty member for high-risk patients (including multiple gestation, pre-eclampsia, morbidly obese patients, and diabetic patients).
- Demonstrate expertise in placing and administration of the following in a non- urgent situation.
- Lumbar epidural placement for obstetric patients
- Spinal anaesthesia administration for obstetric patients
- General anaesthesia with rapid sequence induction for obstetric patients
- Describe the role and function of monitoring modalities.
- Recognises and correctly interprets foetal heart rate monitoring.
- Develop and execute a care plan for the patient with a post-dural puncture headache.

Medical Knowledge

- Define the indications and contraindications of regional and general anaesthesia for labour analgesia and operative delivery.
- Identify the physiological changes of pregnancy.
- Explain the physiologic changes of pregnancy impact on anaesthetic management.
- Describe the basics of foetal circulation, placental gas exchange, and foetal/neonatal effects of maternally administered anaesthetic drugs.
- Define the stages of labour, typical duration, and potential effects of anaesthetics on the progress of labour.
- Identify the nerve roots involved in the pain pathways for the first and second stages of labour, and for operative delivery.
- Recognise the physiological characteristics related to high risk patients (including multiple gestation, pre-eclampsia, morbidly obese patients, peripartum haemorrhage, placenta previa, etc).
- Explain the aetiology, risk factors, presentation, and treatment of patients with post-dural puncture headaches.

Interpersonal and Communication Skills

- Explain and discuss anaesthetic options with a parturient in a complete and reassuring manner and obtain an informed consent.
- Use interpreter services in an efficient manner.
- Recognise importance of communication between all caregivers in the effective management of the parturient.

Professionalism

- Arrive for duty shifts in a punctual manner ready for patient care.
- Continuously demonstrate respect for patients and other caregivers.
- Respect patient/family role in anaesthetic options for the birthing process.
- Recognise cultural differences in patient attitudes/concerns of peripartum care and demonstrate sensitivity to these issues in the care of the parturient.
- Transfer the care of continuing patients to a relieving physician in a complete and punctual manner.

Practice-Based Learning and Improvement

- Explain evidence-based medicine as it applies to the parturient including:
    - The effect of epidural analgesia on the progress of labour, maternal fever, and outcome of labour.
    - The relative risk of regional and general anaesthesia in the parturient.

System-Based Learning

- Identify one system issue that affects patient care and develop a potential solution to the problem.
- Describe the role of cost-effective practice in selection of care plans on labour and delivery.

Instructional Methods

Bedside Teaching. Mini Lecture/Seminars Assessment and Evaluation

Residents will be evaluated on a daily basis using the departmental daily evaluation system.

They will also receive a narrative evaluation from the chief of the rotation. A passing score on the OB anaesthesia multiple choice examination is required at the end of completing the rotation.

Annex XXI: Anaesthetic equipment

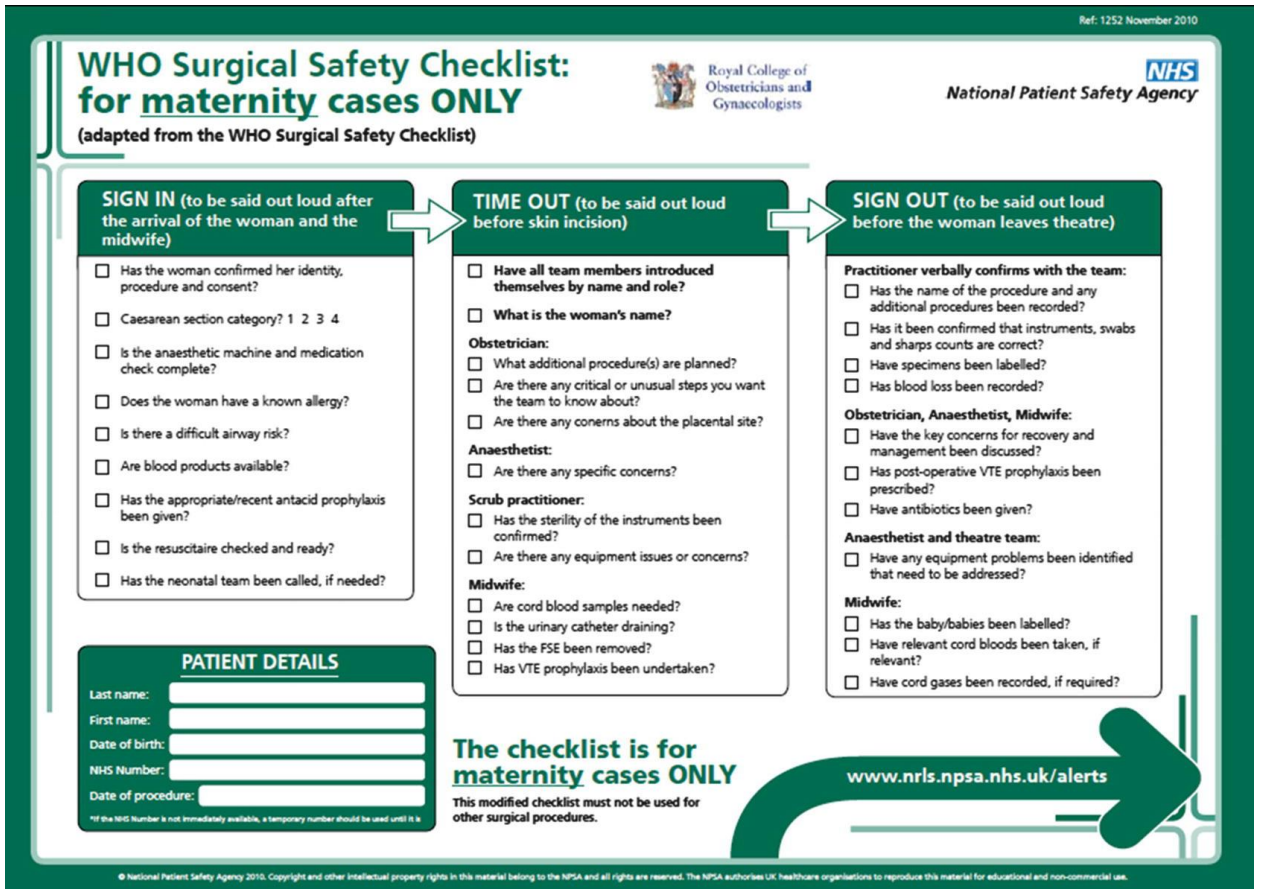
- Oxygen cylinders with flowmeter
- Ambu bag set - adult and neonatal with reservoir bag
- Equipment for intravenous use-needles, cannula, catheter, syringes infusions sets, saline stand
- Spinal needles - ranges from 25 to 27gauge, Quinke or Pencil point type
- Oropharyngeal airways - size 0, 1, 2, 3
- Anaesthetic face masks - size 2, 3 and Rendal baker(neonatal)
- Laryngoscopes - Adult and paediatric, spare bulb and batteries
- Endotracheal tubes - sizes 2.5. 3 and 6,7,7.5, and8, Laryngeal mask airways size 3, 4, I-gel size 3,4
- Stylets intubating adult and children
- Magill's intubating forceps
- Endotracheal tubes and catheter mount
- Breathing hose and connectors
- Breathing system (Bain circuit and Jackson Recs circuit)
- Anaesthetic vaporisers (TEC -3,4)
- Suction apparatus
- Suction catheters, suction Yankaur
- Oxygen concentrator
- Venti mask, mask with reservoir bag and nasal prong
- Monitoring equipment - blood pressure instrument - stethoscope

Anaesthetic Drugs and Emergency Drugs

- Non particulate antacid – sodium citrate
- Ranitidine
- Metoclopramide
- Atropine
- Bupivacaine 0.5%heavy
- Lidocaine 2% with adrenaline and plain
- Calcium gluconate
- Diazepam
- Epinephrine/norepinephrine
- Ephedrine/mephenteramine
- Halothane
- Ketamine
- Pethidine/fentanyl
- Pentazocine
- Thiopental
- Suxamethorium
- Pancuronium
- Sodium bicarbonate
- Xylocard
- Beta-Blockers (Metoprolol, Labetalol/ esmolol)

- Dopamine
- Isoprenaline
- Hydrocortisone
- Chlorpheniramine
- Glucose 25%

Annex XXII: WHO surgical safety checklist for maternal cases



Ref: 1252 November 2010

WHO Surgical Safety Checklist: for maternity cases ONLY

(adapted from the WHO Surgical Safety Checklist)

Royal College of Obstetricians and Gynaecologists

NHS National Patient Safety Agency

SIGN IN (to be said out loud after the arrival of the woman and the midwife)

- ☐ Has the woman confirmed her identity, procedure and consent?
- ☐ Caesarean section category? 1 2 3 4
- ☐ Is the anaesthetic machine and medication check complete?
- ☐ Does the woman have a known allergy?
- ☐ Is there a difficult airway risk?
- ☐ Are blood products available?
- ☐ Has the appropriate/recent antacid prophylaxis been given?
- ☐ Is the resuscitaire checked and ready?
- ☐ Has the neonatal team been called, if needed?

TIME OUT (to be said out loud before skin incision)

- ☐ **Have all team members introduced themselves by name and role?**
- ☐ **What is the woman's name?**

Obstetrician:

- ☐ What additional procedure(s) are planned?
- ☐ Are there any critical or unusual steps you want the team to know about?
- ☐ Are there any conerns about the placental site?

Anaesthetist:

- ☐ Are there any specific concerns?

Scrub practitioner:

- ☐ Has the sterility of the instruments been confirmed?
- ☐ Are there any equipment issues or concerns?

Midwife:

- ☐ Are cord blood samples needed?
- ☐ Is the urinary catheter draining?
- ☐ Has the FSE been removed?
- ☐ Has VTE prophylaxis been undertaken?

SIGN OUT (to be said out loud before the woman leaves theatre)

Practitioner verbally confirms with the team:

- ☐ Has the name of the procedure and any additional procedures been recorded?
- ☐ Has it been confirmed that instruments, swabs and sharps counts are correct?
- ☐ Have specimens been labelled?
- ☐ Has blood loss been recorded?

Obstetrician, Anaesthetist, Midwife:

- ☐ Have the key concerns for recovery and management been discussed?
- ☐ Has post-operative VTE prophylaxis been prescribed?
- ☐ Have antibiotics been given?

Anaesthetist and theatre team:

- ☐ Have any equipment problems been identified that need to be addressed?

Midwife:

- ☐ Has the baby/babies been labelled?
- ☐ Have relevant cord bloods been taken, if relevant?
- ☐ Have cord gases been recorded, if required?

PATIENT DETAILS

Last name:

First name:

Date of birth:

NHS Number:

Date of procedure:

*If the NHS Number is not immediately available, a temporary number should be used until it is

The checklist is for maternity cases ONLY

This modified checklist must not be used for other surgical procedures.

www.nrls.npsa.nhs.uk/alerts

Annex XXIII: Cardiac arrest in pregnancy in-hospital basic life support (BLS) algorithm

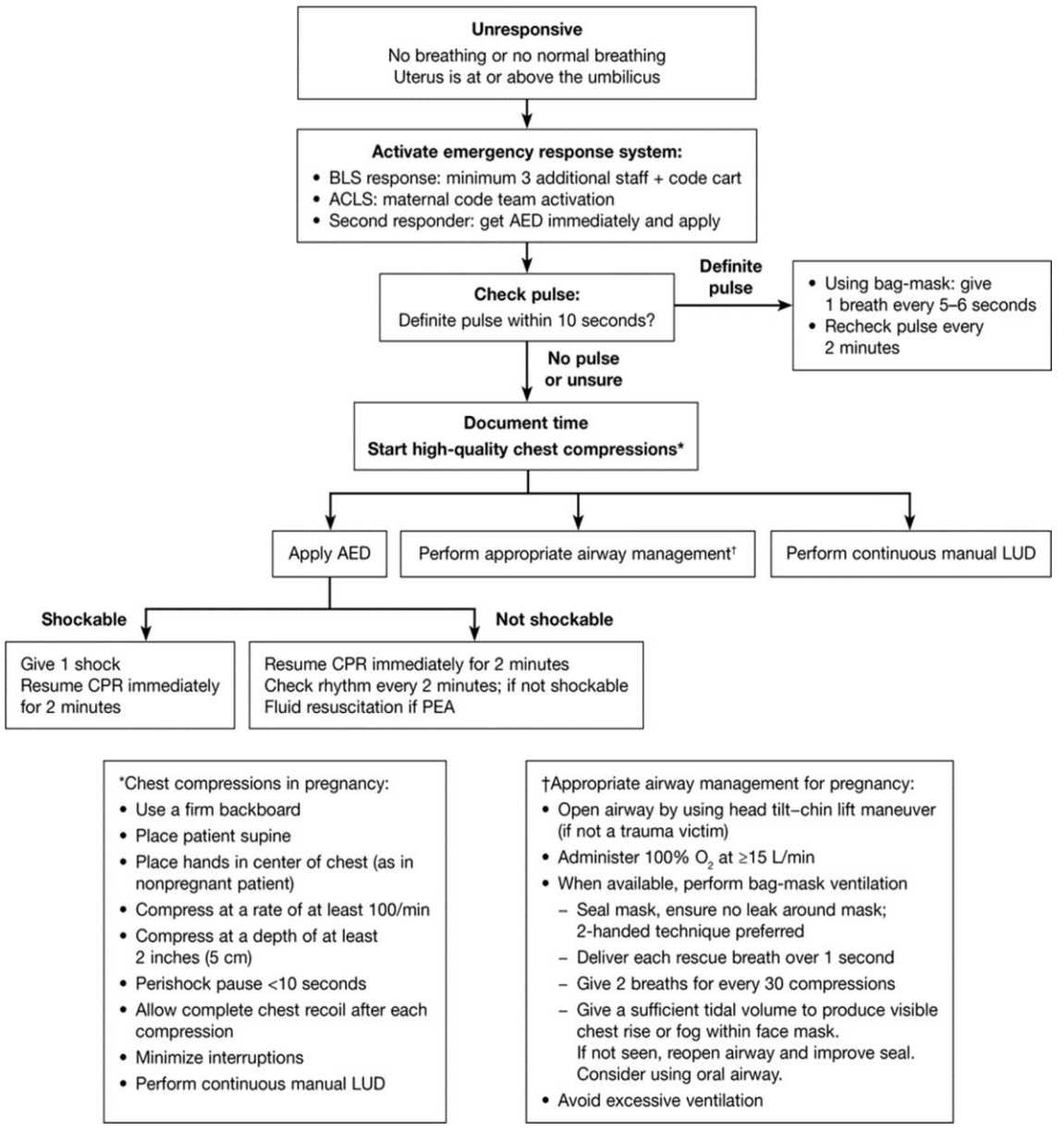
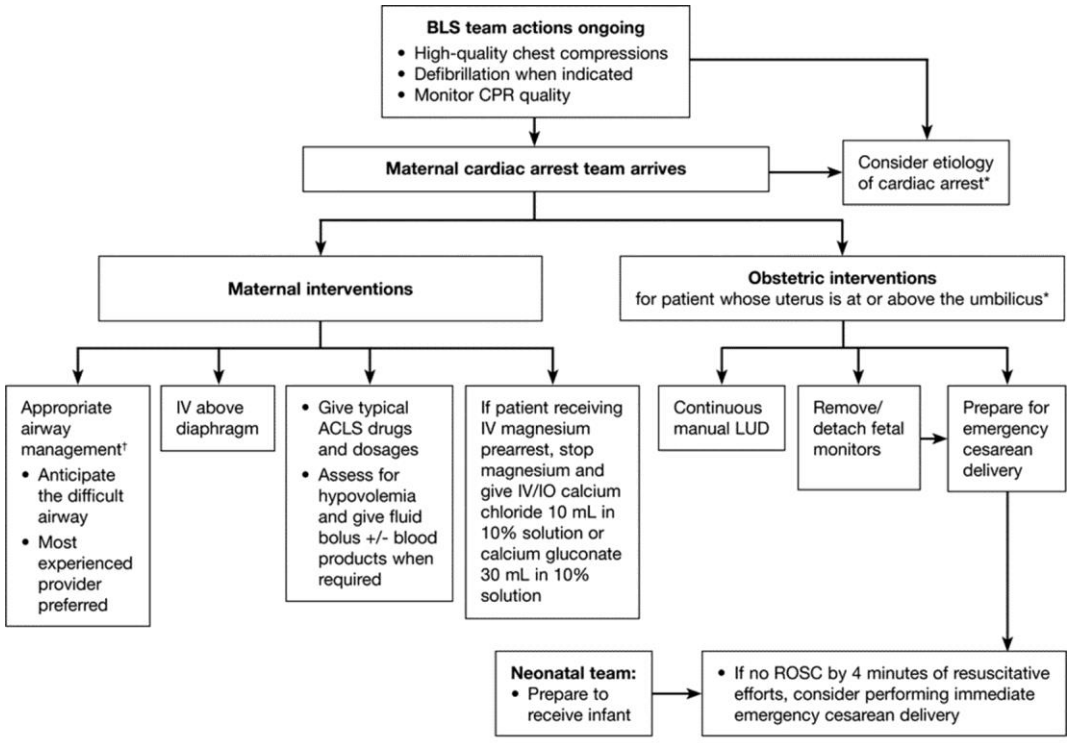


Figure 1 Cardiac arrest in pregnancy in-hospital basic life support (BLS) algorithm: simultaneous C-A-B-U (chest compressions/current-airway-breathing-uterine displacement). ACLS indicates advanced cardiovascular life support; AED, automated external defibrillator

Annex XXIV: Cardiac arrest in pregnancy in-hospital advanced cardiovascular life support (ACLS) algorithm



*Potential etiology of maternal cardiac arrest:

A Anesthetic complications/accidents
B Bleeding
C Cardiovascular
D Drugs
E Embolic
F Fever
G General nonobstetric causes of cardiac arrest (H's and T's)
H Hypertension

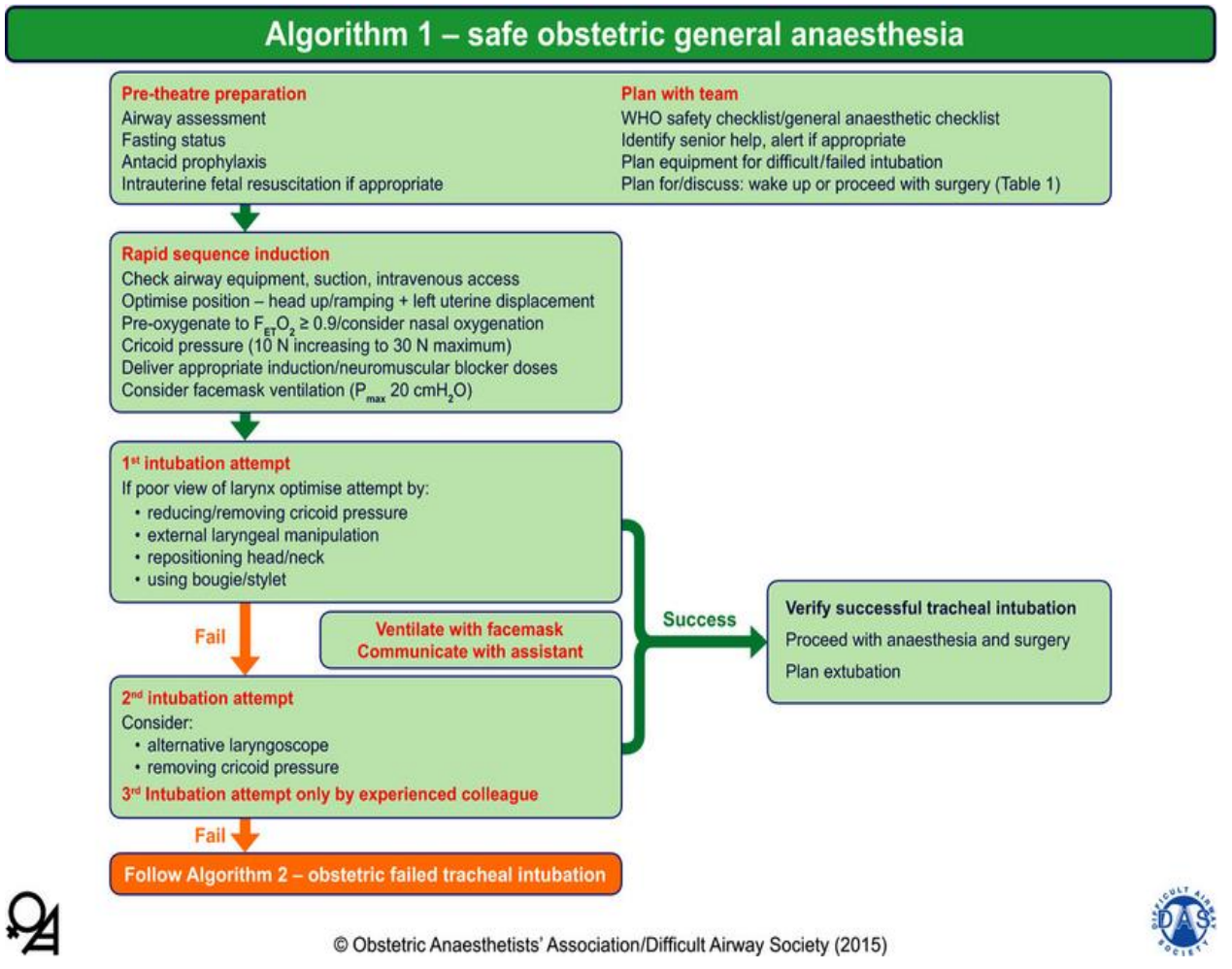
†Appropriate airway management for pregnancy:

- 100% oxygen at ≥15 L/min and continue BLS airway strategies
- Optimally 2 attempts per technique:
  - First intubation attempt—if failed go to
  - Second intubation attempt—if failed go to
  - First supraglottic airway attempt—if failed go to
  - Second supraglottic airway attempt—if failed go to mask ventilation
  - If mask ventilation inadequate—attempt cricothyrotomy
- Avoid airway trauma
- Ventilate with 8–10 breaths/min
- Monitor capnography
- Minimize interruptions in chest compressions during advanced airway placement
- Recommend 6.0- to 7.0-mm inner diameter ETT

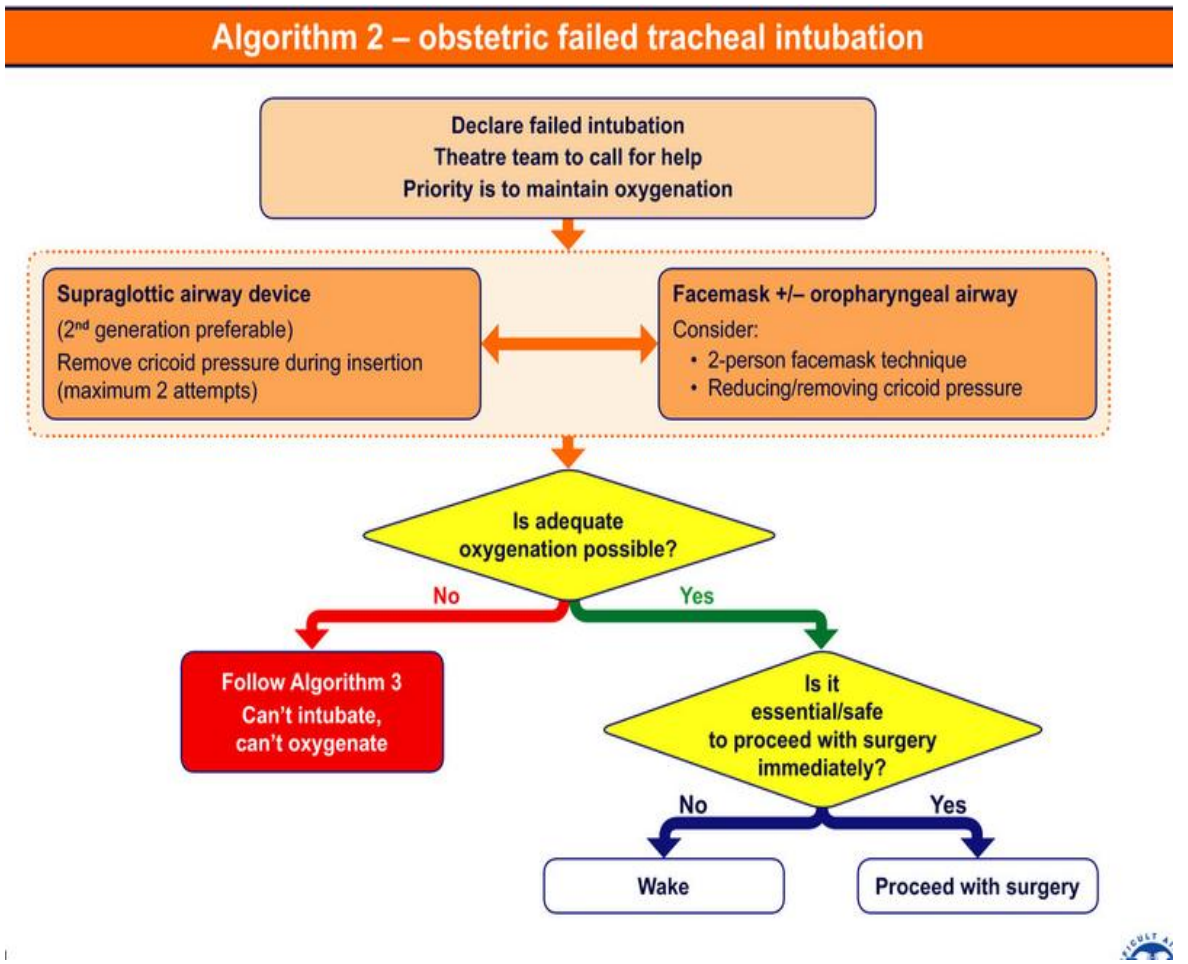
Figure 2 Cardiac arrest in pregnancy in-hospital advanced cardiovascular life support (ACLS) algorithm. BLS indicates basic life support; CPR, cardiopulmonary resuscitation; ETT, endotracheal tube; IV, intravenous; IO, intraosseous; LUD, left uterine displacement

Annex XXV: Safe obstetric general anaesthesia algorithm: algorithm 1

Obtained from Obstetric Anesthetists' Association/Difficult Airway Society (2015)



Annex XXVI: Safe obstetric general anaesthesia algorithm: algorithm 2



Annex XXVII: Safe obstetric general anaesthesia algorithm: algorithm 3