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MINISTRY OF HEALTH - ETHIOPA
የዜጎች ጤና ለሃገር ብልጽግና !
HEALTHIER CITIZENS FOR PROSPEROUS NATION!

Immunization In Practice Participant Manual

Ministry of Health

September, 2023

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Acknowledgement

The federal ministry of health would like to acknowledge the partners and individuals those contribute towards the revision and development of the National Immunization in Practice participant manual and facilitator guide 2023.

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Lists of Immunization in Practice 2023 version Participant Manual and Facilitator Guide

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Preface

Immunization program is one of the most cost-effective public health interventions, with proven strategies to reach the most eligible populations. Measurable achievements in terms of reducing morbidity and mortality associated with vaccine preventable diseases (VPDs) have been documented since the national immunization program was commenced in Ethiopia since 1980 G.C. With progressive introduction of new and under used vaccines, there has been remarkable achievements in reducing morbidity and mortality from VPD diseases and the total antigens in the routine immunization program has currently reached thirteen including COVID 19 vaccine.

The Ministry of Health recognizes the crucial role immunization contributes to reducing child morbidity and mortality and affirms its responsibility to ensure that every target is protected from VPD. With the emergence of COVID 19, and other new vaccines after two years of age immunization has taken the picture of life course approach. Expanded Program of Immunization (EPI) builds on direction and planning of the government's Health sector Transformation Plan (HSTP) and other relevant documents.

Apart from other programmatic priorities, addressing the training gap of EPI frontline workforce in practical aspects of the program requires follow up by ensuring adherence to standards and up to dating the training manuals, including (Immunization in Practice) IIP manual.

The performance improvement model conducted training provides critical support for health care workers who deliver services, with commitment. The aim of this course is to build participant's knowledge, skills, and attitude, enable to improve performance of EPI coverage and quality of immunization services. The revision has been following the introduction of new vaccines considering the current context as well as the skill gap identified in the field and after feedback taken on the previous manual.

The ministry health appreciates technical advisors, agencies and partners that contributes for the development IIP training manual 2023.

Dr. Meseret Zelalem(MD, Pediatrician)

Maternal, Child and Adolescent Health Service Lead Executive Officer

APPROVAL STATEMENT OF THE MINISTRY

The Federal Ministry of health of Ethiopia has been working towards standardization and institutionalization of In-Service Trainings (IST) at a national level. As part of this initiative, the ministry developed a national in-service training directive and implementation guide for the health sector. The directive requires all in-service training materials fulfill the standards set in the implementation guide to ensure the quality of in-service training materials. Accordingly, the ministry reviews and approves existing training materials based on the IST standardization checklist annexed on the IST implementation guide.

As part of the national IST quality control process, this Immunization In practice IST package has been reviewed and revised based on the standardization checklist and approved by the ministry in November, 2023.

Assegid Samuel Cheru

Human Resource for Health Development and Improvement

Lead executive officer

Ministry of Health- Ethiopia

Acronyms

AD	Auto-Disable syringe
AEFI	Adverse Event Following Immunizations
AFP	Acute Flaccid Paralysis.
AIDS	Acquired Immune-Deficiency Syndrome
BCG	Bacillus Calmette Gu'erin
CRS	Congenital Rubella Syndrome
DOTS	Directly Observed Treatment Short course
DT	Diphtheria-Tetanus toxoids
DTP	Diphtheria Tetanus Pertussis
DTP-HepB-Hib	Diphtheria Tetanus Pertussis -Hepatitis B Haemophiles influenza type b
EPI	Expanded Program on Immunization
GAVI	Global Alliance for Vaccine and Immunization
HEW	Health Extension Worker
HEP	Health Extension Program
HAD	Health Development Army
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
ILR	Ice-Lined Refrigerator
IPV	Inactivated Polio Virus vaccine
ITN	Insecticide Treated bed Net
MCV	Measles Containing Vaccine

MR/MMR	Measles, Rubella/ Measles Mumps Rubella vaccines
MNTE	Maternal and Neonatal Tetanus Elimination
NIDs	National Immunization Days
OPV	Oral Polio Vaccine
PAB	Protected At Birth
PATH	Project for Appropriate Technology for Health
PHCU	Primary Health Care Unit
SIAs	Supplemental immunization activities
TB	Tuberculosis
Td	Tetanus-diphtheria toxoid vaccine
TT	Tetanus toxoid vaccine
UNFPA	United Nations Population Fund
UNICEF	United Nations Children's Fund
VAD	Vitamin A deficiency
VAPP	Vaccine associated paralytic polio
VVM	Vaccine vial monitor
WHO	World Health Organization
YF	Yellow fever
COVID 19	Corona virus disease of 2019

Introduction to the manual

Immunization is the cost-effective public health intervention. During 2021, about 81% of infants worldwide (105 million infants) received 3 doses of diphtheria-tetanus-pertussis (DTP3) vaccine, protecting them against infectious diseases that can cause serious illness, disability and death. The COVID-19 pandemic and associated disruptions have strained health systems, with 25 million children missing out on vaccination, 5.9 million more than in 2019 and the highest number since 2009, 60% of these children live in 10 countries: Angola, Brazil, the Democratic Republic of the Congo, Ethiopia, India, Indonesia, Myanmar, Nigeria, Pakistan and the Philippines. There is a disparity in the access of the lifesaving EPI vaccines to children in the world today. Reaching most children in developing counties still remains as a challenge. As a result of the traditional vaccines being underutilized and new vaccines introduced in these developing countries there are three million vaccine preventable child deaths each year in world today.

In Ethiopia, vaccine preventable diseases are contributing substantially to under-five mortality. Measles is one of the leading causes of under-five mortality. However, recently there is substantial reduction in the number of measles caused under-five deaths in the country due to public health intervention including immunization.

In recent years, the EPI coverage is showing encouraging progress after many years of stagnation. The HEP is, therefore, a golden opportunity to increase the immunization coverage for the traditional, underutilized and new routine EPI vaccines.

However, there is a felt need for the IIP training to the health care workers as it is evident during supportive supervision, review meetings and different occasions for training need assessment. The frequent staff turnover and rotation calls for the periodic training using this updated training manual.

Capacity enhancement for health workers is one of important and indispensable strategy for successful EPI service delivery. Health care workers are expected to handle immunization program in their areas and should be able to reach every child to get an opportunity for immunization services. This IIP manual is adapted from the immunization in practice WHO, and current updates to the Ethiopian situation. It will be of great use for health service providers as training manual and will be kept to be used as reference during day-to-day EPI operations as well.

Core Competencies: The participants are expected to do the following core activities in their health facilities;

- Prepare a targeted micro plan to deliver vaccination service for the community
- Oragnize quality immunization sessions in their respective areas
- Monitor vaccine, cold chain and supply chain system of the health facility
- Use informed decision through generating quality data in the health facilities
- Improve utilization of vaccination coverage through demand creation
- Establish active case detection and vaccine safety system in the health facilities

During facility visit:

- Each participant should attend the facility visit based on the facilitator guidance.
- The participants should observe the all chapters as per the checklist and should discus on findings outside of the room and assigned group leader should present the findings to the team on site.
- Regarding to facility visit session, it has to be one day and it should be considered based on the context of local situation of the client flow and immunization schedule of the working day. The next day recap session should be facility visit summary report from each team leaders.
- Facilitators and group leaders should provide onsite feedback to facility heads or focal if there is critical finding found during the visit that affect the immunization system.

Course Syllabus

Training Materials	■ Participant of IIP manual ■ IIP Facilitator guide ■ Exercise book, pen, pencil, sharper, marker ■ Small bag ■ Tally sheet ■ EPI registration book ■ Flip chart and marker ■ Vaccine vials: Pentavalent, PCV, Rotavirus, BCG, Measles, Td, OPV, Men A. , IPV , HPV, COVID 19, Hepatitis , Cholera, Typhoid, Rabies, Ebola ■ Diluents for BCG, Measles ■ Vaccine carrier ■ Foam pad ■ Meeting checklist ■ AD Syringes ■ EPI job aid (comprehensive) ■ Computer and overhead projector	■ EPI Monitoring chart ■ Ice pack ■ EPI reporting formats ■ Infant doll ■ Daily facilitator meeting agenda ■ Health Center with immunization service ■ Pre/Posttest copies ■ Training evaluation sheet ■ Training quality assessment ■ Job aid ■ Supportive supervision and review ■ RED categorization data base tool
Participant selection criteria	**The target audiences for this training;** ■ **Primarily;** Immunization service providers who has a background of nursing, health officer and health extension worker working in the health post, health center and hospital ■ **Secondly;** Health workers worked in other departments with a background of nursing, health officer, midwives, and medical practitioners (it includes all health care providers involved in theprovision of immunization services and facilitation of this course)	

Trainer selection criteria	■ Technical working groups who contributed in the development of this training manual ■ TOT training on immunization in practice ■ Basic training on immunization in practice with facilitation skill training and ■ Health care providers who have Bachelors of Science in Nursing/Health Officer is preferred and have a Minimum two years' experience in EPI unit of the health center.
Method of course evaluation	Participant Formative ■ Pretest ■ Daily course evaluation (discussions, recaps, reflections) Summative ■ Post test
Certification Criteria	■ Basic training participants need to be score minimum of 70% and above in post course assessment and 100% attendance ■ TOT participants need to be score minimum of 80% and above in post course assessment and 100% attendance ■ Continuing Educational Unit (CEUs)=15 CEUs
Course Duration	Six days
Suggested Class size	■ Approximately 25-30 participants, with trainer to trainee ratio of 1: 5-8
Training Venue	■ At accredited CPD center

Course schedule:

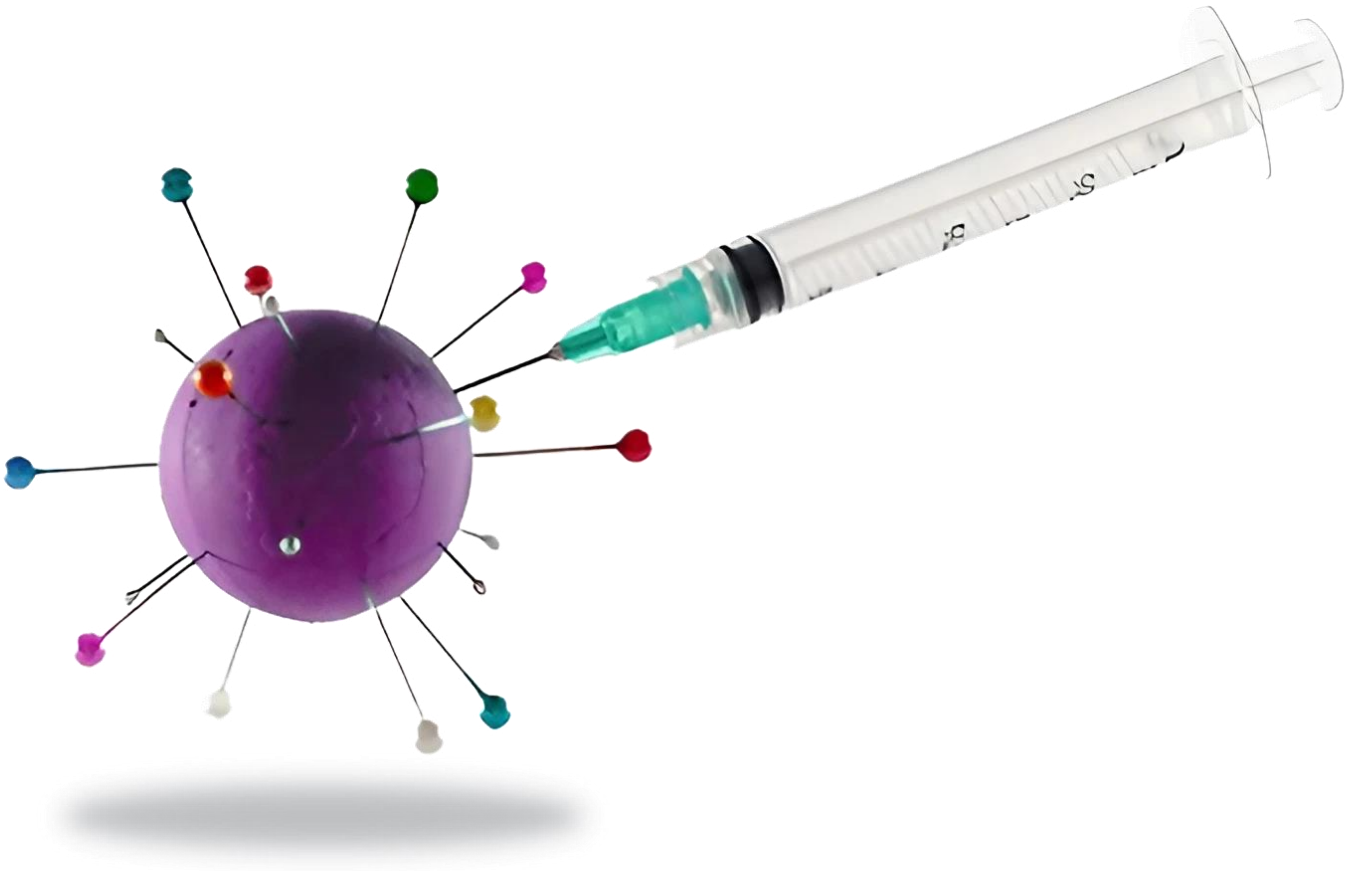
Time	Activity	Lead Facilitator	Co-facilitator
Day One			
02:30-03:00	Registration		
03:00-03:15	Opening Remark		
03:15-03:30	Self-Introduction of the participants and setting norms		
03:30-03:50	Objective of the training		
03:50-04:20	Pre/Post-test		
Chapter One: Introduction to vaccines preventable diseases and their vaccines			
04:20-04:30	Vaccine preventable diseases and its characteristics		
04:30-04:45	Tea Break		
04:45-05:20	Vaccine preventable diseases and its characteristics		
05:20-06:30	Vaccine types and their characteristics		
06:30-07:30	Lunch		
07:30-08:00	Vaccine types and their characteristics		
08:00-08:20	Emergency or outbreak response vaccines being provided in Ethiopia		
08:20-08:40	Vaccine not introduced and in pipeline		
08:40-08:50	Summary		
Chapter Two: Vaccine, Supply and Cold chain management			
08:50-09:00	Chapter course description		
09:00-09:30	Session 2.1: Forecasting vaccines and related supplies		
09:30-09:45	Tea break		
09:45-10:40	Session 2.1: Forecasting vaccines and related supplies		

10:40-11:30	Session 2.2: Vaccine stock management		
Day Two			
02:30-02:40	Day one session recap		
02:40-04:10	Session 2.2: Vaccine stock management		
04:10-04:30	Session 2.3 Vaccine Wastage		
04:30-04:45	Tea break		
04:45-05:45	Session 2.4 Cold chain equipment and management		
05:45-06:30	Session 2.5 Temperature monitoring		
06:30-07:30	Lunch		
07:30-08:25	Session 2.5 Temperature monitoring		
08:25-09:30	Session 2.6 Basics of CCE maintenance		
09:30-09:45	Tea break		
Chapter 3: Demand Promotion & Crisis Communication			
09:45-10:15	Basics of communication		
10-15-10:45	Communication gaps in immunization		
10:45-11:30	Demand promotion and communication strategies and approaches		
Day Three			
02:30-02-40	Day two session recap		
02:40-04:30	Interpersonal communication (IPC) skills		
04:30-04:45	Tea break		
04:45-05:15	Crisis communication in immunization		
Chapter 4: Planning and Coordination			
05:15-06:30	Micro plan development processes		
06:30-07:30	Lunch		
07:30-08:30	Micro plan devel opment processes		

08:30-09:30	Planning vaccine delivery strategies		
09:30-09:45	Tea break		
09:45-10:10	Immunization coordination mechanism		
10:10-11:20	Micro plan development and session planning exercise		
11:20-11:30	Chapter Summary		
Day Four			
02:30-02:40	Day three recap session		
Chapter 5: Injection Safety and Waste Management			
02:40-03:40	Session 1: Injection safety		
03:40-04:20	Session 2: Waste management		
04:20-04:30	Chapter summery		
04:30-04:45	Tea Break		
Chapter Six: Immunization Service Delivery			
04:45-05:05	Immunization service delivery strategies		
05:05-05:45	Preparing and planning immunization session		
05:45-06:05	Prepare session site, vaccine and injection supplies		
06:05-06:30	Communication accurate information		
06:30-07:30	Lunch		
07:30:07:50	Assessing eligible for vaccination/ contraindication		
07:50-09:00	Preparing to vaccinate and vaccine administration		
09:00-09:15	Tea break		
09:15-11:30	Vaccine, Supply and Cold Chain Mgt. Facility Practical Session		
Day Five			
02:30-02:40	Day four session recap		

02:40-06:30	Facility Practical Session 1. Service Delivery, IPC and Injection Safety-2hr 2. Microplanning, Monitoring and Evaluation (Register, Tally sheet, reporting and Leisure book/Logistics registration) and Data Triangulation-2hr		
06:30-07:30	Lunch		
07:30-07:50	Recording Data		
07:50-08:50	Exercise		
08:50-09:10	Chapter Summary		
Chapter 7: VPD Surveillance and vaccine safety surveillance			
09:10-09:30	Concept of VPD Surveillance, and case definition		
09:00-09:15	Tea break		
09:45-10:15	Concept of VPD Surveillance, and case definition		
10:15-11:15	Case detection, notification, and reporting		
11:15-11:30	Concepts of AEFI Surveillance		
Day Six			
02:30-02:40	Day five session recap		
02:40-03:10	Concepts of AEFI Surveillance		
03:10-03:50	AEFI Reporting		
03:50-04:20	AEFI Case management		
04:20-04:30	Chapter summery		
04:30-04:45	Tea break		
Chapter Eight: Monitoring, evaluation, learning and accountability			
04:45-05:00	Basic concepts of immunization program monitoring and evaluation		
05:00-06:00	Immunization monitoring, recording and reporting tools		

06:00-06:30	Immunization Data quality assurance		
06:30-07:30	Lunch		
07:30-08:00	Immunization Data quality assurance		
08:00-08:50	Immunization program data analysis and use		
08:50-09:05	Lesson learned and best practice documentation		
09:05-09:20	Evidence based accountability		
09:20-09:30	Chapter summary		
09:30-09:45	Tea break		
09:45-10:05	Immunization in Practice Summary		
10:05-10:35	Post test		
10:35-10:50	Reflection		
10:50-11:00	Closing and the way forward		



Chapter 1:

Introduction to vaccines preventable diseases and their vaccines

Time Allocated: 195 Minutes

Chapter description: This chapter describes causative agent, mode transmission, sign and symptoms, major complication treatment and prevention for vaccine preventable diseases. It also describes specific vaccine storage conditions, dosage, schedule, route of administration and common adverse events.

Chapter Objective: At the end of this chapter participants will be able to describe vaccine preventable diseases and their vaccines.

Enabling Objectives:

- Describe basic facts of vaccine preventable diseases.
- Explain vaccine types and their characteristics.

Chapter outline:

1.1. Vaccine preventable diseases characteristics

1.2. Vaccine types and their characteristics

1.3. Chapter summary

1.1. Vaccine preventable diseases and its characteristics

Activity 1: Group discussion

Time: 60 minutes

Instruction: Form a group and select a chair and secretary for the discussion points and present your group discussion for the larger group

1. List common VPD those are included in routine vaccination program and the Sign, symptom and major complications of each VPD and prevention methods?

Time: 15 minutes

Vaccine preventable diseases: Based on the global burden of vaccine-preventable infectious diseases report on 2018, vaccine preventable diseases are among a leading cause of morbidity and mortality worldwide. Seven hundred thousand under 5 children died of vaccine-preventable diseases from 5.3 million under five deaths, of which 99% of the children who died had lived in low- and middle-income countries[1].

Table 1.1. Common vaccine preventable diseases with their characteristics

Target disease	Causative agent	Type of agent	Mode of transmission	Incubation period	Sign and symptom	Major complications	Treatment	Prevention
Diphtheria	Corynebacterium Diphtheria	Bacteria	Respiratory Droplets	2–5 days (range 1–10 days)	Sore throat, tonsillitis, fever	Respiratory Obstruction, Heart failure	Diphtheria Antitoxin and antibiotics	Vaccination, (Diphtheria containing vaccine like Penta, Td)
Pertussis	Bordetella Pertussis	Bacteria	Respiratory droplets	9–10 days	Fever, Cough, Vomiting, Apnea	Pneumonia and Convulsion	Antibiotics	Vaccination (Penta vaccine-pertussis containing)
Tetanus	Clostridium Tetani	Bacteria	Through wound or cut	3 and 21 days	Fever, Neck stiffness and Muscle spasm	Respiratory failure, death	Antitoxin/ immunoglobulin, antibiotics	Vaccination (Tetanus containing vaccines Td, Penta vaccine-Tetanus containing)
Haemophilus Influenzae type b	Haemophilus influenzae type b	Bacteria	Respiratory droplets	few days	Fever, cough, Neck stiffness	Neurological disability hearing loss, mental retardation	Antibiotics	Vaccination (Penta-Haemophilus Influenzae type b Containing)

Hepatitis B	Hepatitis B virus	Virus	Contact with infected blood and fluids, congenital (mother to newborn)	For acute hepatitis B it may vary from about 30 to 180 days.	Fatigue Nausea, Jaundice, vomiting, abdominal pain	Fulminant hepatocellular carcinoma, cirrhosis,	Supportive, Antivirus drugs	Vaccination (Hepatitis B virus containing vaccine like Penta, and Hep B birth dose)
Tuberculosis	Mycobacterium tuberculosis	Bacteria	Respiratory droplets	2 weeks - several months or years	Cough, fever, night sweating, weight loss, loss of appetite	TB meningitis, lung fibrosis	Anti TB	Vaccination (BCG), ventilation and nutrition
Pneumococcal disease/ Pneumonia	Streptococcus pneumoniae	Bacteria	Respiratory droplets	1 - 3 days	Cough, fever, shortness of breath	Empyema Meningitis, hearing loss, mental retardation	Antibiotics	Vaccination (PCV)
Rotavirus gastroenteritis	Rotavirus	Virus	Feco-oral	1–3 days	Diarrhea, Vomiting	Dehydration, Shock	Fluid replacement (ORS) with zinc	Vaccination (Rota vaccine), Hygiene and sanitation
Poliomyelitis	Poliovirus types 1,2,3	Virus	Feco-oral	commonly 7–10 days (range 4–35 days).	Fever, headache, sore throat	Muscle spasm, pain, Limb paralysis	Physiotherapy, use of brace	Vaccination, (OPV, and IPV)

Measles	Measles virus (paramyxovirus)	Virus	Respiratory droplets	10–14 days	Fever Coryza, skin rash, Conjunctivitis	Dehydration Pneumonia Otitis media Encephalitis, blindness	Antibiotics ORS Vitamin A	Vaccination (Measles Containing Vaccine)
Rubella, Congenital Rubella Syndrome	Rubella virus (Paramyxovirus)	Virus	Respiratory droplets	12 to 23 days	Fever, Conjunctivitis, skin rash, congenital cataract, loss of hearing	Encephalitis, hydrocephalus, Blindness	Supportive Antivirus, Vitamin A	Vaccination (Rubella containing vaccine)
Mumps	Mumps Virus (Paramyxovirus)	Virus	Respiratory droplets	The incubation time averages 16–18 days with a range of 2–4 weeks	Fever, neck swelling	encephalitis, deafness, orchitis, and pancreatitis	Supportive Antivirus, Vitamin A	Vaccination (Mumps containing vaccine)
HPV and cervical cancer	Human papilloma Virus	Virus	Sexual contacts		No symptom before cancer lesion	Cervical cancer, vaginal bleeding, pain	Surgery Chemotherapy, radiotherapy	Vaccination (HPV), Condom, early screening, and treatment
Meningococcal meningitis	Neisseria meningitidis	Bacteria	Respiratory droplets	2-10 Days	Headache, fever, vomiting convulsion, petechial rash	Pericarditis, Coma, Brain damage	Antibiotics	Vaccination, (Meningitis vaccine)

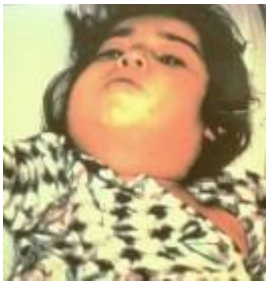
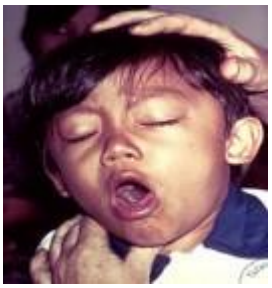
Yellow fever	Yellow fever Virus (Flavivirus)	Virus	Vector borne (Aedes mosquito)	3-6 days	Fever, muscle pain, vomiting	Liver, kidney failure, Coma.	Supportive	Vaccination (Yellow fever vaccine), Vector control
COVID 19	Sars Cov 2 or Corona Virus 2	Virus	Respiratory droplets	2-14 days	Cough, fever, body weakness, loss of taste and smell	Difficulty of breathing, organ failure, blood clot, pneumonia	Supportive, Anti-viral	vaccination (COVID 19 vaccine), Face mask, social distancing, hand washing,
Malaria	Plasmodium species (PF, PV, PM, PO)	Parasite	Vector borne, (Anopheles)	8–14 days in non-immune persons. For other may be longer	Fever, Chills, headache, myalgia	Cerebral malaria, renal failure, shock, convulsion, anemia	Antimalaria	Vaccination (Malaria vaccine), environmental control, bed net, Indoor Residual Spray,
Cholera	Vibrio cholerae	Bacteria	Feco-oral	<24 hours to 5 days	Diarrhea and vomiting	Hypotension shock, muscle cramp	Rehydration, and antibiotics	Hygiene and sanitation, Vaccination (Oral cholera vaccine (OCV),

Ebola	Ebola virus, (filovirida)	Virus	Direct contact with blood or other body fluids	2-21 days	Fever, fatigue, headache, muscle pain	Internal and external bleeding, rash, diarrhea	Rehydration, blood transfusion,	Vaccination (Ebola vaccine), avoid contact with blood and body fluids
Typhoid	Bacteria, Salmonella Typhi	Bacteria	Feco-oral	7–14 days on average	Fever, headache, vomiting,	Hemorrhage, intestinal perforation	Rehydration, antibiotics, antipyretics	Hygiene and sanitation, Vaccination (Typhoid vaccine),
Rabies	Rabies virus (Lyssaviruses)	Virus	Animal bite vial saliva through scratch	2–3 months	Tingling, burning pain	Hallucination, hydrophobia, aerophobia	Supportive	Vaccination (postexposure (PEP) prophylaxis rabies vaccine)

Activity 2: Individual reflection

Instruction: look at the pictures below and discus which the following diseases along with their sign for 7 min and the facilitator will present.



Key: 1- Measles **2- Diphtheria** **3- Mumps** **4-Pertusis**

1.2. Vaccine types and their characteristics

1.2.1. Routinely provided vaccines in Ethiopia

Activity 3: Group discussion, presentation, and summary

Instruction: be one group read and discuss the below question for 70 minutes and present and prepare response and presentation for the following question and present for 10 minutes and the second group will present for 10 min as well. The facilitator will arrange questions and answers for 30 min and will summarize with a short ppt.

1. List routine vaccines in Ethiopia, schedule, dosage, site of administration,

Note: Vaccine is a biological preparation that improves immunity to a particular disease contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins or one of its surface proteins. It Stimulate the body's own immune system to protect the person against subsequent infection or disease.

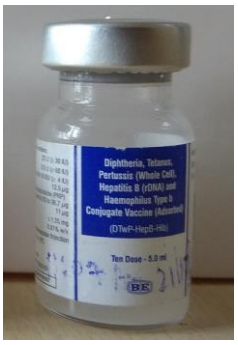
1.2.1.1. Bacille Calmette-Guérin (BCG) vaccine

Ethiopia is among high burden countries having Tuberculosis disease globally. Thus, BCG vaccine is used to prevent childhood tuberculosis meningitis and miliary disease. The BCG vaccine is formulated in 20 doses per vial (Table 2.1).

Table1.2. Summary of BCG vaccines characteristics

Type of vaccine	Live attenuated
Number of doses	One (1) dose
Schedule	At or as soon as after birth. But, for those delayed children BCG vaccination can be provided up to one year age.
Booster	None
Contraindications	Known Symptomatic HIV infection or other immune deficiency
Adverse reactions	Severe: disseminated disease or infections such as osteomyelitis; abscess, lymphadenitis Mild: injection site reactions
Special precautions	Correct intradermal administration is essential
Dosage	0.05 ml; a specific syringe and needle are used for BCG
Injection Site	Right outer deltoid
Route of administration	Intradermal
Storage	Store between 2°C–8°C. Do not freeze

1.2.1.2. *Penta valent vaccine*



Penta valent vaccine has five antigens (Diphtheria, Tetanus, Pertussis, Haemophilus Influenzae type b and hepatitis B, formulated in single dose vial (Table 2.2).

Table1.3. Summary of Penta valent vaccine characteristics

Type of antigen in the Penta valent vaccine	Toxoid (Diphtheria, Tetanus), acellular (Pertussis), Conjugate polysaccharide (Haemophilus Influenzae type b), Recombinant DNA (hepatitis B)
Number of doses	Three (3) doses
Schedule	6, 10, 14 weeks of age. Additionally, for those delayed children vaccination can be provided per catch up vaccination guideline
Booster	None
Contraindications	Anaphylactic reaction to previous dose or to any constituent
Adverse reactions	■ Mild local or systemic reactions are common after vaccination (Fever, injection site pain and swelling ...) ■ For pertussis: Hypotonic-hypo responsive episodes in <1000-2000; febrile seizures <1 in 100; prolonged crying <1 in 100 ■ For Tetanus: Severe: rare anaphylaxis, brachial neuritis, GBS and Mild: injection site reactions and fever
Special precautions	DTP containing vaccine not usually given over 6 years of age
Dosage	0.5ml
Injection site	Left outer mid-thigh in infants
Route of administration	Intramuscular
Storage	Store between 2°C–8°C. DTP-HepB-Hib vaccine should never be frozen

1.2.1.3. *Pneumococcal Conjugated vaccine (PCV)*

Pneumococcal conjugated vaccine protects against disease caused only by the pneumococcal serotypes causing pneumococcal pneumonia and meningitis. The PCV 13 vaccine is currently formulated in one and four doses. Ethiopia is currently using PCV 13 vaccine in four dose vail (Table 2.3).

Table 1.4. Summary of Pneumococcal conjugate vaccine characteristics

Type of vaccine	Conjugate (pneumococcal polysaccharide bound to a carrier protein; does not contain any live bacteria)
Number of doses	Three (3) doses
Schedule	6, 10, 14 weeks of age. Additionally, for those delayed children vaccination can be provided per catch up vaccination guideline
Booster	None
Contraindications	Anaphylactic reaction to previous dose or to any constituent
Adverse reactions	Severe: none or known Mild: injection site reactions and fever
Special precautions	Postpone vaccination if the child has moderate to severe illness (with temperature =39 °C)
Dosage	0.5ml
Injection site	Right mid anterolateral (outer) thigh in infants and children
Route of Administration	Intramuscular
Storage	Store between 2°C–8°C. Do not freeze

1.2.1.4. *Rotavirus Vaccine*

Rotavirus vaccination prevents rotavirus gastroenteritis and should be included as part of a comprehensive treatment and prevention strategy to control diarrhea (table 2.4). There are two common Rota vaccines (Rotarix and Rota SILL) available in the market. Ethiopia uses the Rotarix vaccine currently.

Table 1.5. Summary of Rotavirus vaccines characteristics

Characteristics	Rotarix	Rota Sill
Type of vaccine	Live attenuated	Live attenuated
Number of doses	Two (2) doses	Three (3) doses
Schedule	At 6 and 10 weeks of age.	3-dose (6,10,14 Weeks)
Booster	Not recommended at this time	Not recommended at this time
Contraindications	Severe allergic reaction to previous dose; severe immunodeficiency (but not HIV infection)	Severe hypersensitivity to any of their components Severe allergic reaction (e.g. anaphylaxis) after a previous dose Infants with a history of uncorrected congenital malformation of the gastrointestinal tract that would predispose the infant for IS Individuals with Severe Combined Immunodeficiency Disease (SCID) should not receive Vaccine
Adverse reactions	Serious: intussusception Mild: irritability; nasopharyngitis; otitis media; diarrhea; vomiting	Very common (≥1/10): Fever, Irritability, Decreased activity level Very common (≥1/10): Decreased appetite and Vomiting Common (≥1/100 and < 1/10): Diarrhea Intussusception (IS) Gastrointestinal symptoms and signs
Special precautions	Should be postponed for acute gastroenteritis/diarrhea, fever with moderate to severe illness. Not routinely recommended for history of intussusception or intestinal malformations possibly predisposing to intussusception If the child has diarrhea and vomiting after receiving oral administration, please repeat the dose.	Should be postponed for acute gastroenteritis/diarrhea, fever with moderate to severe illness.
Dosage	1.5 ml	2ml
Route of administration	Oral only	Oral only
Storage	Store between 2°C–8°C. Do not freeze	Store between 2°C–8°C. Do not freeze

1.2.1.5. *Measles vaccine*

Measles vaccination resulted in a 73% drop in measles deaths. Vaccination with two dose measles vaccine per the schedule confers 95% immunity. All children should receive two doses of the vaccine at age 9 months and 15 months. Currently, Measles vaccine is formulated in single, 5 doses and 10 doses vail.

Table1.6. Summary of Measles-containing vaccines characteristics

Type of vaccine	Live attenuated
Number of doses	Two (2) doses
Schedule	MCV 1: at 9 months of age. MCV 2: at 15 months of age. Additionally, for those delayed children MCV 2 vaccination can be provided as per catch up vaccination guideline. Note: During catch up vaccination: two doses of measles vaccine can be provided or vaccinated in 4 weeks interval time.
Booster	None
Contraindications	Known allergy to vaccine components (including neomycin and gelatin); pregnancy; severe congenital or acquired immune disorders, including advanced HIV infection/AIDS
Adverse reactions	■ Serious (rare): thrombocytopenia (decreased platelets), anaphylaxis, encephalitis ■ Mild (more common): fever, rash 5-12 days following administration
Special precautions	None
Dosage	0.5ml
Injection site	Left upper arm
Route of administration	Subcutaneous
Storage	Between +2 °C and +8 °C; Keep all MCVs away from sunlight

Note 1: Measles vaccine can be provided in addition to routine doses during preventive or outbreak vaccination campaigns regardless of routinely provided doses.

Note 2: Vit A supplementation highly recommended to be given during measles vaccination to develop high immunity for measles disease. (Refer further nutrition guide)

1.2.1.6. Polio vaccines (OPV and IPV)

Polio virus causes one in 200 infections that leads to irreversible paralysis. Among those paralyzed, 5–10% die when their breathing muscles become immobilized. Polio vaccine significantly contributed to the reduction of wild poliovirus by 99% since 1988, from an estimated 350 000 cases then, to 6 reported cases in 20212. Currently there are two types of polio vaccines 1) oral polio vaccine (OPV) 2) Inactivated polio vaccine (IPV). OPV vaccines are formulated in oral drop form in 10 doses and 20 doses vial and IPV vaccine is formulated in injection form in 5 dose and 10 dose vials.

Table1.7. Summary of polio vaccines characteristics

Characteristics	OPV	IPV
Type of vaccine	Live attenuated	Inactivated
Number of doses	Four (4) doses	Two (2) doses
Schedule	Birth, 6, 10, 14 weeks of age	IPV 1 at 14 weeks and IPV 2 at 9 months
Booster	None	none
Contraindications	Anaphylactic reaction to previous dose or to any constituent	Anaphylactic reaction to previous dose or to any constituent
Adverse reactions	Rare vaccine-associated paralytic polio (VAPP)	Serious: none known. Mild: injection site reactions
Special precautions	Postpone vaccination if the child has moderate to severe illness (with temperature =39 °C)	Postpone vaccination if the child has moderate to severe illness (with temperature =39 °C)
Dosage	Two drops into the mouth	0.5 ml
Route of Administration	Oral only	Intramuscular: Right anterolateral (outer) mid-thigh in infants. There should be minimum of 2.5cm apart from PCV injections
Storage	Store between 2°C–8°C. OPV is very heat sensitive	Store between 2°C–8°C. IPV is freeze sensitive
Note: mOPV (monovalent oral polio vaccine) and nOPV (noble oral polio vaccine) are available for cVDPV outbreak response vaccination program.		

1.2.1.7. *Tetanus diphtheria (Td) vaccine*

Td vaccine can prevent tetanus and diphtheria. Td vaccines contain both tetanus and diphtheria antigens. Td vaccine available in liquid formulation and 1, 10 and 20 dose presentations. Ethiopia uses 10 doses vial for Td. Td can be provided for preschool children and older, adolescents, reproductive age mothers. But per the Ethiopian vaccination policy Td vaccine is provided only to pregnant mothers currently.

Table1.8. Summary of Tetanus-diphtheria (Td) vaccine characteristics

Type of vaccine	Toxoid		
Number of doses	Five (5) doses		
Schedule and protection year	Td1	0 (as early as possible),	Elicits no protection
	Td2	4 weeks after Td1	3 years
	Td3	6 months after Td2 or subsequent pregnancy	5 years
	Td4	1 year after Td3 or subsequent pregnancy	10 years
	Td5	1 year after Td4 or subsequent pregnancy	All childbearing years
	Note: There is malpractice that every pregnant mother injected two doses of Td vaccines during each pregnancy. The correct way of Td vaccine administration is if the mothers get 2 doses of Td during her 1st or whatever pregnancy the following vaccination is become 3rd dose of Td, she do not have to restart as new.		
Booster	Td vaccine can be given as booster doses 18 months to 6 years of age (Two doses of Td at school age following Penta vaccination), thus prolonging the duration of protection from both diseases. However, Ethiopia has not yet started providing Td Booster doses.		
Contraindications	Known hypersensitivity or anaphylaxis to a previous dose		
Adverse reactions	Severe: rare anaphylaxis, brachial neuritis, GBS Mild: injection site reactions and fever		
Special precautions	None		
Dosage	0.5 ml		
Injection Site	Intramuscular injection into the deltoid muscle		
Storage	Store between 2°C–8°C. Do not freeze		

1.2.1.8. *Human papilloma virus vaccine (HPV vaccine)*

Cervical cancer is the fourth most common cancer among women globally, with an estimated 604 000 new cases and 342 000 deaths in 2020. About 90% of the new cases and deaths worldwide in 2020 occurred in low- and middle-income countries. A large majority of cervical cancer (more than 95%) is due to the human papillomavirus (HPV). There are three types of HPV vaccine globally, Bi valent, quadrivalent and nano valent. Each vaccine addresses different serotypes of HPV. Ethiopia introduced and using quadrivalent HPV vaccine with formulation of single dose.

Table1.9. Summary of HPV vaccines characteristics

Type of vaccine	Recombinant protein capsid, Quadrivalent
Type of vaccine	Recombinant protein capsid, liquid vaccine
Number of doses	One (1) dose
Schedule	9 (Nine) years of age adolescent girls. Additionally, for those delayed Adolescent girls' vaccination can be provided per catch up vaccination guideline
Booster	None
Contraindications	Anaphylaxis or hypersensitivity
Adverse reactions	Severe: rare anaphylaxis Mild: injection site reactions; fever, dizziness, nausea
Special precautions	Postpone vaccination for pregnancy. Adolescents should be seated during injections and for 15 minutes afterwards since they sometimes faint
Dosage	0.5 ml
Route of administration	Intramuscular, Deltoid muscle of upper arm
Storage	Store between 2°C–8°C. Do not freeze

Note: Currently the HPV vaccine is provided at age of 14 years, and after multi age cohort vaccination (10-14 years) HPV will be provided at 9 years of age.

1.2.1.9. COVID 19 vaccines

Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. Most people infected with the virus will experience mild to moderate respiratory illness and recover without requiring special treatment. However, some will become seriously ill and require medical attention. Older people and those with underlying medical conditions like cardiovascular disease, diabetes, chronic respiratory disease, HIV or cancer are more likely to develop serious illness. Anyone can get sick with COVID-19 and become seriously ill or die at any age. Covid 19 vaccines have resulted in significant reduction in COVID 19 disease mortality and morbidity globally. There are different types of COVID 19 vaccines currently available worldwide such as Pfizer, Moderna, AstraZeneca, Janssen and Janssen, Sinopharm, Sinovac, Sputnik V, etc. Ethiopia has been using Pfizer, AstraZeneca, Janssen and Janssen, Sinopharm, Sinovac for COVID 19 pandemic response vaccination.

Table1.10. Summary of COVID 19 vaccines characteristics

Characteristics	Pfizer tris formulation (gray cup)	Janssen and Janssen	AstraZeneca	Sinopharm/ Sinovac
Type of vaccine	mRNA	Recombinant	Recombinant	Inactivated
Number of doses	Two (2) doses	One (1) dose	Two (2) doses	Two (2) doses
Schedule	12 year and above, the 2nd dose after 3 to 4 weeks	18 year and above	18 year and above, the 2nd dose after 4 to 8 weeks	18 year and above, the 2nd dose after 3 to 4 weeks
Booster	6-month after 2nd dose	6-month after 1nd dose	6-month after 2nd dose	6-month after 2nd dose
Contraindications	Known allergy with previous doses	Known allergy with previous doses	Known allergy with previous doses	Known allergy with previous doses
Adverse reactions	Soreness, myalgia, headache, joint pain, injection site pain	Soreness, myalgia, headache, joint pain, injection site pain	Soreness, myalgia, headache, joint pain, injection site pain	Soreness, myalgia, headache, joint pain, injection site pain
Dosage	0.3 ml	0.5 ml	0.5 ml	0.5 ml

`Route	Intramuscular, deltoid	Intramuscular, deltoid	Intramuscular, deltoid	Intramuscular, deltoid
Storage	When stored/ maintained at -80°C to -60°C can be used by the indicated expiration date on the vaccine vial. But if it is stored at 2°C to 8°C it can be used for only 10 weeks.	2°C to 8°C	2°C to 8°C	2°C to 8°C
Note: Covid 19 administration, scheduling, storage, type, adverse reaction, contraindication might change overtime. Thus, we encourage vaccinators to use updated information.				

1.2.2. Vaccines provided for emergency or outbreak response in Ethiopia and potential to be routinized

Activity 4: Group discussion, presentation, and summary

Instruction: be in one group read and discuss the below question for 30 minutes and present and share your reflections to larger participants (10 min). Facilitator will summarize and allow Questions and answers in 10 min.

1. List vaccines currently provided for emergency and outbreak response vaccination in Ethiopia, and list VPDs prevented

1.2.2.1. Yellow fever vaccine

Yellow fever is prevented by an extremely effective vaccine, which is safe and affordable for those aged 9 months or more living or traveling to high-risk areas. A single dose of yellow fever vaccine is sufficient to grant sustained immunity and life-long protection. A booster dose of the vaccine is not needed. The vaccine provides effective immunity within 10 days for 80-100% of people vaccinated. Currently Ethiopia is providing yellow fever vaccine for international travelers and yellow fever outbreak responses.

Table1.11. Summary of yellow fever vaccine characteristics

Type of vaccine	Live-attenuated viral
Number of doses	One (1) dose
Schedule	Age greater than 9 months
Booster	None
Contraindications	Age <6 months; age 6 –8 months except during epidemics; Known allergy to egg antigens or to a previous dose; Symptomatic HIV infection (AIDS stage)
Adverse reactions	Severe: anaphylaxis; YF vaccine-associated neurologic disease and viscerotropic disease; encephalitis in infants aged <6 months Mild: headache, muscle pain, fever
Special precautions	Risk-benefit assessment before administering to pregnant women or people aged >60 years
Dosage	0.5 ml
Injection Site	Outer upper left arm or shoulder (for subcutaneous)
Injection type	Subcutaneous or intramuscular
Storage	Store between 2°C–8°C. Do not freeze
Note: the schedule for routine yellow fever vaccine has not been decided yet. It will be decided during routine introduction time.	

1222. *Oral Cholera vaccine*

Cholera is an acute diarrheal disease that can kill within hours if left Untreated. Provision of safe water and sanitation is critical to prevent and control the transmission of cholera and other waterborne diseases. Severe cases will need rapid treatment with intravenous fluids and antibiotics. Oral cholera vaccine is a tool used to prevent cholera disease outbreaks in conjunction with improvements in water and sanitation in areas known to be high risk for cholera. Currently there are 3 WHO pre-qualified oral cholera vaccines Dukoral, Shanchol, and Euvichol. Ethiopia currently uses Euvichol-plus oral cholera vaccine for outbreak response and cholera high risk areas. Cholera vaccine is not yet introduced as a routine immunization program.

Table1.12. Summary of Euvichol-plus oral cholera vaccine (OCV) characteristics

Type of vaccine	Inactivated, liquid formulation
Number of doses	Two(2) doses
Schedule	Age greater than 1 year, the 2nd dose is given after 2 weeks of interval
Booster	None
Contraindications	Known hypersensitivity with previous dose
Adverse reactions	Abdominal pain, diarrhea
Dosage	1.5 mL
Route of administration	Oral
Storage	Store between 2°C–8°C. Do not freeze

1223. Meningococcal vaccines

There are two Meningococcal vaccines Polysaccharide and Conjugate, these two vaccines prevent Neisseria meningitidis. Ethiopia is in the African meningitis belt countries and vaccinated 2013-2015 vaccinated conjugate meningococcal vaccines (Men A) all aged one to 29 years.

Table1.13. Summary of Meningococcal polysaccharide and conjugate vaccines characteristics

Characteristics	Meningococcal conjugate (Men A)	Meningococcal polysaccharide (Men A)
Type of vaccine	Purified bacterial capsular polysaccharide bound to protein; monovalent, quadrivalent	Purified bacterial capsular polysaccharide; bivalent, trivalent or quadrivalent
Number of doses	One (1) dose	One (1) dose

Schedule	Monovalent: Single dose for all between 1 and 29 years of age through SIA; Single dose at the age of nine months through routine.	Two years of age and older
Booster	None	One dose after 3-5 years if still at risk
Contraindications	Anaphylaxis or hypersensitivity after a previous dose	Anaphylaxis or hypersensitivity after a previous dose
Adverse reactions	Severe: rare anaphylaxis Mild: injection site reaction, fever	Severe: rare anaphylaxis; Mild: injection site reaction, fever
Special precautions	See schedules above for age restrictions	Children under 2 years of age are not protected by the vaccine
Dosage	0.5ml	0.5ml
Injection site	Left arm	Left arm
Injection type	Intramuscular	Subcutaneous
Storage	Between +2 °C and +8 °C, do not freeze	Between +2 °C and +8 °C, do not freeze
Note: Men A vaccine not yet included in the routine immunization program.		

1224. *Rabies vaccine*

Dogs are the main source of human rabies deaths, contributing up to 99% of all rabies transmissions to humans. Rabies can be prevented through vaccination of dogs and prevention of dog bites. After a potential exposure of people to a rabid animal, they can seek post-exposure prophylaxis (PEP), which consists of immediate, thorough wound washing with soap and water for 15 minutes, a series of rabies vaccinations and, if indicated, administration of rabies immunoglobulin or monoclonal antibodies, which can be lifesaving.

Table1.14. Summary of rabies vaccines characteristics

Type of vaccine	Imovax, Rabavert, HDVC (Human Deploid Cell Vaccine), PCEC (Purified Chick Embryo Cell Vaccine)
Number of doses	Four (4) doses, before signs and symptoms develop
Schedule	0, 3 days after the first, 7 days, 14 days
Booster	None
Contraindications	None
Adverse reactions	Soreness, redness, headache
Special precautions	For higher additional rabies immunoglobulin

N.B. Measles and polio vaccines are also used for outbreak response vaccination. their characteristics can be referred at page 11 and 12.

1.2.3. Vaccine not introduced and in pipeline.

Activity 5: Individual reflection

Instruction: List vaccine types in pipeline in Ethiopia

Time: 5 minutes

1.2.3.1. Hepatitis B birth dose

Hepatitis B virus is most transmitted from mother to child during delivery, as well as through contact with blood or other body fluids during sex with an infected partner, unsafe injections or exposures to sharp instruments. In 2019, hepatitis B resulted in an estimated 820 000 deaths, mostly from cirrhosis and hepatocellular carcinoma. Hepatitis B virus infection during delivery time is much more likely to persist as chronic HBV infection leading to cirrhosis and hepatocellular carcinoma resulting in premature death. Hepatitis B birth dose vaccine prevents mother to child Hep B virus transmission during birth and delivery. Penta valent vaccine contains Hepatitis B antigen, but it doesn't prevent mother to child transmission, but it prevents Hepatitis infection during childhood period and beyond.

Table1.15. Summary of Hepatitis B- Birth dose vaccine characteristics

Type of vaccine	Recombinant DNA or plasma-derived
Number of doses	One (1) dose
Schedule	Highly recommended Immediately after birth within 24 hrs. and until 2 weeks
Booster	None
Contraindications	Anaphylactic reaction to previous dose or to any constituent
Adverse reactions	Mild: soreness at the injection site, irritability and fever
Special precautions	Use only stand-alone Hep B birth dose vaccines for the birth dose.
Dosage	0.5ml
Injection site	Intramuscular injection anterolateral aspect of the thigh.
Storage	Store between 2°C–8°C.
Note: A child should continue to get vaccinated with Hepatitis B vaccine containing Penta vaccine for full protection at later age.	

1.23.2. Malaria Vaccine

Malaria affects 68% of the population in Ethiopia, estimated at 10 million clinical cases/year. The main parasites are PF-60% and PV 40%. Malaria vaccine, RTSS works by targeting a portion of the sporozoite protein on the surface of the malaria parasite. The idea is that a vaccinated individual will generate antibodies and kill off the parasite before it can enter red blood cells. Studies showed Malaria Vaccine resulted in reduction in severity of the disease, and 21% reduction in hospitalization and up to 39 % prevention. Malaria vaccine should be implemented in combination with other malaria prevention interventions to be effective enough to prevent malaria disease.

Table1.16. Summary of malaria vaccines characteristics

Type of vaccine	RTS, S/S/A so1
Number of doses	Four (4) doses
Schedule	Not yet decided
Booster	Not yet decided
Contraindications	Hypersensitivity to previous dose, or hepatitis B vaccine
Adverse reactions	Swelling, pain on injection site and fever
Special precautions	Do not freeze, store in temperature 2 °c - 8 °c
Not yet decided: this means that Ethiopia's national immunization advisory group/committee (NITAG) will decide how to use this vaccine in Ethiopia during introduction time.	

1.2.3.3. Typhoid vaccine

Typhoid fever is a life-threatening infection caused by the bacterium Salmonella Typhi. Two vaccines have been used for many years to prevent typhoid. The conjugate typhoid vaccine was available and can provide longer protection time.

Table1.17. Summary of Typhoid vaccines characteristics

Type of vaccine	Conjugated Vi polysaccharide, non vi polysaccharide vaccine, live attenuated oral 2yua
Number of doses	Single, 0.5 ml SC or IM
Schedule	Not yet decided
Booster	Not yet decided
Contraindications	Does not produce immune response in < 2 years old children
Adverse reactions	Common tenderness, redness
Special precautions	not recommended for use during pregnancy
Route administration	Intramuscular, deltoid
Storage	

1.2.3.4. *Rubella vaccine*

Rubella and congenital rubella Syndrome (CRS) are infections caused by a virus. Rubella is normally a mild childhood disease, but women who are infected with rubella in early pregnancy can pass the virus on to their fetuses and this can lead to fetal death or CRS. The rash associated with rubella infection may not occur in 20–50% of cases. CRS includes birth defects of the ears, eyes, heart, and brain. Rubella containing vaccines reduces the burden of Rubella and congenital rubella Syndrome (CRS) globally. Rubella vaccine is available in form combination as measles and rubella (MR) or measles, mumps, and rubella (MMR) or measles mumps rubella and varicella (MMRV).

Table1.18. Summary of Rubella-containing vaccines

Type of vaccine	Live attenuated viral
Number of doses	Two (2) doses
Schedule	The same as measles vaccine
Booster	Not recommended at this time
Contraindications	Known allergy to vaccine components (including neomycin and gelatin)
Adverse reactions	Common: injection site reactions, fever, rash, irritability, lymphadenopathy (swollen lymph glands), myalgia (muscle aches) and paranesthesia's (tingling sensations)
Special	None
Precautions	
Dosage	0.5 ml
Route	Subcutaneous, left upper arm
Storage	Store between 2°C–8°C. keep all Rubella vaccines away from sunlight

1.2.3.5. *Mumps vaccine*

Mumps disease can cause complications, such as permanent deafness in children, and occasionally, encephalitis, which could rarely result in death. Mumps containing vaccines reduces the burden of mumps disease globally. Mumps vaccine is available in form combination form as measles, mumps, and rubella (MMR) or measles mumps rubella and varicella (MMRV)

Table1.19. Summary of mumps-containing vaccines

Type of vaccine	Live attenuated viral
Number of doses	Two (2) doses
Schedule	The same as measles vaccine
Booster	Not recommended at this time
Contraindications	Known allergy to vaccine components (including neomycin and gelatin); pregnancy; severe congenital or acquired immune disorders, including advanced HIV infection/AIDS
Adverse reactions	Common: injection site reactions, fever, rash, irritability, myalgia (muscle aches) and tingling sensations
Special	None
Precautions	
Dosage	0.5 ml
Route	Subcutaneous, left upper arm
Storage	Store between 2°C–8°C. keep all Rubella vaccines away from sunlight

1.23.6. Ebola (Ervabo) Vaccine

Ebola virus disease has a case fatality rate of around 50%. Early supportive care with rehydration, symptomatic treatment improves survival. Ebola Vaccine is tohelp control the spread of Ebola outbreaks.

Table1.20. Summary of Ebola vaccines characteristics

Type of vaccine	Recombinant, live attenuated
Number of doses	Two (2) doses, 8 weeks apart

Schedule	For older than 18 years old
Contraindications	Pregnant and lactating
Adverse reactions	Joint pain or swelling, arthritis
Special precautions	After vaccination, people should be observed for at least 15 minutes
Route of administration	Intramuscular, deltoid muscle
Storage	When stored/maintained at -80°C to -60°C can be used by the indicated expiration date on the vaccine vial. But if it is stored at 2°C to 8°C it is only used for 14 days.

1.3. Chapter Summary

- A vaccine-preventable disease is an infectious disease for which an effective preventive vaccine exists.
- Vaccination is among the most cost-effective health interventions and has been responsible for substantial reductions in mortality and morbidity for under five as well as adults.
- Vaccine-preventable deaths are usually caused by a failure to obtain the vaccine in a timely manner.
- Direct protection afforded to vaccinated individuals, high levels of vaccination coverage offer indirect protection (herd immunity) to the remaining unvaccinated individuals in a population.
- Vaccines are our best defense against many diseases.
- Vaccine-preventable diseases (VPDs) are diseases caused by bacteria and viruses that can be prevented by vaccines.

Chapter 2:

Vaccine and Cold chain management

Time Allocated: 480 Minutes

Chapter description: This chapter provides technical guidance on Vaccines and supply Forecasting, providing insights into effective vaccine management. It extensively covers Cold Chain Equipment, emphasizing its optimal usage at Health Facility levels. The chapter highlights the crucial role of Temperature Monitoring in preserving vaccine integrity during storage and distribution. Additionally, it underscores the importance of Preventive Maintenance protocols at Health Facility levels to ensure continuous equipment functionality, ultimately contributing to the success of immunization programs

Chapter Objective: At the end of this chapter participants will be able to:

- Explain vaccine and cold chain equipment.

Enabling Objectives:

- Estimate the vaccine and supply needs
- Prepares vaccine and supply stock
- Determine vaccine wastage
- Manipulates cold chain equipment
- Demonstrate proper vaccine temperature monitoring practice.
- Operates basic preventive maintenance

Chapter outline:

2.1. Introduction to vaccine and cold chain Management

2.2 Forecasting required vaccine & supplies

2.3 Managing vaccine stock

2.4 Determine vaccine wastage.

2.5 Cold Chain Equipment and Management

2.6 Cold Chain Temperature Monitoring Devices

2.7 Basic Cold Chain Equipment Maintenance

2.8. Chapter summary

2.1. Introduction to Vaccine and Cold Chain Management

Immunization supply chains form a unique vaccine distribution channel due to their dependence on a well-functioning end-to-end cold chain necessary for ensuring vaccine potency to the last mile, and ultimately to every person being immunized.

Proper Vaccine and cold chain management require health workers with specialized knowledge and Skills in vaccine management tools and procedures, Storage facilities (cold rooms, freezer rooms, refrigerators, etc.), transportation facilities (refrigerated vehicles, passive containers, etc.) and temperature monitoring devices and procedures.

Effective management and storage of supplies can help save on program costs, prevent high wastage and stock-outs, and improve the safety of immunizations.

2.2. Forecasting vaccines and related supplies

Forecasting is the process of estimating vaccines, and related supplies (diluents, syringes, safety boxes, etc.) required for a target population in a specific period. Without sufficient vaccines in the facilities, the needs of the immunization program cannot be met, and eligible populations will not be fully protected against vaccine-preventable diseases (VPD).

The quantity of the vaccines should be calculated for the period and a designated (25%) quantity should be added to keep as buffer stock.

2.2.1. Methods of Vaccines and Related Supply Forecasting

There are three methods of Vaccines and related supplies forecasting: -

- Target population
- Consumption and
- Size of immunization sessions

Table 2.1 Vaccines Forecasting Method Summary

Method	Formula	Preferred application	Advantages	Constraints
Target Population	*Annual Need of Vaccine= Annual target population * Annual Coverage Plan * number of doses per individual targets * Wastage Factor of*	Central and intermediate levels and Supplementary immunization activities (SIA)	Suitable at higher levels and for Facilities' active and accurate planning. Assists in monitoring vaccine wastage	Unreliable demographic data.
Consumption method	*Vaccines need = (Beginning Balance + Received Quantity) - (Ending balance + Wasted unopened vaccine dose)*	Countries with a stable EPI and good vaccine stock management system. Convenient to use at Facilities with high coverage, Hospitals and private HFs.	Adequate for short periods and does not depend on target population data	Difficult to apply for long periods. Planning is passive.
Immunization session method	*Annual Vaccines need = # of immunization posts *# of weeks of operation in the year * # of immunization sessions per week *Average number of vials op doses per vial* # of doses per vial*	At the fixed health facilitylevel (fixed posts) and Outreach posts	Makes it easy to control the size of immunization sessions	Promotes passive planning. Monitoring of VWR is not involved

Note:

This formula assumes that 25% buffer stock is available at any time at the health facility. It has to be considered during the new vaccine introduction or 25% buffer stock is not available during the planning session.

Estimating dry supply and Safety box requirement using the Target population method

$$AD\ Syringe = Targets\ (for\ each\ antigen) * Coverage * number\ of\ dose\ per\ per\ individuals * Wastage\ Factor$$

$$Mixing\ Syringe = number\ of\ Vials * Wastage\ Factor$$

$$Number\ of\ Vials = \frac{total\ doses}{number\ of\ doses\ per\ vial/Ampoule}$$

$$Safety\ box = \frac{(Total\ AD\ Syringe + Total\ Mixing\ Syringe)}{100} * Wastage\ Factor$$

Example 2.1:

Calculate the Annual and Monthly Vaccine, AD Syringe, Mixing Syringe, and safety box needed for a Health Center with 25,000 populations. (Consider Percentage of Live Birth 3.7% and % Surviving infant 3.2%, use 1.4% and 64% for HPV & Pfizer vaccines respectively).

Note:

- Use Live Birth-for BCG, HepBD, Td, bOPV and Surviving Infants for IPV, Penta, Measles, PCV-13, Rota
- IPV, Pentavalent, Pcv-13, Measles, Hep BD, HPV, Td, Janssen, and Sinopharm use 0.5ml AD Syringe and BCG-uses 0.05ml AD Syringe and Pfizer Vaccine uses 0.3ml AD Syringe.

Table 2.2 Annual and monthly required quantity of all Vaccines (Answer to Example 2.1)

S/N	Vaccine	Target population	Target coverage	# of doses in the n schedule	Wastage factor (WMF)	Annual need	Monthly need
1	BCG	925	100%	1	2	1,850	154
2	BOPV	925	100%	4	1.11	4,107	342
3	IPV	800	100%	2	1.11	1,776	148
4	Penta	800	100%	3	1.05	2,520	210
5	Hep BD	925	100%	1	1.05	971	81
6	Measles	800	100%	2	1.54	2,464	205
7	PCV-13	800	100%	3	1.11	2,664	222
8	Rota	800	100%	3	1.11	2,520	210
9	Td	925	100%	3	1.11	3,080	257
10	Pfizer	16,000	70%	2	1.11	24,864	2072
11	HPV	350	95%	1	1.05	349	29

Table 2.3 Annual and monthly required quantity of all AD Syringe (Answer to Example 2.1)

S/N	AD Syringes	Target population	Target coverage	# of doses in the schedule	Wastage factor (WMF)	Annual need	Monthly need
1	BCG AD Syringe(0.05ml)	925	100%	1	1.05	971	81
2	IPV AD syringe (0.5ml)	800	100%	2	1.05	1,680	140
3	Penta AD syringe (0.5ml)	800	100%	3	1.05	2,520	210

4	Hep BD AD syringe (0.5ml)	925	100%	1	1.05	971	81
5	Measles AD syringe (0.5ml)	800	100%	2	1.05	1,680	140
6	PCV-13 AD syringe (0.5ml)	800	100%	3	1.05	2,520	210
7	Td AD syringe (0.5ml)	925	100%	3	1.05	2,914	243
8	Pfizer AD syringe (0.3ml)	16,000	70%	2	1.05	23,520	1,960
9	HPVAD syringe (0.5ml)	350	95%	1	1.05	349	29
	Total					37,125	3,094

Note:

- Total required syringe = (total calculated vaccine in dose /2) X 2 syringe
    - Total Syringe= (2520/2) *2=2,520
- Total required Adapter = (total calculated vaccine in dose /2)
    - Total Adapter= 2520/2=1,260
- Make sure syringe and adapter bunding

Calculating Mixing syringe (Annual & Monthly)

- BCG mixing syringe= Number of BCG Vials*WF
- Number of BCG Vials=Number of BCG doses/20=1850/20=93
- Annual BCG Mixing Syringe=93*1.05=98
- Monthly BCG Syringe=98/12=8
- Measles Mixing Syringe=Number of Measles Vials*WF
- Number of Measles Vials=Number of Measles doses/10=2464/10=246
- Annua lMeasles Mixing Syringe = 246* 1.05 = 258
- Monthly Measles Mixing Syringe = 258/12 =22

Calculating Safety box

- Annual Safety box needed= (AD Syringe + Mixing Syringe) *WF/100
- Annual Safety box= (37,125+356) *1.05/100
- Annual Safety Stock=394
- Monthly safety box=394/12=33

Note: The target population for Covid vaccine will be calculated based on the most recent Vaccination Coverage data. All covid COVID-19 vaccines require two doses to achieve full immunization status except the Janssen vaccine. . All covid COVID-19 vaccines require two doses to achieve full immunization status except the Janssen vaccine.

Note: Currently, vaccines that require mixing syringes for reconstitution in Ethiopia are BCGand measles vaccines.

Exercise 2.1:

Time allotted 30 minutes for Exercise and 15 minutes for Presentation

Instructions: Discuss in five groups and present your discussion for the larger group using a flip chart

Geda Health Center is found in the Oromia region, Adama Town and it has a catchment population of 40,000. Calculate Annual and Monthly needed vaccines, AD, and mixing syringes and safety boxes based on the following information. (Consider the Percentage of Live Birth 3.7% and % Surviving infants 3.2%, use 1.4% for HPV targets). Use Live Birth to calculate the target population for BCG, Hep BD, Td, bOP and Surviving Infants to calculate target population of IPV, Penta, Measles, PCV-and 13,Rota. Usthe e Wastage rate and number of doses in schedule from the Example 2.1 above. Complete your answer in the table below.

Table 2.4 Templates for response to exercises 2.1(Vaccines and related supply)

Items	Vaccines needed	BCG	BOPV	IPV	Penta	Hep BD	HPV	Measles	PCV-13	Rota	Td
Vaccine	Annual										
	Monthly										
AD syringe	Annual										
	Monthly										
Mixing Syring	Annual										
	Monthly										
Safety box	Annual										
	Monthly										

Exercise 2.2

Calculate monthly needs of Vaccines, AD Syringes, Mixing syringe, and Safety boxes on the basis of previous consumption of Health Center with the following basic information.

Table 2. 5 Given information to calculate the Monthly Vaccines need using Consumption method

Vaccines	Beginning Balance	Quantity received	Ending Balance	Doses discarded	Monthly need
BCG	0	600	400	0	
BOPV	200	160	260	0	
IPV	1000	200	560	60	
Pentavalent	600	360	430	100	
Measle	300	600	600	0	
PCV 13	160	460	480	0	
Rota	250	200	280	30	
Td	400	400	400	0	
HPV	360	0	360	0	
Syringe AD 0.5ml	2400	2000	3800	50	
Syringe AD 0.05ml	0	500	400	0	
Mixing Syringe (BCG)	0	30	20	0	
Mixing Syringe (Measle)	400	60	60	0	
Safety box	160	260	190	0	

Exercise 2.3

Calculation of annual needs of Vaccines, AD Syringe, Mixing Syringe, and Safety box according to past vaccination sessions of Bole health Center with the following information.

Table 2. 6 Given information to calculate Annual Vaccines need using Immunization session method

Vaccines	# Vaccination post	# Weeks in Operation	# of session per week	Number of Vial per session	Number of doses per vial	Annual Vaccines needed(doses)
BCG	20	48	3	6	20	
BOPV	20	48	3	8	10	
IPV	20	48	3	12	5	
Pentavalent	20	48	3	80	1	
Measle	20	48	3	23	10	
PCV 13	20	48	3	40	2	
Rota	20	48	3	40	1	
Td	20	48	3	25	10	
HPV	20	48	3	20	1	

Note: For all methods, the accuracy of forecasted quantity of vaccine and suppliesdepends on the quality of the data used for forecasting and the knowledge of thehealth care worker doing the calculations. *The AD Syringe and Safety box can be calculated using the Vaccines doses for both Consumption and Immunization Session Methods*

222. Forecasting vaccines and supplies for Special conditions:

The required quantity of vaccines and other supplies at health facility level may increase under special conditions like outbreaks, conflicts, internal displacement, low immunization coverage (high number of unimmunized and under immunized children) etc. where separate planning is essential. In such instances factors required for vaccine forecasting are similar with routine vaccines except changes in target age, wastage rate and supply lead time. Identifying appropriate target population, assessing the cold storage capacity, distribution plan including transport should be considered.

2.3. Vaccines stock management

Effective vaccine stock management is one of the focus areas of vaccine supply chain management. It consists of appropriate receiving of vaccines, ensuring the required storing conditions, and controlling the distribution of vaccines through the different levels to ensure the adequacy and quality of vaccines for immunization programs.

A system of stock management must be in place to record ***vaccines received, vaccines dispatched, used, and wasted.*** This will make sure that vaccines are used before their expiry date, that the status of VVM is recorded at receipt and issue, and that there are no stock-outs, or over-stocking.

2.3.1. Stock level at Health Facility

For appropriate stock management andwell-timed ordering of vaccines and other EPI supplies, stock level determination is imperative. The stock levels that have to be followed for meticulous stock management and ordering of vaccines are:

Safety Stock:

The "safety stock", also called reserve or buffer stock is a provision made to cover unforeseen fluctuations of demand and unexpected delays in the delivery schedule. It can be established as a certain percentage (25%) of the supply period needs.

The safety stock can be calculated using the following formula at PHCU

Safety stock= Vaccines needed in supply period *25%

Note: the safety stock is not supposed to be consumed under normal circumstances. However, it should not be managed as a separate physical stock put aside in the store. It is a virtual amount and the entire physical stock should be managed and distributed according recommended principles, i.e., EEFO, VVM status, FIFO.

Minimum Stock Level (Time to Order): -

It implies the least amount that should have in stock. It is an amount of stock, which is used in the time between placing and receiving the order plus the buffer stock.

Maximum Stock Level

The maximum stock is the maximum number of vaccine doses that should be found in the store after a supply. The "maximum stock" is the sum of the supply period needs and "safety stock". The maximum stock will help to determine the storage capacity needed.

The maximum stock can be calculated using the following formula

Maximum stock=Quantity needed for the supply period + Safety stock

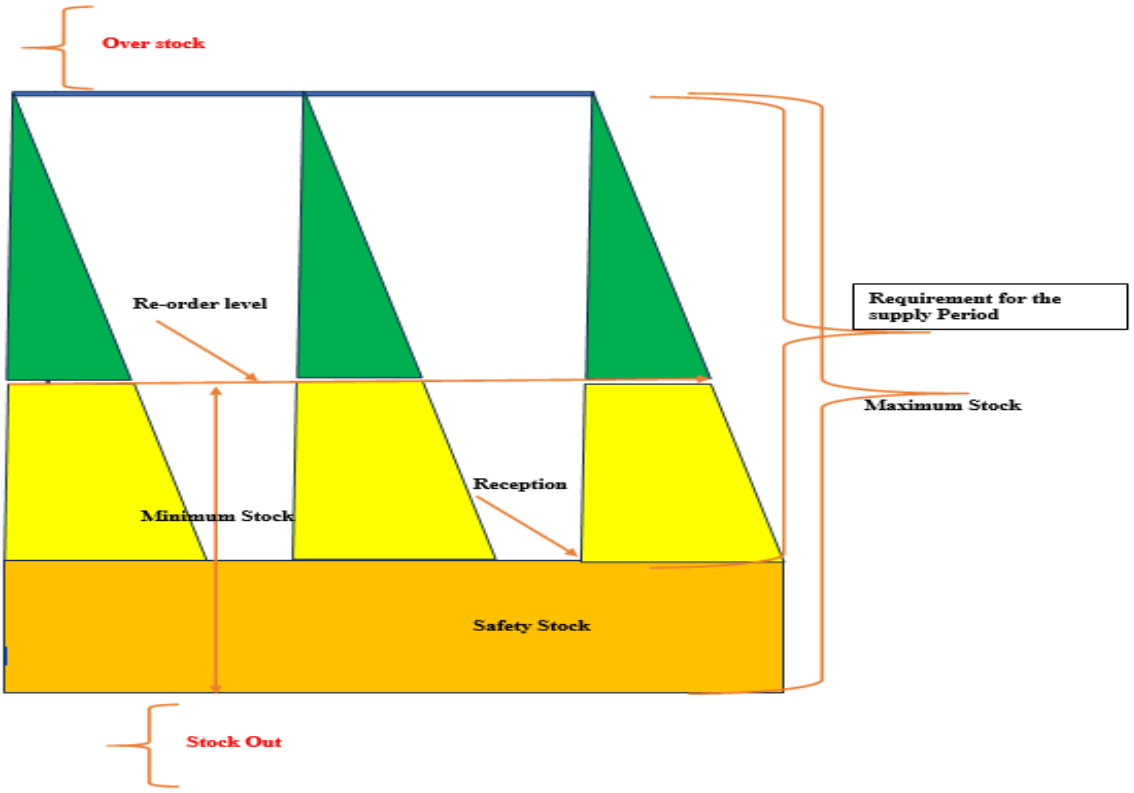


Figure 2.1 Graph of vaccines stock level

Example 2.2:

From Example 2.1 above the monthly Vaccine need of Measles & Td Vaccine were 205 & 257 respectively. Calculate the safety stock, Minimum stock and maximum stock for both Measles and Td Vaccine. Minimum stock is the sum of safety stock plus the lead time consumption. Lead time consumption=requirement Supply period/4

Table 2.7 Answer for Example 2.2

Vaccines	*Monthly Vaccines need*	*Safety stock*	*Minimum Stock*	*Maximum stock*
Measles	*205*	*51*	*102*	*256*
Td	*257*	*64*	*128*	*321*

Vaccine Supply Period

Since all the annual quantities of vaccine cannot be used or stored at once, portions of the total annual need are supplied periodically to each storage/service point. A formal requisition/dispatch process should be put in place and followed to implement these deliveries. Stock levels will also be determined and used as triggers for placing orders.

Placing the orders and subsequent deliveries should be programmed and implemented in the most efficient way to meet demand. This implies defining periods of vaccine supply, which will depend on:

- The supply chain level (national, subnational, service delivery)
- The quality of the cold chain
- The availability of cold storage capacity
- The performance of stock management system, including vaccine monitoringand distribution.

If the cold chain is not reliable or does not have enough capacity, the supply period should be adjusted to minimize the quantity of the stock.

For example, a health post will have a shorter period of vaccines supply (one to two weeks) than the Woreda store (one month), where the cold chain is more reliable. Similarly, a EPSS Hub vaccine store will have shorter period of supply than the EPSS central stores, because the EPSS hub is more likely to experience power cuts or generator breakdowns.

Table 2.8 Generally recommended standard periods for vaccines supply

Location of the store	Supply period	Remark
EPSS Central	6 Months	
EPSS hub	3 months	
Woreda	1 months	
PHCU	1 months	
Health Post with Refrigerator	Week to 1 month	
Health Post without Refrigerator	Collect Vaccines on the days of immunization session	

Note

- If the Health Post has functional refrigerator and storing Vaccines, they can use HPMRR for Vaccines request

2.3.2. Ordering/Requesting Vaccines and related supplies

Once the above critical stock levels are established, the vaccine quantities to be ordered are calculated taking into account the stock balance in store at the time of placing the order, the maximum stock and lead time using the Vaccine Request Form. It is therefore recommended that an order be placed as soon as the stock of one vaccine reaches the re-order level. In this case, the order should cover all vaccines, including those that have not reached the re-order level.

Every order for vaccines should take into account the following considerations:

- Avoid stock shortages
- Avoid situations where vaccines expire during their storage period due to stock excess
- Ensure that there are adequate cold chain storage facilities (with adequate capacity and at appropriate temperature).
- Ensure that vaccines ordered are in conformity with standards recommended by the national regulatory authority (Monthly at Woreda & Health Facility level)
- Ensure that stocks of consumables (e.g., diluents, syringes and safety boxes, etc.) are available and sufficient.
- Ensure the "bundling" strategy is adopted.

Vaccine Requisition Form

Vaccine requisition form (VRF) is used to place orders of vaccines and supplies to the next level of the supply chain system (Figure 2.2)

The vaccine requisition form should be submitted to the supplying facility regularly before the end of agreed period to avoid stock out because of the lead time. Woreda Health Office checks and evaluates VRF reporting rate, completeness, accuracy, Timeliness, stock levels, vaccine storage conditions, etc., and provides feedback to the respective health facilities.

Electronic vaccine stock management system: Digitization of vaccine stock management at health facility level is of the highest importance to ensure accurate and real-time stock visibility. The ministry is working to implement improved electronic inventory management tools that will potentially improve end-to-end supply chain operations for better vaccine availability and immunization service enhancement. Currently, mBrana is the electronic vaccine management tool in use to track Vaccine transactions and can generate VRF that can be submitted it to EPSS.

Vaccine Request Form -Revised

Ministry of Health

Ethiopian Pharmaceutical Supply Service

Region/Zone/Woreda	
Name of cold store	
Responsible Person	
Contact Address	
Telephone Number(s):	

Level of cold chain
- (●) RHB/HUB Cold room
- ( ) Woreda
- ( ) Health facility (H/HC/HP)

Date of request:	
No. of months to supply (S):	
For population catchment served	
Births (BI):	
Surviving infants (SI):	
Pergnant women	
Age of 9 years	

#	Antigen	Doses/pieces	Waste factor	Target coverage	Balance at beginning of last supply period	Received during the last supply period	Used or dispatched to lower level during last supply period	Doses discarded (Provide reason in remarks)	Current balance (E + F - G -H)	Requirement for the next supply period*	Requested Amount (J - I)	Quantity released	Vaccinations given since last supply (all doses)	Remarks
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	BCG + Diluent	1	2											
2	bOPV + droppers	4	1.11											
3	IPV (Inactivated Polio Vaccine)	2	1.11											
4	DTP-Hib-Hep (Pentavalent) Vaccine	3	1.05											
5	Measles +Diluent	2	1.54											
6	Pneumococcal Conjugate Vaccine (PCV13)	3	1.11											
7	Rota Virus Vaccine + adapter with syringe	3	1.11											
8	Td (Tetanus and Diphteria) Vaccine	3	1.11											
9	HPV	1	1.05											
10	HepB- Birth dose	1	1.05											
11	Yellow Fever +diluent	1	1.05											
12	Meningitis vaccine + diluent	2	1.11											
13	COVID-19 -Pfizer vaccine	3	1.11											
14	COVID-19 -Janssen Vaccine	2	1.11											
15														
16	Syringe, A-D, 0.5ml	20	1.05											
17	Syringe, A-D, 0.05ml (BCG)	1	1.05											
18	Syringe, A-D,0.3 ml (Pfizer)	1	1.05											
19	Mixing syringe (BCG) 2ml	1	1.05											
20	Mixing syringe (Measles) 5ml	1	1.05											
21	Safety box		1.05											

*Birth Infants (Births for BCG,bOPV and Td) × B × C × D × S (months to supply) ÷ 12 × 1.25 (buffer)

*Surviving Infants (for other vaccines) × B × C × D × S (months to supply) ÷ 12 × 1.25 (buffer)

N.B all figures are indicated as doses, pieces; requested amount includes requirement for number of months indicated at target coverage PLUS 25% buffer (min. stock), LESS current stock

#	Equipment monitoring	No. of units			No. Temperature excursions		Remarks
	Type of fridge	F	NF	FT*	< 0°C	> 8°C	
1	Cold rooms						
2	Refrigerators						
3	Freezers						

*Functional (F); Non-functional (NF); Fridge tag (FT) in use

Requested by: ____________

Approved by: ____________

Figure 2.2 Vaccines Request Form

Establish a Pre-delivery or Pre-collection notification system.

When vaccines are delivered, responsible staff at the receiving store should know well in advance when the shipment is due to arrive. Establish an effective procedure for doing this; notification may be by telephone, e-mail, text message, or social media platforms.

- In the case of deliveries, the receiving store may need to prepare the store to receive the shipment, by reorganizing existing stock to free space in the refrigerator (Pre-delivery notification).
- In case of Collection, the receiving Health Facilities need to notify the next level when to collect the Vaccines and related supplies (Pre-collection notification)

- There must be an authorized staff member on hand to receive, check, and sign for the delivered vaccine.
- In case of an Emergency request, the receiving Health Facilities should notify the Woreda/ EPSS in advance when the collection is to be made so that they have time to prepare ice packs and to pack the vaccine in preparation for the collection

Exercise 2.4

Time 30 minutes

Instructions: Discuss in five groups and present your discussion for the larger group using a flip chart

Geda Health Center is found in the Oromia region, Adama Town and it has a catchment population of 40,000. Using the information given below Complete the VRF for August 2015. Live Birth 3.7%, Surviving Infant 3.2%. The Name of the EPI Focal is Bontu Temesgen and her phone number is 0917687645 **. The refrigerator has 2 high temperatures in this month. The PHCU Director is Solomon Lemma and the supplying EPSS hub is Adama.

Instruction:

- Complete your response in VRF Form
- Summarize and present your group work to a larger group using a copy of VRF provided by your facilitator.

Table 2.9 Vaccines transactions information of Geda Health Center

Antigen	Balance at the beginning of the last supply period	Received during the last supply period	Used or dispatched to a lower level during the last supply period	Doses discarded (Provide reason in remarks)
BCG	180	240	240	20

Hep BD	80	150	120	0
BOPV	410	400	600	-
IPV	200	300	200	-
Pentavalent	100	400	350	30
Measles	160	310	330	-
PCV	180	500	200	-
Rota Virus Vaccine	140	250	200	-
Td	480	400	670	-
Syringe, A-D, 0.5ml	1,200	1,400	2,300	-
Syringe, A-D, 0.05ml	100	150	130	-
Mixing syringe (BCG)	10	10	10	-
Mixing syringe (Measles)	15	25	30	-
Safety box	400	300	700	-

2.3.3. Receiving Vaccines & related supplies at Health Facility levels

During Vaccines and related supply receiving from the EPSS hub the EPI Focal or Cold Chain manager should Check

- The quantity on the STV against the actual count
- The Expiry date and VVM stage of all Vaccines
- Check the Fridge tag or temperature recorded during transportation
- Bundling (the Diluent, Ad Syringe, Safety box, dropper)
- After Checking all the above major points store the Vaccines based on their characteristics in the refrigerator.
- Write Model 19 and update the EPI ledger book

2.3.4. EPI vaccines and injection materials stock recording book (Ledger Book)

Vaccines Ledger book is a simple and practical vaccine stock recording and monitoring tool, that is used at the health facility level. For each vaccine, diluent, and other supplies received or issued, all details including the purpose of collection/distribution, batch number, date of expiry, VVM status, quantity, presentation (dose/vial), manufacturer, minimum - maximum stock levels, discarded, returned should be properly recorded.

Table 2.8 Vaccines and other EPI supply recording

Vaccine and other EPI Supply Recording and stock Monitoring Book

Vaccine: **Measles**

Minimum stock (Doses)	Requirement for supply period (Doses)	Maximum stock (minimum + Requirement for supply period) (Doses)

Month: ______________ Year ______________

Date	Received from/ Distributed to	Purpose of Collection/ Distribution (Routine EPI or SIA)	Movements (Doses)				Presentation (dose/vials)	Manufacturer	Status of VVM	Batch Number	Expiry Date	Balance	Number of Children Vaccinated (Only for those who have vaccination sessions)	Remarks
			Received	Returned	Issued	Withdrawn (Discarded)								
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
Carried over from previous period														

A=Date of received or issued or returned or discarded	F = Amount given to others or lower level or vaccination	L= Expiry date of material
B = Name of Organization received from or distributed to	G = Discarded due to Expiry, VVM change, contamination, etc...	K= Batch or lot number of material vaccination session
C = Reason for receive or distribution (Routine EPI of SIA s)	H= Number of doses per vial or Number of AD/Mixing syringes	M =Balance at the beginning or at the end
D =Amount received in dose or unit	I= Name of manufacturer	N =Number children vaccinated with vaccine issued for
E = Amount returned from session or other HFs in dose or unit	J = Stage of VVM (1,2,3 or 4)	O =Any points to be noted such as reasons for discard

N.B. . Put your minimums stock (25% of yours apply period), Yours apply period stock and maximum stock (Yours apply period stock+ minimum stock supply period means one mont for Health Facilities and Woreda and 3 months for Zone

All types of vaccines, diluents, AD-syringes, mixing syringes, droppers, and other consumables like safety box should be recorded.

While recording, it is important to distinguish between different batches of vaccines because they may have different expiry dates and should be used accordingly. Also, in the rare situation that there is a serious adverse event, it will be useful to know the exact description of the vaccine (manufacturer, batch number, etc.). After each receipt or issue, the balance in stock should be updated. The balance recorded should be physically checked and verified at periodic intervals (e.g., once every Month at the health facility level). During the period that vaccines remain in storage, regularly check the expiry dates and VVM status of the stock to ensure no older batches are present which should have been distributed before more recent arrivals. Only vaccine stocks that are fit for use should be included in stock records. Any expired vials, heat damaged vials or vials with VVMs beyond the discard point should not appear in the available stock balance.

Exercise 2.5: Completing vaccine and EPI equipment recording sheet.

Case scenario

Instructions:

Discuss in a 4 group of participants to complete a vaccine ledger book using the information given below. Use the Safety stock, requirement for the supply period and maximum stock of Measles & Td Vaccine from the Exercise 2.2 above. The Manufacture of Measles & Td Vaccine is Serum institute of India (SII)

Time allowed: 25 minutes for group work and 5 minutes for presentations

Table 2.8 Vaccines received from EPSS Adama on 1/03/2015.

Antigen	Formulation/ presentation	Dose	VVM status	Expiry date	Batch#	Remark
Measles	10	1800	1st	Aug .2026	004N0141	
Td	10	2000	1st	Sep-2026	004M5150	
Td	10	200	2nd	Aug-2026	004M5151	
Measles	10	800	1st	June .2026	054N0133	

Scenario 1, Updating ledger book for Measles Vaccine

a. Complete the Safety stock, Requirement for supply period, Maximum stock

b. Update Ledger book for Measles Vaccines with all the information provided below

1. On 1/03/2015 Geda health center received the measles vaccines from Adama hub. Using the table 2.8 information update the ledger book. Assume the Geda Health Center have 0 doses of Measles Carried over from previous period.
2. On 3/03/2015 the health Center issued 600 doses of Measles Vaccines to K health Post.
3. On 4/03/2015 issued 200 doses of Measles to HC EPI room.
4. On 5/03/2015 issued 680 doses of Measles to L health Post and on the same date the L Health Post returned 180 doses of Measles doses with stage 2 VVM.
5. On 8/03/2015 Health Center issued 160 doses of Measles for EPI room.
6. On 10/03/2015 the EPI Focal person physically checked the refrigerator and found the 20 doses of Measles with Stage 3 VVM, and 1100 doses with 1st stage VVM.

Scenario 2, Updating Ledger book for Td Vaccine

a. Complete the Safety stock, Requirement for supply period, Maximum stock

b. Update Ledger book for Td Vaccines with all the information provided below

1. On 1/03/2015 Geda health center received Td vaccine from Adama hub. Using the above information(Table 2.8) update the ledger book. Assume the Geda Health Center has 200 doses of Td Carried over from previous period with Batch number 004M5151, VVM 1st stage,and Expiry Sep 2021.
2. On 3/03/2015 the health Center issued 400 doses of Td Vaccines to K health Post.
3. On 4/03/2015 issued 460 doses of Td to HC EPI room.
4. On 5/03/2015 issued 720 doses of Td to L health Post and on the same date the L Health Post returned 200 doses of Td Left over Vaccines from Health Post with stage 2 VVM.
5. On 8/03/2015 Health Center issued 150 doses of Td for EPI room.
6. On 10/03/2015 the EPI Focal person physically checked the refrigerator and found the 50 doses of Td with Stage 3 VVM, and 820 doses with 1st stage VVM.

Physical Inventory:

A regular physical check is the only way to ensure that stock records and running balances are accurate and complete. Count all stocks of every vaccine, diluent or dropper in storage, and compare the totals to those shown as the running balance in the ledger book. The count should also match diluents and droppers to the correct vaccine batches.

Physical stock checks should be completed every month or before ordering the next request. Based on the Physical count the ledger book has to be updated. If there is any discrepancy between physical count and ledger book the reason for discrepancy should be written in the remark column.

2.3.5. Vaccine distribution to EPI Room & Health Post

Vaccine distribution systems need to be efficient so that vaccines are always available in the Vaccination post. During Vaccines distribution to EPI room or Health Post the Vaccines temperature storage temperature should be maintained. The proper packing of Cold box and Vaccines Carriers & preparing Water packs ahead of distribution is mandatory.

How to pack cold boxes?

1. Place cool water pack or conditioned ice packs side by side against the inside walls and floor of the cold box as per the diagram given on the lid of the cold box.
2. Make sure that the cold box is cool to prevent early melting.
3. Stack vaccine and diluents in the box.
4. Place cool water pack or conditioned ice packs over the top of the vaccine and diluents.
5. Place the plastic sheet to cover the ice packs kept on top to ensure full hold over time.
6. Secure the lid tightly.
7. Do not open the lid when not required.

Figure 2.3 How to pack Cold box

A standard cold box, without an insulated barrier lining to separate the vaccine storage compartment from the icepacks.

A freeze-preventative cold box with an insulated barrier separating the vaccine storage compartment from the icepacks

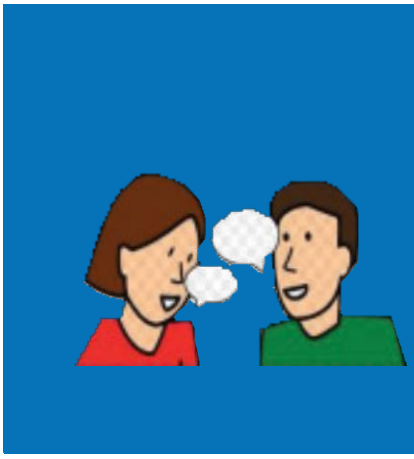
How to pack a vaccine carrier

1. Prior to use, confirm that there areno cracks in the walls of the vaccine carrier.
2. Make sure that the vaccine carrier is cool to prevent early melting.
3. Take out the required number of ice packs from the refrigerator or deep freezer and wipe them dry.
4. Keep them outside for conditioning before placing them into the carrier.
5. Place four conditioned ice packs/cool water packs in the carrier and wait for a few minutes for temperature to fall to less than 8 degrees Celsius in the carrier.
6. Never use only two conditioned ice packs/ cool water packs for vaccine carriers.
7. Place a foam pad at the top of cool water / conditioned ice packs.
8. Secure the lid tightly.

Figure 2.4 Packing Vaccine Carrier

24. Monitoring Vaccine Wastage

Due to various reasons some degree of vaccine wastage is expected in any immunization service. Wastage can occur at any stage. It can occur in the cold store at central level, intermediate levels, at the point of use at an immunization session and during transportation.



Think Pair and share:

1. What are the major reasons for Vaccine wastage at your health facility?
2. List all contributing factors based on your real experiences.

Allotted Time: 5 Minutes

Reducing wastage depends upon better management at all levels. The factors associated with vaccine wastage can be classified as unavoidable and avoidable.

Unavoidable vaccine wastage:

- Reconstituted vaccines that must be discarded at the end of the session.
- Small vaccination session

Avoidable vaccine wastage conditions:

- Poor stock management resulting in over-supply and vaccines reaching expiry before use.
- Cold chain failure that exposes vaccines to unacceptably high or low extremes of temperature.
- Incorrect dosage, e.g., the administration of three drops of OPV instead of two.
- Failure to comply with the multi-dose vial policy.
- Vials lost, broken.

Vaccine wastage can also be classified as opened and unopened wastage:

Table 2.10 Vaccines Wastage Category

Vaccine wastage in unopened vials	Vaccine wastage in opened vials
■ Expiry ■ VVM indication ■ Freezing ■ Breakage ■ Missing inventory	■ Reasons contributing for unopened vial wastage, ■ Discarding remaining doses at end of session ■ Poor reconstitution practices ■ Submergence of opened vials in water ■ Suspected contamination ■ Patient reaction requiring more than one dos

2.4.1. Vaccine wastage calculations at health facility level:

All immunization points should monitor their vaccine usage and wastage on a monthly basis. The minimum data that must be collected at the service delivery level are:

- Start balance/ beginning balance (in doses);
- Doses received during the month.
- Number of children immunized/ Number of doses administered
- End balance (in doses)

To calculate the vaccine wastage rate, properly filling and updating vaccine ledger book is mandatory.

Formula to calculate Vaccine wastage Rate at health facility level:

$$\text{Vaccine Usage (rate)} = \frac{\text{Number of doses administrated}}{\{\text{Number of doses usable at beginning of period} + \{\text{Number of doses received during period} - \{\text{Number of usable doses in stock at end of period}\}\}} \times 100$$

Vaccine wastage rate (VWR) = 100 - vaccine usage rate (VUR)

Vaccines Wastage Factor:

Knowing the wastage rate helps to determine the wastage factor, which is one of the parameters used to estimate vaccine needs.

$$\textit{Vaccine Wastage Factor} = \frac{100}{100 - \textit{wastage rate}}$$

Example 2.3 Calculating vaccine usage, wastage rate and Wastage factor at health facility step by step

Health facility-x received 200 doses of pentavalent (DTP-HepB-Hib) vaccine in 1 dose vials in January. During monthly reporting, 130 children were found to be recorded as immunized (Penta1 + Penta2 + Penta3). They had 30 doses as a start balance on 1 January and by 31 January their stock level was 60 doses.

Step 1: Calculate the number of doses used during the month.

In the beginning of the month the facility had 30 doses and had received 200 doses during the month. This makes a total of 230 doses available for use. End balance showed 60 doses at the end of the month. Subtracting the end balance from available doses gives us the number of doses used during the month, which 230 minus 60 is 170 doses.

Step 2: Calculate your vaccine usage rate (VUR) during the month.

Divide the number of children immunized with the number of doses used during the month, which is 130 divided by 170= 0.764. Multiply this with 100, which gives you 76.4%.

Step 3: Calculate vaccine wastage.

As shown in the above formula wastage rate is 100 minus VUR (100% minus 76.4%) = **24%**

Step 4: Calculate vaccine wastage factor.

$$\text{Wastage Factor} = \frac{100}{100-24} = 1.3$$

Reducing Vaccine Wastage

In many countries where outreach is needed to reach all infants, vaccine wastage rates will remain at relatively high levels, especially for freeze-dried vaccines, in order to maintain and increase immunization coverage.

However, at all levels measures to control and reduce avoidable vaccine wastage are very important. These include:

- Regular reporting on stock levels, improved estimation of requirements and effective stock management.
- Improving district and health facility levels planning, with special regard to reliability of services.
- Planning sessions efficiently to balance session size and convenient opportunities.
- Using the multi-dose vial policy (MDVP) when applicable.
- Establishing systems to monitor and regularly report vaccine wastage at all levels.
- The corrective measures, however, should not be introduced at the expense of coverage.

24.2. Multi-dose Vial Policy (MDVP)

All opened WHO-prequalified multi-dose vials of vaccines should be discarded at the end of the immunization session, or within six hours of opening, whichever comes first, UNLESS the vaccine meets all of the criteria listed below. If the vaccine meets the criteria, the opened vial can be kept and used for up to 28 days after opening. The criteria are as follows.

- The vaccine is currently prequalified by WHO.
- The vaccine is approved for use for up to 28 days after opening the vial, as determined by WHO.
- The expiry date of the vaccine has not passed.
- The vaccine vial has been stored at WHO recommended temperatures.

- VVM is visible on the vaccine label and is not past its discard point, and the vaccine has not been damaged by freezing. If all the criteria cited above are present, the vaccine vial may be kept and used for up to 28 days after opening, or until all the doses are administered.

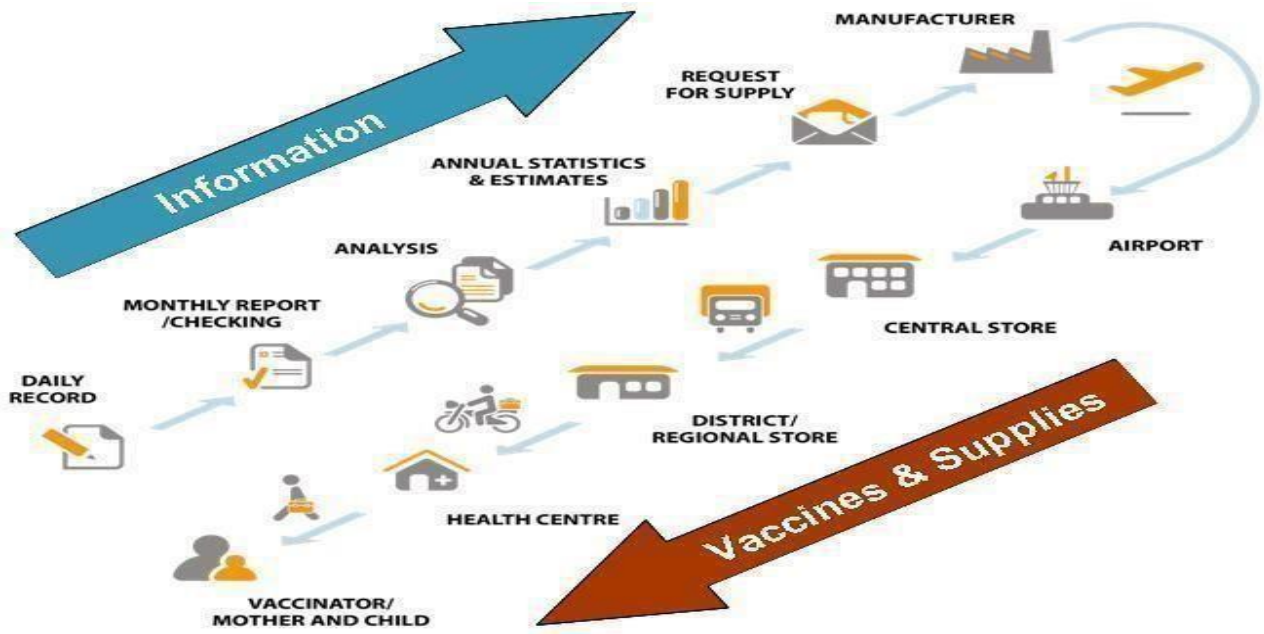
  In Ethiopia we apply multi-dose vials policy for bOPV, IPV, Td, and PCV-13 if they fulfill MDVP requirements. For reconstituted vaccines (measles and BCG) it should be discarded after 6 hours of reconstitution or at the end of immunization session whichever comes first.

2.5. Cold chain equipment and management

2.5.1. Introduction: the cold chain system

The system used for storing & distributing vaccines in good condition is called the cold chain. The cold chain consists of a seriesof links that are designed to keep vaccines within WHO recommended temperature ranges, from the point of manufacture tothe point of administration. The figure below illustrates the complete cold chain.

Figure 2.5 The vaccine cold chain and information flow



Note: The bottom row of arrows shows the flow of vaccines down to the health facilities; the top row of arrows shows where data are collected, recorded, checked and analyzed, and how reporting information flows back up the chain. This ensures that cold chain performance is properly monitored, and that the necessary information is gathered for vaccine forecasting.

Three major elements of the cold chain.

- Personnel who use and maintain the equipment
- Equipment for safe storage and transportation of vaccine
- Procedures and information to manage the programs and control the distribution and use of vaccines.

To maintain a reliable vaccine cold chain to keep vaccines safe and potent at the peripheral level, the following key procedures must be observed:

- Store vaccines and diluents within the required temperature range at all sites
- Pack and transport vaccines to and from outreach sites according to ecommended procedures
- Keep vaccines and diluents within recommended cold chain conditions during immunization sessions

25.2. Types of Cold Chain Equipment

Cold chain equipment is the equipment used for storage and transportation of vaccines within the recommended temperature conditions.

Different levels within the national cold chain system require different types of equipment with different storage capacity for transporting and storing vaccines and diluents within the recommended temperature range.

To ensure optimal performance, cold chain equipment used for immunization programme at any level must comply with relevant technical specifications, as defined under WHO prequalification standards or as determined by national regulatory authorities. Effective vaccine management assessment and cold chain mapping can be used to determine the most appropriate cold chain system. Cold Chain Equipment can be grouped in to two

a. **Slow cold chain:** The slow cold chain relies on cold-generating equipment and they require power source to maintain cold temperature. The slow cold chain will reduce the costs of vaccine distribution, but increase

the quantity in circulation. Slow Cold chains are cold rooms, refrigerators, and freezers

b. **Fast cold chain:** The fast cold chain option is based on the use of passive containers (not cold generating but maintaining it), e.g., cold box, vaccine carrier, etc. used for temporary storage of vaccines. The fast cold chain relies on speed to minimize the gaps in vaccine storage, distribution and handling.

1. **Slow Cold chain:**

The slow cold chain used at Health Facility level is Refrigerator.

Refrigerators

A health facility refrigerator should be chosen based on the most reliable power supply available and the combined capacity needed for vaccine and water-pack storage. Health facility refrigerators may be powered by electricity, solar energy or kerosene.

a. **Electric Refrigerator:**

Also referred to as compression units. Ice-lined refrigerators are the preferred option where there is at least eight hours per day of reliable electricity. Even with periodic breaks in electricity, the inner lining of the unit can preserve the +2˚C to +8˚C holdover time. A few models are available that can operate effectively on as little as four hours of electricity per day. Ice-lined refrigerators can expose vaccines to freezing temperatures if vaccines are not loaded properly. Some of the compression type equipment are Ice pack freezers (TFW 800, etc.), ILR (MK 404, MK 304, TCW 4000, VLS 300, etc.). Some equipment can be used as freezers or refrigerators interchangeably (TCW 3000) by switching to freezing or cold storage.

Figure 2.6 Compression Refrigerators

a) Compression Refrigerators in use at Health Facilities

MK 404
Net storage capacity 135 lit

TCW 3000
Net storage capacity 126.5 lit

VLS 300
Net storage capacity 98 lit

b. Solar energy:

Also referred to as photovoltaic units. Solar refrigerators are more expensive to buy and install than electric refrigerators, but they have no running costs, apart from cleaning and preventative maintenance. The two types are: a) solar-battery units connected to a battery bank, which is charged by the solar panels and b) solar direct-drive units that are powered directly by the solar panels.

Solar Direct Drive (SDD) refrigeration systems are the new generation of solar powered refrigeration systems by passing the use of a battery. Instead of the battery, the power is stored using different non-battery-based technologies. There are currently four technologies existing: PCM (phase change material), Ice-lined (ILR), water- lined and ice bank.

Figure 2.7 Solar Refrigerators

b)Solar Refrigerators in use at Health Facilities

HCT 60 SDD
Net storage capacity 21 lit

TCW 15 SDD
Net storage capacity 16 lit

Kerosene: also referred to as absorption units. Kerosene refrigerators can expose vaccines to freezing temperatures.Health Facilities currently using the Absorption refrigerators needs strict follow up of the temperature because it is difficult to keep the temperature between +2˚ c to +8˚ c.

c. Keeping vaccines in the +2˚C to +8˚C range is particularly difficult with kerosene refrigerators.

Figure 2.8 Absorption refrigerators

c)Absorption Refrigerators in use at Health Facilities

Sibir 170 EK
Net storage capacity
55 lit

Sibir 110 EK
Net storage capacity
17 lit

RCW 50 EK
Net storage capacity 24 lit

Domestic refrigerators do not have good temperature control and they cannot keep vaccines cool during electricity cuts of more than one or two hours. These units are not specifically built or designed to store vaccines. For this reason, domestic refrigerators are not recommended by WHO for vaccine storage.

Holdover time: The time in hours during which all points in the vaccine compartment of a vaccine refrigerator remain below +10°C, at the maximum ambient temperature of the temperature zone for which the appliance is rated, after the power supply has been disconnected.

A health facility refrigerator must never be packed solid – always leave plenty of space around the vaccines and diluents to allow air to circulate freely, and to make vaccine handling easier

2. Fast cold chain

They are passive containers that can maintain cold for specific period. Theyare Cold box, vaccine carrier, and long- term passive Vaccine Container used for temporary storage of vaccines. Passive container[] systems consist of a thermally insulated container with an opening lid and a compatible set of coolant-packs that line the inside of the container. Depending on the operational conditions, coolant-packs may be frozen, conditioned, cooled or warmed before use in order to maintain safe temperatures within the container for the transport period required.

a. Cold boxes

A cold box is an insulated container that can be lined with water-packs to keep vaccines and diluents in the required temperature range during transport or short-term storage.

Cold boxes are used to transport vaccines from intermediate to lower level. Besides, cold boxes can be used to store vaccine for the following condition: -,

- When power is out
- During defrosting
- When the refrigerators are non-functional temporarily

The "cool life" of a cold box is the maximum length of time the closed cold box can maintain temperatures below +20°C if lined with cool water-packs that have been stored in a refrigerator. Current prequalified cold box models have a maximum cool life of 12 hours to two days when tested at a constant +43°C. Currently, there are freeze free cold boxes that are being used at health facility level.

The vaccine storage capacity of cold boxes is between 5 and 25 liters.

Cold boxes can be grouped into two range categories:

a. **Short range:** With a minimum cold life of 48 hours at 43°C ambient temperature.

b. **Long range:** With a minimum cold life of 96 hours at 43°C ambient temperature.

Figure 2.9 Different Models of Cold boxes

Standard Cold box

Freeze Free Cold box

Different models of cold boxes have different vaccine storage capacities and need different numbers and sizes of water-packs. It is important to use the correct number and size of water-packs, exactly as specified by the container manufacturer, otherwise cold life or cool life will be affected.

b. Vaccine carriers

Vaccine carriers are smaller than cold boxes and easier to carry. Current prequalified vaccine carriers have a cold life with frozen ice- packs of between 18 and 50 hours at +43°C and a cool life with cool water-packs of between three and 18 hours.

Vaccine carriers are generally used for the following purposes:

- To transport vaccines and diluents from woreda to health facilities, outreach sites and store them during health facility immunization sessions.
- To store vaccines temporarily when the health facility refrigerator is out of operation or is being defrosted.

The vaccine storage capacity of vaccine carriers is between 0.8 to 3.4 liters.

Vaccine carriers can be grouped into two range categories:

a. **Short range:** With a minimum cold life of 15 hours at 43°C ambient temperature.

b. **Long range:** With a minimum cold life of 30 hours at 43°C ambient temperature.

Figure 2. 10 Different Types of Vaccines Carrier

Standard Vaccine Carrier

Freeze free Vaccine Carrier

How to keep vaccine carrier in good condition when not in use

- Keep the vaccine carrier in good condition when not in use.
- Do not use any sharp tool to open the lid of the carrier.
- Clean and dry the inside after every use.
- Never use a vaccine carrier containing two ice packs. except Vaccine carriers made for 2 water packs

c. Long Term Passive Vaccine Storage Device

The long-term passive vaccine storage device is designed to keep vaccines at appropriate temperatures for a month or more and no need for electricity. The device combines the best attributes of vaccine cold boxes and stationary refrigerators currently used. Unlike other vaccine cold boxes that keep vaccines cold for one to five days, the device holds temperatures for over a month, and unlike refrigerators, it is transportable, low cost, low maintenance, and can be used anywhere. The ice pack should be replenished **at least three to five days** from nearby health facilities.

Figure 2.11 Long Term Passive Vaccine Storage Device

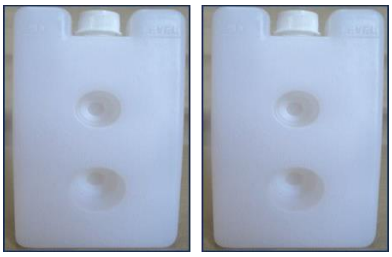
Passive Container Accessories

a. Coolant-packs / Water packs

Coolant-packs / Water-packs are flat, leak-proof plastic containers that can be filled with tap water. They are used to line the inside of the cold box or vaccine carrier. Water-packs are used to keep vaccines at the required temperature range inside cold boxes and vaccine carriers. In order to protect the vaccines, it is important to use the correct number and size of water-packs and to follow the instructions printed inside the lid of the container. To ensure optimal performance, WHO recommends the use of pre-qualified water-packs.

Health facilities must have a minimum of two complete sets of water-packs for each of its cold boxes and vaccine carriers so that one set can be frozen or cooled in the freezer/ refrigerator while the other set is being used in the cold box or vaccine carrier.

Figure 2.12 Water packs



The appropriate temperature of the water-pack will depend on the type(s) of vaccines being transported, the ambient temperatures to which the cold box or vaccine carrier will be exposed, and the duration of transport.

Water-packs can be used in any of the following ways:

- Frozen ice-packs - taken directly from a freezer at temperatures between -10°C and -25°C. At the health facility level, it is not recommended to use frozen ice packs.

- Conditioned ice packs: containing a mixture of water and ice at temperature of about 0°C
- Cool water-packs: containing liquid water at an initial temperature of +5 °C or less.

Note that taking frozen, conditioned, or cool water-packs out of the vaccine carrier will shorten their cold/cool life. Therefore, water-packs should not be removed during immunization sessions to hold opened vials.

b. Foam pads

A foam pad is a piece of soft sponge-like material that fits precisely on top of the water packs inside a vaccine carrier while still permitting the lid of the vaccine carrier to fully close.

The foam pad is provided by the manufacturer of the vaccine carrier. The foam pad usually has slits in which vaccine vials can be inserted snugly and protected.

Figure 2.13 Foam pads

Locally available Sponge used to prepare foam pad

The foam pad should be used during an immunization session as a temporary lid to securely hold opened vials, while protecting unopened vials in the cool chamber below inside the carrier.

Note that opened vials of heat-sensitive vaccines can be protected from heat damage for longer periods during immunization sessions if they are pushed into the foam pad. Even with a foam pad, however, it is important to keep the hard vaccine carrier lid closed whenever possible to conserve the inner temperature.

If the original foam pad procured with the vaccine carrier is not available for use during the immunization session, it is advisable to prepare the foam pad using the locally available sponge with acceptable thickness not less than 4 cm.

25.3. Cold chain management

a. Placement/ Installation of Refrigerator at vaccine storage sites

The efficiency of refrigeration cooling systems depends on dissipation of heat from the condenser. Good air circulation around the vaccine storage unit is essential for proper heat exchange and cooling function.

- For the efficient operation of refrigerators and freezers, it is recommended that they are installed with a minimum space of 200 mm (or as recommended by the manufacturer) from the wall to allow for adequate air circulation. This also allows ample space for technicians when they carry out preventive maintenance.
- The unit should be placed in a well-ventilated room not accessible to the public and should have space aroundthe sides, top, and back. Ensure it is in a secure area and is accessible to authorized staff only.
- Nothing should be blocking the coverof the motor compartment, which is normally located at the back or the side of the unit.
- Make sure that the unit stands firmly and is level, and that the wheels or leveling legs are adjusted so that the bottom of the unit sits 2.5 cm/1 inch to 5 cm/2 inches above the floor.
- Do not place it in direct sunlight, near a heat source, or along an outside wall, where the temperature of the wall can vary depending on the season.
- Ensure a reliable power outlet. Vaccine storage units should ideally be on a dedicated circuit.
- ***Use voltage regulators instead of direct power connection for compression refrigerators!***
- When the refrigerator is first installed, set the thermostat so that the refrigerator compartment stays between +2°C and +5°C during the coldest part of the day (typically the morning). It is essential to avoid freezing temperatures and the freezing risk is greatest when the ambient room temperature is low.

b. Arranging vaccines inside cold chain equipment

Vaccines must be arranged inside cold chain equipment in a manner that helps ensure that they remain in good condition with minimum risk of exposure to damaging temperatures. This section describes how to arrange vaccines inside vaccine refrigerators, cold boxes, and vaccine carriers.

General rules for using vaccine refrigerators.

Health facility refrigerators are used tostore vaccines and diluents. Several types of refrigerators are available and the arrangement of items inside them varies according to their type.

The following general rules (Do's and Don'ts) apply to all health facility refrigerators.

Figure 2.14 General rules for Using Vaccines refrigerators

DOs with the vaccine refrigerators	DON'T do the following with vaccines refrigerators
■ Store vaccines and diluents in a refrigerator that is reserved for this purpose only.	***DON`T*** Store other materials like food & beverages in the refrigerator except those items approved by national policy guidelines.

- Always arrange vaccines and diluents so that air can circulate freely; this also makes it easier to handle the vaccines.
- If vaccines or diluents are supplied in their original boxes, arrange the boxes so that there is at least a 2 cm space between stacks.
- If vaccines or diluents are supplied as individual containers (vials, ampoules or tubes), use a plastic tray, plastic box or other arrangement to store the vaccines in an orderly fashion.

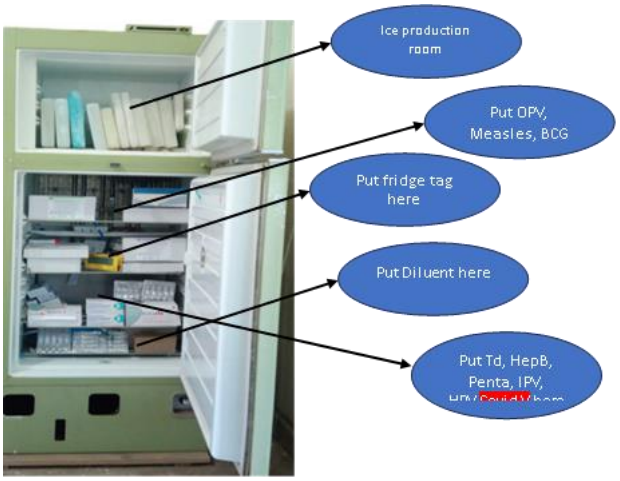
- Store diluents in the refrigerator if there is adequate space. If there is no adequate space, move the diluents to the refrigerator at least 24 hours before use so they are cooled.
- ***Use first box*** used for the following conditions: Vaccine with Stage II VVM, Vaccine returned from outreach, opened vial vaccine where MDVP applied, near expiry vaccine

- ***DON`T*** store any cool items in EPI refrigerators, except those items approved by national policy guidelines like Oxytocin. When doing so, clearly labeling, and putting into a separate shelf should be maintained in order to easily identify vaccines from other keep cool items.
- ***DON'T*** open the door or lid unless it is essential to do so. Frequent opening raises the temperature inside the refrigerator.
- ***DON`T*** store vaccines and diluents in the freezer compartment
- ***DON`T*** keep expired and vaccines with VVM beyond the discard point in the refrigerator.
- ***DON`T*** return reconstituted vials and opened liquid vaccines without preservative into the refrigerator. Discard these items immediately according to your national guidelines.

c. Specific rules for using front-opening refrigerators:

Different types of front-opening vaccine refrigerators are used for storing vaccines. Figure 2.13 shows how a front-opening refrigerator should be organized.

Figure 2.15 Vaccine and diluent arrangement in a front-opening vaccine refrigerator



The following rules apply for front-opening refrigerators:

- Never put freeze-sensitive vaccines in contact with, or close to, the evaporator plate in the refrigerator.
- Keep extra, unfrozen water packs at the bottom part of the main refrigerator compartment to keep this section cold in case of a power failure.
- ***Never store frozen*** water-packs in the refrigerator compartment; this will lower the temperature and increase the risk of freezing vaccines.
- Put **Measles, BCG, OPV, yellow fever,** and any other vaccines not damaged by freezing on the top shelf.
- Put **Td, HepB, Penta, IPV, HPV, PCV, rotavirus, Covid-19** vaccines and/or any other freeze-sensitive vaccines on the middle or lower shelves.
- Put the diluents on the bottom shelf, clearly labeled so they can be easily identified to their matching vaccine.

Some health facilities may have an upright ice-lined refrigerator. In these models there is very little variation in the temperature inside the refrigerator compartment, so vaccines and diluents can be placed safely on any of the shelves. However, in humid climates, there is a risk of condensation. Cartons and vials should be stored in plastic boxes with tightly fitting lids to reduce the risk of moisture damage. Never store vaccines below the bottom shelf – this area may be wet because it collects and drains the condensation from the roof and walls of the compartment

d. Specific rules for using top opening refrigerators:

Many top-opening ice-lined refrigerators are supplied with baskets for storing vaccines. There are also a few top-opening solar-battery models; typically, these models do not have an ice lining, but they generallyhave baskets. The following rules apply to these refrigerators:

- Always store vaccines and diluents in the baskets provided. Never store them outside the baskets.
- If there is an internal lid on the freezer compartment and/or the refrigerator compartment, always replace it before you close the main lid.
- Some solar direct-drive refrigerators have an ice-bank at one end. Never remove ice- packs from this area.

- Some solar direct-drive refrigerators have a separate ice-pack freezing compartment. Make sure you follow the manufacturer's instructions on the use of this feature – instructions vary.
- Use the bottom baskets to store Measles, BCG, OPV, yellow fever, and any other vaccines not damaged by freezing.
- Use the top baskets to store products for immediate use and to store Td, HepB, Penta, PCV, IPV, HPV, rotavirus and any other freeze- sensitive vaccines.
- Never put freeze-sensitive vaccines in the bottom baskets. In some models there is a risk of freezing in these areas.
- Store the diluents close to the freeze-dried vaccine with which they were supplied; if this is not possible; makesure the diluents are clearly labeled so they can be easily identified to their matching vaccine.

Figure 2.16 Vaccine and diluent arrangement in a top-opening refrigerator with baskets

e. Proper handling and use of Diluents

Diluents are not simple water. They usually contain a variety of salts, chemicals, and additives required to stabilize a specific vaccine after reconstitution. Besides, some diluents contain an aluminum adjuvant that is essential to the effectiveness of the vaccine, some contain a preservative, and some are actually liquid vaccines used to reconstitute a lyophilized vaccine. The following precautions are imperative to ensure proper use of diluents.

- **Correct storage temperature for Diluents:** Diluents for vaccines are less sensitive to storage temperatures than the vaccines with which they are used. When vaccines are reconstituted, the diluent should be at the same temperature as the vaccine,

between +2oC to +8oC. To ensure this, at the health facility level, diluents should be kept in the cold chain. However, **diluent vials must never be frozen.**

- ***Correct Bundling and matching of diluents:*** Freeze-dried vaccines and their diluents should always be distributed together in matching quantities. Diluent must always be of the correct type, and from the same manufacturer as the vaccine which it is accompanying.
- ***Diluents are not used interchangeably*** This is essential to ensure that the health worker always has equal numbers of vaccine vials and diluent vials from the same manufacturer for reconstituting them.
- ***Volume of diluents:*** Diluents are prepared by the manufacturer specifically for each vaccine and the volume of diluent is exactly matched to the required volume to arrive at the proper concentration of the product after reconstitution. Therefore, the total contents of the diluent vial must be withdrawn with the reconstitution syringe and added to the vaccine for reconstitution. This may occasionally provide one or two extra doses in the vaccine vial for potential withdrawal excesses, and this is entirely acceptable. These extra doses may be administered if they can be drawn to measure a full dose. (For detail information refer WHO guidance note on vaccine diluents).

f. Preparing conditioned ice packs and cool water-packs

At the health facility level, it is recommended to use cool water packs at vaccination sessions and during vaccine transportation. Every health facility should have at least two sets of water-packs that correspond in size and number to its stock of cold boxes and vaccine carriers.

Preparing cool water-packs

Where cool water-packs are used for vaccine transport, the health facility has to have storage capacity to prepare and store cool water packs.

Conditioning frozen icepacks

Frozen icepacks, taken directly from the freezer, are not suitable for immediate use. If they are not correctly conditioned, it is very likely that freeze-sensitive vaccines will be frozen and destroyed. ***Wrapping vaccines in newspaper or other materials does not protect against freezing.***

In case cool water packs are not available, WHO recommends the use of “conditioned” ice-packs for transporting vaccines in cold boxes and vaccine carriers. An ice-pack is correctly conditioned when it has melted enough to allow the ice to move inside the pack.

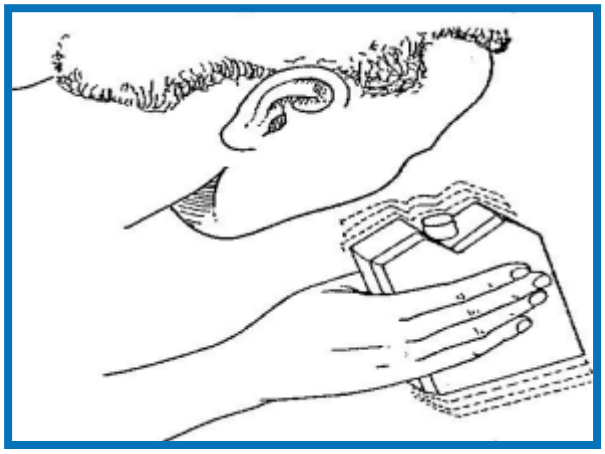
Use the following procedure.

Remove the required number of frozen water-packs from the freezer compartment. The number and type of pack required is shown on the inside of the lid of the cold box or vaccine carrier.

Lay the frozen icepacks on a work surface in a single layer leaving gaps of about 5cm between packs.

Wait until all packs are properly conditioned – there must be liquid water inside every pack and the ice-cores should move inside the packs when shaken. This will take at least 30–45 minutes in hot weather and much longer in cool conditions – from 90 to 120 minutes at +20°C.

Figure 2. 17 Listen for the sound of the ice core moving.



Activity: Video show in the classroom:

1. Types of Refrigerators Found in Health Facilities
2. Using Top-Opening Refrigerators without basket and with basket

2.6. Temperature Monitoring

In order to maintain vaccine quality, it is essential to monitor the temperature of vaccines throughout the supply chain. Effective temperature monitoring and record-keeping achieve the following objectives:

- Verification that vaccine storage temperatures are within the acceptable ranges (+2°C to +8°C for health facilities and beyond) in vaccine cold chain at any level.
- Detection of out-of-range temperature records during storage and transportation so that corrective action can be taken to safeguard the vaccines.

In general, well-maintained records can be used to assess the quality of the vaccine supply chain, monitor the performance of cold chain equipment over time and demonstrate compliance with good storage and distribution practices.

2.6.1. Temperature sensitivity of Vaccine

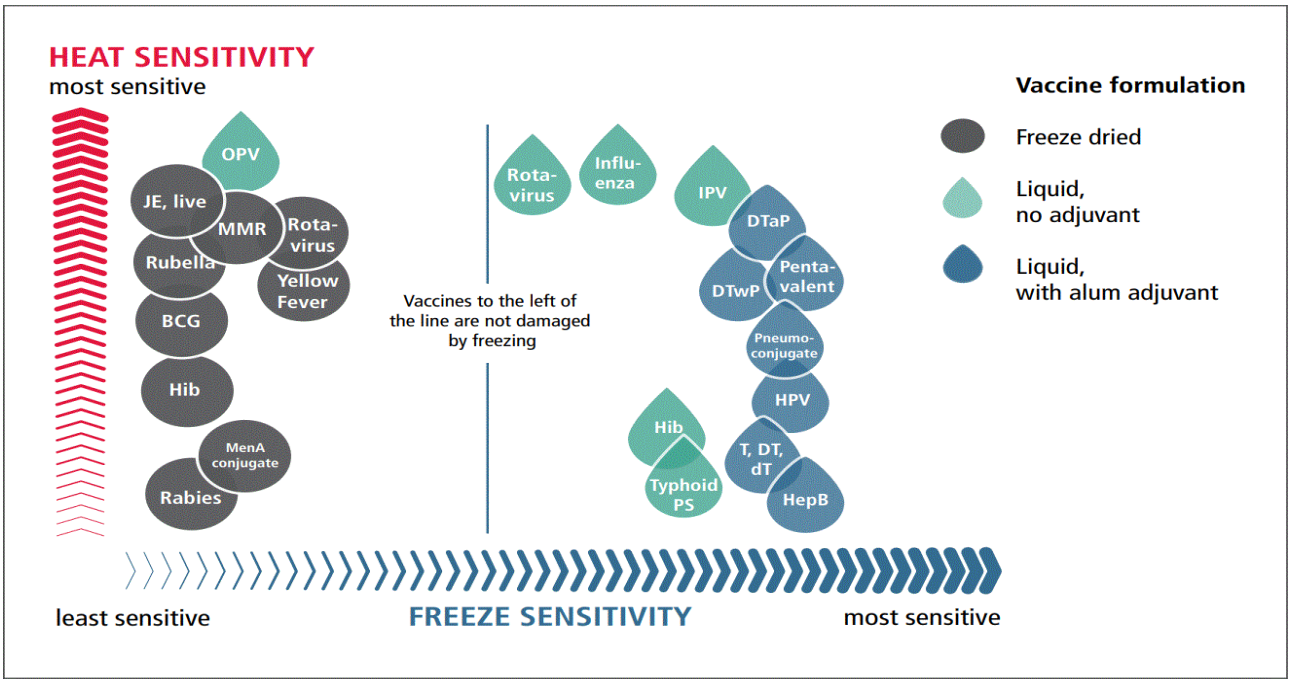
Vaccines are Temperature sensitive biological products. Some vaccines are sensitive to freezing, some to heat and others to light. Vaccine potency, meaning its ability to adequately protect the vaccinated client, can diminish when the vaccine is exposed to inappropriate temperatures. Once lost, vaccine potency cannot be regained. To maintain quality, vaccines must be protected

from temperature extremes. Vaccine quality is maintained using a cold chain that meets specific temperature requirements. Figure14 shows recommended vaccine storage temperatures at each level of the cold chain. It is essential that all those who handle vaccines and diluents know the temperature sensitivities and the recommended storage temperatures for all the vaccines in the national schedule.

Freezing:

Some vaccines are also sensitive to freezing. Freezing destroys the potency of freeze sensitive vaccines. Therefore, these vaccines should not be frozen. The sensitivity of vaccines to freezing is illustrated in figure below.

Figure 2.18 Heat and Freeze Sensitive Vaccines



Heat sensitivity:

- All vaccines are sensitive to heat to some extent, but some are more sensitive than others.
- The commonly used EPI vaccines may be ranked according to their heat sensitivity as figure above.

Light Sensitivity of vaccine:

- Some vaccines are very sensitive to light and lose potency when exposed to it.
- Such vaccines should always be protected against sunlight or any strong artificial light (like florescent tube or bulbs), and exposure should be minimized.
- Vaccines that are as sensitive to light as they are to heat include BCG and measles.
- These vaccines are often supplied in dark glass vials that give them some protection from light damage, but they should be kept in their secondary packaging for as long as possible to protect them during storage and transportation.

2.6.2. Temperature monitoring devices

Temperature monitoring devices are tools for providing information on the vaccine storage temperature inside cold chain equipment. To ensure the stability, safety, and potency of vaccines, adequate cold chain temperature control using appropriate temperature monitoring technologies (devices and/or tools) are imperative throughout the vaccine cold chain system from manufacturer to the point of end-users, including outreach sites both during storage and transportation.The users can determine the action to be taken based on the temperatures and other information provided by these devices.

The type of temperature-monitoring equipment that are commonly used at health facility level are Fridge tag, Freeze indicator, VVM, Thermometer and Remote Temperature Monitoring Devices (RTMD).

a. 30-day electronic temperature loggers (30 DTR)

These devices are placed with the vaccine in a vaccine refrigerator. They record the refrigerator temperature at no more than 10-minute intervals and show thetemperature history for any day in the last 30days. They also record and display a 30- day history of any heat and freeze alarms that have occurred.

- ***Freeze / Low Alarms*** are triggered if the temperature of the refrigerator drops below -0.5°C for continuous period of 60 minutes
- ***Heat/High alarms*** are triggered ifthe temperature of the refrigerator exceeds +8°C for a continuous period of 10 hours.

As long as the temperature has remained within the recommended range, the device displays 'OK' or a tick (√) symbol. Fridge tag is one of the several types of 30 DTR prequalified by WHO. On newer models, data can also be downloaded via a connection to a computer. 30 DTRs like fridge tags should not be used in vaccine freezers. Current models have built-in batteries with a battery alarm feature; the device must be discarded and replaced when the battery expires, which is typically from 3 to 5 years.

Figure 2.19 Fridge tag

Fridge tags should be placed in an accessible position where they can be read easily and are unlikely to be damaged. This will vary depending on the type of refrigerator being monitored. If the refrigerator is used to store any freeze-sensitive vaccines, preferably the device should be placed in the coldest part of the refrigerator that is being used to store these vaccines.

b. Remote Temperature Monitoring Devices

Some refrigerators equipped with electronic refrigerator temperature logger with integrated sensor devices which enable to

monitor temperature remotely. They can be used for vaccine refrigerators and cold rooms. The device can log the daily temperature data, and alarm indications displayed in the LCD display when the temperature exceeds. Data within 30 days can be viewed and downloaded by USB port to PC, and generate temperature charts. One example of RTMD is the recently installed B.medical System refrigerators.

Figure 2.20 Remote Temperature Monitoring Device

c. Thermometers (Stem/Dial):

These devices only provide an instantaneous temperature reading. For this reason, WHO no longer recommends them as the main monitoring device in vaccine refrigerators. However, they remain an essential back-up device because they do not require a battery or other power source. WHO no longer recommends-metallic dial thermometers for any purpose because they lose their calibration overtime, especially if they are dropped.

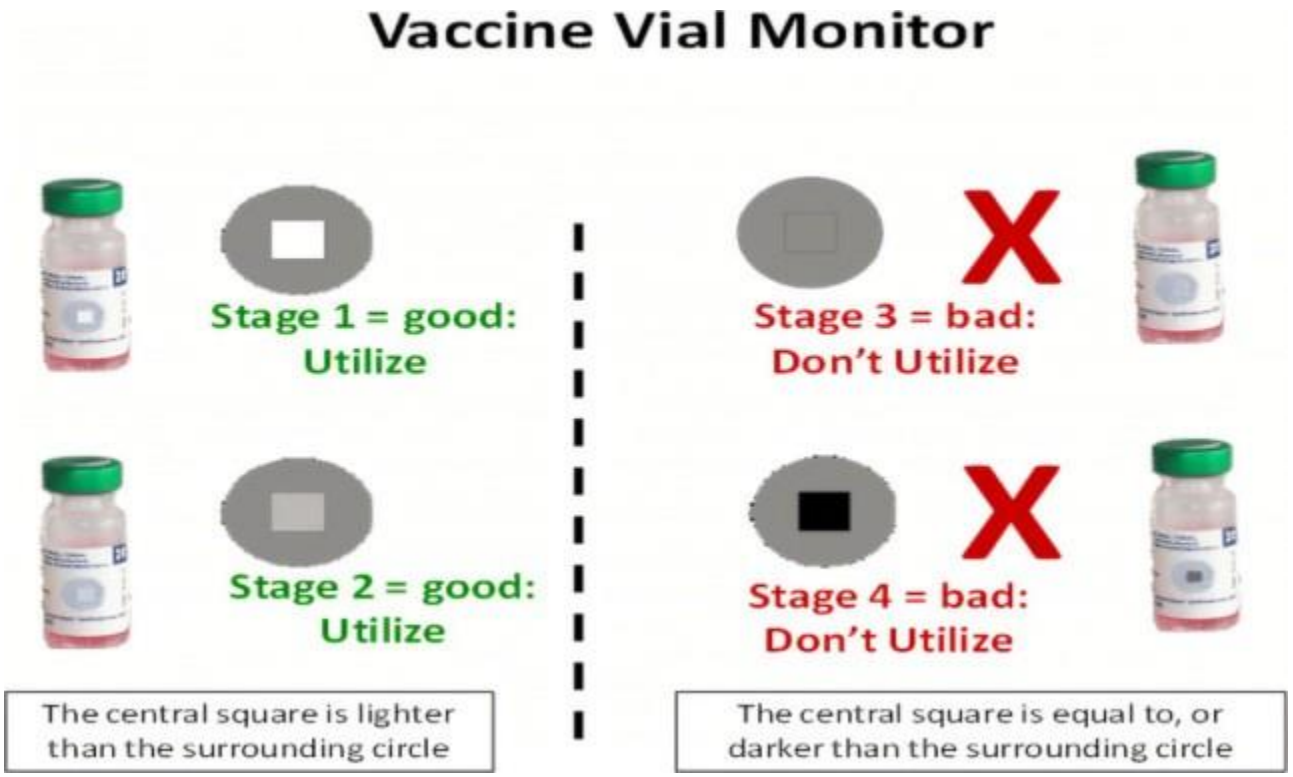
a. Vaccine Vial Monitors (VVM)

Vaccine vial monitors are vaccine control indicators mounted on vaccine vials or ampoules at the point of manufacture (by the vaccine manufacturer). Vaccine vial monitors (VVMs) are the only temperature-monitoring tool that routinely accompany the vaccine throughout the entire supply chain.

As the vaccine moves through the supply chain, the VVM records cumulative heat exposure through a gradual change in color. If the color of the inner square is the same (third stage) or darker than (fourth stage) the color of the outer circle, the vaccine should be discarded.

Note that VVMs DO NOT record exposure to freezing temperatures.

Figure 2.21 Vaccine vial monitor (VVM) color change sequence and interpretation



VVM monitoring for decision Making:

The main purpose of VVMs is to ensure that heat-damaged vaccines are not administered. VVM status is also used to decide which vaccines can safely be kept after a cold chain break occurs; this minimizes unnecessary vaccine wastage. In addition, VVM status helps determine the order in which vaccines should be used—a batch of vaccine with VVMs that show significant heat exposure but have not yet reached their discard points should be distributed and used ahead of a batch that shows lower heat exposure, even if the expiry date is later. VVMs should also be checked by health workers before the vaccine is used.

VVM status should always be checked and recorded manually on the arrival voucher when it first reaches the health facility, vaccine stock recording book.

Figure 2.22 Location of VVM on the vaccine vial

26.3. Monitoring vaccine refrigerator temperature

Exercise 2.6 Temperature monitoring & Recording Practice

Think Pair and share	Think Pair and share.
	1. Discuss a group of two participants on temperature monitoring and recording practice in your facility? 2. Share your response to a larger team for plenary discussion? **Allotted Time:** 2 minutes for each individual

The temperatures to which vaccines are exposed must be monitored, recorded, and reported throughout the vaccine supply chain, from the manufacturer's point of origin to health facilities including the point of vaccination. This provides documented evidence of the temperatures to which vaccines and diluents have been exposed during storage and transport; it also provides a means of detecting cold chain equipment failures and other operational problems so that they can be rectified. This section reviews temperature monitoring of vaccine refrigerators, cold boxes, and vaccine carriers at the health facility level.

A. *Monitoring vaccine refrigerator temperature*

A standard manual temperature-recording pad/chart should be available for each and every vaccine refrigerator in use at health facilities. Readings should be taken twice a day seven days per week, including weekends and holidays. Daily readings should be taken from the **same** temperature-monitoring device each time. The health worker should read the 30 DTR (fridge tag) and write the data on the chart. If there is no 30 DTR, you should check the integrated dial thermometer or, where necessary, the stem thermometer.

Manual readings should be recorded on a temperature monitoring pad/chart using the following procedure:

- Check the refrigerator temperature of the refrigerator at least twice daily; in the morning and at the end of the day.
- Record the temperature by date and time on the temperature chart (example specifically designed for fridge tag is shown in Figure 2.23).
- Maximum and minimum temperature recordings in the 24-hours period of the previous day.
- Keep completed charts together in a file for future reference.
- Temperature Excursions and actions taken should be documented on the chart.

For Refrigerators **without** 30 DTR/ Fridge-tag the morning and evening instant temperatures should be taken from the integrated digital thermometer or, where necessary, the stem thermometer.

Actions for instant Temperature violationson Refrigerators:

- ***If the temperature is below +2oC***
  - The health worker should closely follow the refrigerator.
  - For a refrigerator working on electricity, turn the thermostat knob so the arrow points to a lower number.
  - For kerosene refrigerators decrease the size of the flame.
  - Protect the vaccine from freezing by moving to the safe storage (apply the contingency plan).
  - Check freeze-sensitive vaccines to see if they have been damaged by freezing using the Shake Test.
- ***If the temperature is between 8 -10°C:***
  - No further action is necessary if there has been a **temporary** power failure.
  - Check that the refrigeration unit is working, monitor the situation closely and take appropriate actionif the temperature is not within the normal range at the time of the next inspection.
- ***If the temperature is above +10ºC:*** A report should be made to the supervisor. The following corrective action should be taken:

- Make sure that the refrigerator is working. If it is not working, check whether the power supply (electricity, kerosene or solar) is adequate.
- Check whether the door of the refrigerator or the freezing compartment closes properly; if the seal is broken, the temperature will fluctuate. Call a technician to make repairs.
- Check whether frost is preventing cold air in the freezing compartment from entering the refrigerator compartment. Defrost if necessary.

If the temperature is **above +8ºC** and the power supply, door seal and frost levels are all in working order:

- For a refrigerator working on electricity, turn the thermostat knob so that the arrow points to a higher number. This will make the refrigerator cooler. Remember: to avoid freezing vaccines, do not adjust the thermostat to a cooler (higher number) setting after a power cut.
- For kerosene if the temperature goes above 10 ºC increase the flame size.
- Following the above measures if the temperature cannot be maintained between +2ºC and +8ºC, store vaccines in other cold chain equipment thatcan maintain this temperature range until the refrigerator is repaired.

Figure 2.23 Vaccine refrigerator temperature monitoring chart

Region: _____ **Zone** _____ **Woreda** _____ **Facility name:** _____

Refrigerator model: _____ **Refrigerator No** _____ **Fridge Tag ID number:** _____

Record the refrigerator temperature twice per day. Temperature should stay between 2 - 8°C to protect vaccines. **Month** _____ **Year** _____

	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Today	Morning Temp. AM (°C)																														
	Evening Temp. PM (°C)																														
Previous day	▲ Maximum temp (°C)																														
	▲ Alarm (Y/N)																														
	▲ Duration (HH:MM)																														
	▼ Minimum temp (°C)																														
	▼ Alarm (Y/N)																														
	▼ Duration (HH:MM)																														

Date of alarm and corrective Measures taken for Temperature Excursions

Date of alarm	▼	▼	Actions taken (code)*	Impact of excursions on vaccines

(Indicate type of an alarm by ✓(tick) under ▲ or ▼ for high and low temperature respectively for specific date of alarm)

* Use the following code for actions to be taken during alarm:

1. Vaccine transferred
2. VVM checked
3. Frozen vaccine discarded
4. Shake test conducted
5. Refrigerator maintained
6. Reported to higher level
7. Thermostat adjusted
8. other measure (specify)

In addition to recording the code for taken action, outcome of shake test and VVM checking has to be recorded.

Actions for temperature Alarms on Fridge-tag (a 30 DTR)

A temperature alarm is a serious event that requires prompt and adequate response by the person in charge of the vaccine cold stores. Staff in charge of vaccine management should be ready for this scenario, ideally with a written contingency plan.

There are 4 key action steps that you should systematically take when a temperature alarm is noticed:

I. ***Safeguard the vaccines:*** Remove the vaccines from the unsafe storage condition to prevent further exposure to damaging temperature.

II. ***Separate the damaged vaccines from the usable ones.***

- Check VVM of all vaccine vials (for high alarms)
- Conduct shake test for freeze sensitive vaccines exposed to freezing (during low alarms)
- Discard Vaccines with VVM at or beyond discarding point, Vials that failed shake test and frozen vials of freeze sensitive vaccines.

III. ***Fix the underlying problem:*** understand and address the root cause of the temperature problem.

IV. ***Document and inform relevant people:*** get other people, notably the higher level, informed and involved. Those people ought to support in safeguarding the vaccines as well as fixing the problems.

B. Maintaining the correct vaccine temperature in cold boxes and vaccine carriers.

To maintain the correct temperature incold boxes and vaccine carriers, proceed as follows.

- Place the correct number and type of properly conditioned ice-packs or cool water- packs in the cold box or vaccine carrier for storing vaccines.
- If you are using conditioned ice-packs you should preferably put fridge tag or an electronic freeze indicator in each cold box or vaccine carrier containing freeze-sensitive vaccines.
- Keep the cold box or vaccine carrier in the shade. Keep the lid tightly closed.

During Immunization Session

- Use the foam pad to hold opened vials at the top of the vaccine carrier during an immunization session; keep the vaccine carrier lid closed whenever possible.
- During the immunization session, vaccines must be kept at the recommended temperatures after opening.

At the end of the immunization session

- Check the VVMs of all unopened vialsand return the unopened vials with VVMsthat are not past the discard point to a working refrigerator or appropriate cold box as soon as possible.
- Where multi-dose vial policy is applied, check the VVMs of all opened vials that contain preservative and return those with VVMs that are not past the discard point to a working refrigerator or

appropriate cold box as soon as possible. Use these vaccines first for the next immunization session.

2.6.4. The Shake Test

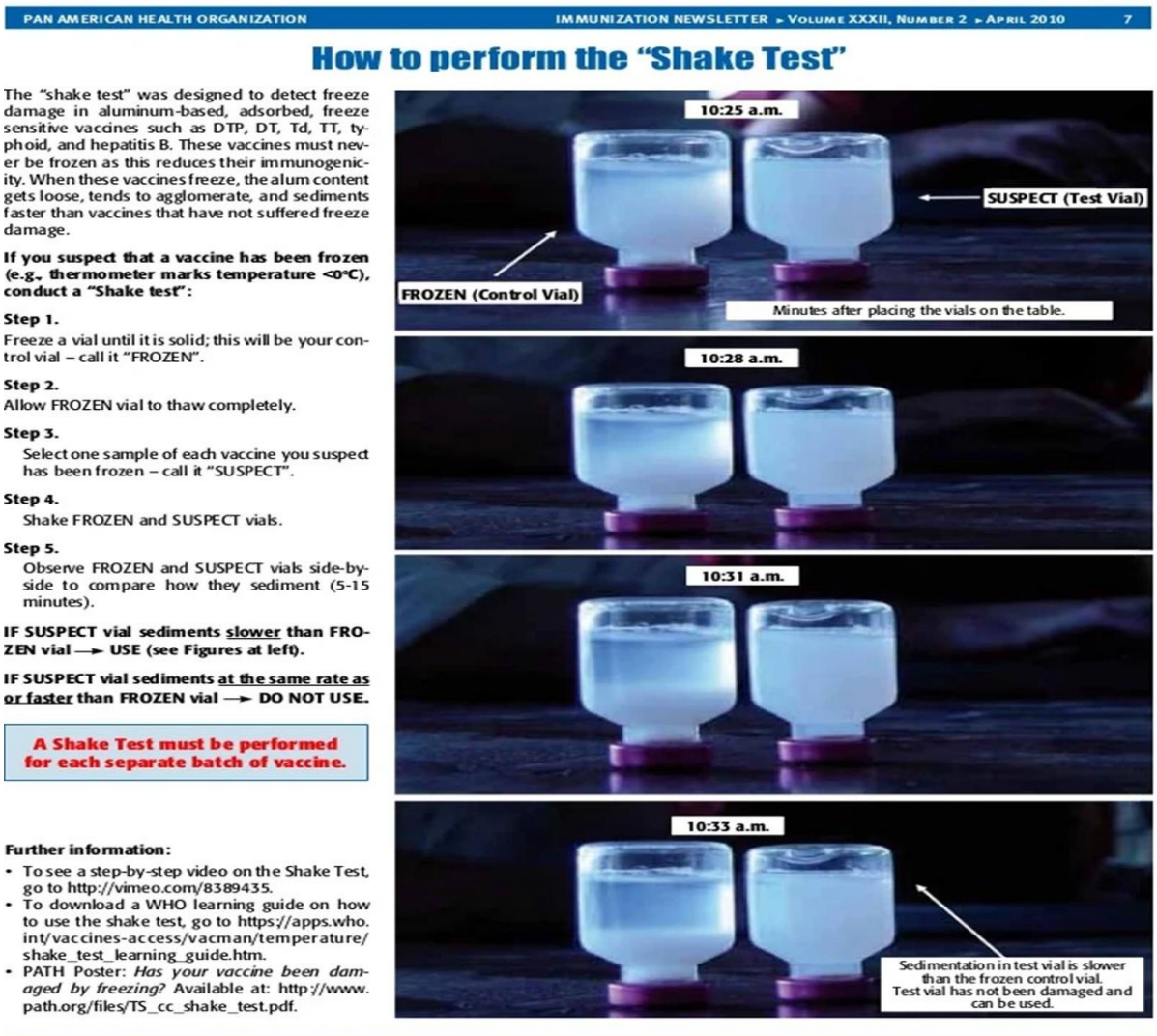
What is the Shake Test?

The Shake Test is used to check whether freeze-sensitive vaccines have been damaged by exposure to freezing temperatures (temperatures below 0°C). After it has thawed, a vial of vaccine that has been frozen no longer has the appearance of a cloudy liquid but tends to form flakes that settle at the bottom of the vial.

When is the Shake Test needed?

If a freeze indicator is activated, or temperature recordings show negative temperatures or low alarms, freeze-sensitive vaccines may have been damaged. If these occur, carry out the Shake Test on a sample of the freeze-sensitive vaccines and notify your supervisor. To conduct shake test, follow the shake test protocol[2] on the next page.

Figure 2.24 Shake test



[2] *https://apps.who.int/iris/handle/10665/270736*

Exercise 2.7: Fridge tag temperature reading

Case scenario

Time allowed:
5 minutes

Instruction:

Using temperature sheet below (figure 23), do the following activities in group of 5 participants and present your discussion result to a larger Group.

Activities:

1. Read the fridge tag temperature reading (Morning, Evening, Maximum, and minimum on third, sixth, ninth days of the month).
2. Identify the high temperature alarms and when they occurred? Identify the low temperature alarmsfrom the chart and when they occurred?
3. List the action that the responsible health worker has to take for both low and high alarms observed.
4. Which vaccines would be affected most with high and low alarms? What procedures should be conducted to identify vaccines affected by temperature excursions? Explain your answers to the group.

Figure 2.25 Sample of used Fridge tag Temperature recording sheet for exercise 2.7

Fridge-Tag@ 2 Temperature Recording Sheet

Region: _____ **Zone** _____ **Woreda** _____ **Facility name:** _____

Refrigerator model: _____ **Refrigerator No** _____ **Fridge-Tag ID number:** _____

Record the refrigerator temperature twice per day. Temperature should stay between 2 - 8°C to protect vaccines. **Month** _____ **Year** _____

	Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Today	Morning Temp. AM (°C)	2	3.4	4.2	3.4	3.4	5	4.5	15.4	14.6	5	6	2	4	1	7															
	Evening Temp. PM (°C)	3.2	3.4	4.5	6.4	2	9	4	19.4	18.5	6.6	6.3	3.2	4.2	6.1	8															
Previous day	▲Maximum temp (°C)	5.3	4	4.5	8.5	9	9	13	20	19	7	8	5	5	7	9															
	▲Alarm (Y/N)	N	N	N	N	N	N	Y	Y	Y	N	N	N	N	N	N															
	▲Duration (HH:MM)	0.0	0.0	0.0	1.35	5.4	1.05	11.21	24	12.34	0.0	0.0	0.0	0.0	0.0	2															
	▼Minimum temp (°C)	-1.2	-1.9	-1.1	2.5	2	3.4	4	14.6	14.5	5	4.5	1.5	3.3	-0.5	6.5															
	▼Alarm (Y/N)	Y	Y	N	N	N	N	N	N	N	N	N	N	N	N	N															
	▼Duration (HH:MM)	2.13	1.12	0.25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0															

Date of alarm and corrective Measures taken for Temperature Excursions

Date of alarm	▼	▲	Actions taken (code)*	Impact of excursions on vaccines

(Indicate type of an alarm by ✓(tick) under ▲ or ▼ for high and low temperature respectively for specific date of alarm)

* Use the following code for actions to be taken during alarm:

1. Vaccine transferred
2. VVM checked
3. Frozen vaccine discarded
4. Shake test conducted
5. Refrigerator maintained
6. Reported to higher level
7. Thermostat adjusted
8. other measure (specify)

In addition to recording the code for taken action, outcome of shake test and VVM checking has to be recorded.

Instruction:

- Read both case scenarios and do exercises accordingly individually.
- Share your response to the larger team for plenary discussion.

Time allotted: 20 minutes for the individual work and 5 minutes for presentation

Case Scenarios 1:

In Awash health center, Abebe, the person in charge of the cold chain management found that the refrigerator was not working and the temperature of the refrigerator was raised up to 20 ºC on Monday. He did not see the refrigerator during the weekend. If you were the head of this health center, what are the actions you would like to take step by step? Explain your answer based on the following questions.

1.1 What would you do with the vaccines?

1.2 What would you do to prevent the occurrence of such problems in future?

Case scenario 2:

On Friday, Ahmed decided to defrost his refrigerator because a lot of ice had collected around the freezer compartment. He put Td and pentavalent vaccines into a vaccine carrier lining with cool water packs, and Polio and measles vaccines into another vaccine carrier lining with ice packs. There was not enough space in the carriers for everything, so he put the diluents on the window ledge. After defrosting and cleaning he turns ON the refrigerator. On the next day the temperature of the refrigerator was stable at 5 ºC and he returned all vaccines into the refrigerator. On the following Monday, immunization day at the clinic, many children come in for measles immunization. Ahmed takes the measles vaccines out of the refrigerators and the measles diluents from the window ledge to reconstitute the vaccine.

Question: Is measles reconstituting practice of Ahmed, correct? Explain your answer based on the given scenario.

27. Basic maintenance of cold chain equipment

Individual reflection /Brainstorming:

1. From your experience, what would you do if you encountered a failure of the vaccine refrigerator at your health facility?
2. List the actions to be taken by the health facility to minimize occurrence of the similar problems in the future?

The main aim of maintenance is to ensure that cold chain equipment and transport systems function well for successful implementation of immunization activities. Maintenance can be categorized into two groups: preventive maintenance and corrective maintenance. Corrective maintenance is unanticipated and should be minimal if preventive maintenance is effective.

Preventive maintenance is the servicing of equipment according to a predefined plan and schedule in compliance with established Standard Operation Procedures (SOP). Servicing is done before equipment failure.

Basic cold chain maintenance activities supposed to be done at health facilities are described below.

27.1. Defrosting vaccine refrigerators

A refrigerator only works well if it is properly installed and is then cleaned and defrosted regularly.

Thick ice in the freezer compartment andon the evaporator, plate does not keepa refrigerator cool. Instead, it makes the refrigerator work harder and uses more electricity, kerosene, or solar power. Refrigerators should be defrosted regularly (at least every month), or when the thickness of the ice is more than 0.5 cm thick.

To defrost and clean a refrigerator:

- Remove all the vaccines and transfer them to another refrigerator or to a cold box or vaccine carrier lined with conditioned ice packs or cool water packs.
- Switch off the electrical supply for a mains or solar-battery refrigerator. Extinguish the flame for a kerosene refrigerator.
- Leave the door open and wait for the ice to melt. Never try to remove the ice with a knife or ice pick; this can permanently damage the refrigerator. A pan of boiling water can be placed inside and the door closed.

- Clean the inside of the refrigerator and door seal with a clean damp cloth. Re-start the refrigerator. Do not adjust the thermostat.
- When the temperature in the main section falls to +8°C or lower (but not less than +2°C), arrange the vaccines, diluents and water packs in their appropriate places.

Solar refrigerators should be defrosted only on a sunny day; they should never be defrosted in cloudy or rainy weather. A solar direct-drive refrigerator should generallybe defrosted in the early morning. It willhave partly defrosted overnight so this will speed up the process. Defrosting in the early morning will also allow the refrigerator to make best use of the day's supply of solar power.

If a refrigerator needs to be defrosted more than once a month, check for these common problems:

- *staff are opening the door too often (more than three times daily)*
- *the door is not closing properly*
- *the door seal needs to be replaced*

2.7.2. Applying preventive maintenance of solar powered refrigerators

Preventive maintenance Tasks for solar refrigerators can be divided into daily, periodic (weekly/monthly) and annual system (for the detail see table 2.12)

Daily

- Check the status of the control panel display. Take appropriate action as described in the instruction manual if status is not normal.
- For Solar refrigerators with battery systems only: Check the indicator lights on the battery charge regulator every day. Do not freeze water-packs if the low battery warning light is on. Move the vaccine to a safe location if the load-disconnect warning light or alarm sounder is activated.

Periodically (weekly/monthly)

- Clean dust or snow off the solar array. The frequency with which this needs to be done will vary. In very dusty areas, clean the array weekly. Remove any snow accumulation as soon as possible.

- Clean the array in the early morning or evening when the sun is weak.
- Use a soft cloth dampened with water. Wipe gently, starting at the top and working downwards.
- Do not attempt to carry out this task unless you have the correct access and safety equipment and have received training in safe working at height. Make sure you have somebody to help you and to hold the ladder.
- Never stand on corrugated roof sheets or tiles – use a properly designed roof ladder.
- Do not lean or stand on the array panels because you may damage them. Report any damage to wiring or hardware toyour supervisor.

Once a year

- Make sure the solar panels are not shaded by trees, plants, new buildings or overhead cables between 9.00 am and 3.00 pm. If there is shading from vegetation, arrange for the vegetation to be cut back. If there is shading from newly constructed buildings or new overhead cables, contact your supervisor. The solar array may have to be moved or increased in capacity.
- Check the electric cables between the solar array, the charge regulator, the batteries and the refrigerator. Inspect grounding/lightning protection. If you see any damage, contact your supervisor.

Table 2.11 Summary of planned preventive maintenance for different types of refrigerators

Frequency	Absorption	Compression (Electric)	Solar
Daily	■ Record the temperature twice daily. ■ Adjust thermostat ■ Check color of flame for kerosene refrigerator (Blue flame) ■ Examine fuel tank contents. ■ Arrange vaccine in their correct temperature sensitivity order. ■ Remove any residual liquid from inner container immediately. ■ Check and fill the tank with clean kerosene before it is completely empty. Always keep enough spare kerosene to ensure you never	■ Check & record temperature. ■ Remove any residual liquid from inner container immediately	■ Check & record temperature. ■ Make sure that refrigerator ventilation grill (if fitted) is not blocked
Weekly	■ Check the layer on the evaporator. ■ Clean lid sealing and verify the lid is locking tightly ■ Trim wick using wick cleaner. ■ Examine the holes of burner housing and ■ Examine to ensure the burner is free from soot ■ Clean burner glass	■ Check the amount of ice forming around the freezer compartment, conduct defrosting	■ Wipe clean refrigerator door seals. ■ Check the amount of ice forming around the freezer compartment, conduct defrosting.

	■ Examine to ensure the end of the wick reaches the bottom of the tank inlet ■ Clean the chimney using the brush provided. ■ Opening in the burner inlet must remain free ■ Check that you have enough Kerosene for at least another week		■ Clean the solar array (early morning or evening).
Monthly	■ Use soft brush to free the unit from dust ■ Clean the lid sealing / door gasket. ■ Check the hinges & locking for tight fastening & verify that the lid is locking tightly. ■ Check the fuel tank to see if there is sediment at the bottom and empty out the dirty kerosene and flush the tank with little clean kerosene. ■ Replace the wick when you cannot turn it up any more to trim it. Use the correct type of wick and follow the instruction manual. Always keep two spare wicks in a safe place.	■ Check the hinges & locking for tight fastening & verify the lid is locking tightly. ■ Clean the condenser use a soft brush	■ Check that the Condenser is clean, and air is free to move over condenser. ■ Check that the electrical cable is in good condition and free from damage. ■ Check that the wall socket junction is in good condition.

a. Managing vaccine refrigerator breakdowns

If a vaccine refrigerator stops working, first protect the vaccines and then check the cause of the problem, and report to your supervisor. record the cause of the problem, document maintenance activities done.

2. Preventive maintenance for cold boxes and vaccine carriers

Vaccine carriers and cold boxes must be kept clean and dried well after use, with their lids properly open. If they are left wet with their lids closed, they will become moldy. Mold and damp can affect the seal of the cold boxes and vaccine carriers and may contaminate the vaccines. If possible, store cold boxes and vaccine carriers with the lids open.

Knocks and sunlight can cause cracks in the walls and lids of cold boxes and vaccine carriers. Store passive containers out of reach of sunlight. Never drop or sit on the vaccine carrier/cold box.

27.3. Cold chain Contingency Plan

All staff responsible for vaccine management should know when and how to respond in the event of an emergency related to a cold chain equipment breakdown, a major power supply failure, a transport emergency or any other situation that puts vaccines at risk. Managers and storekeepers should develop facility- and equipment-specific contingency plans that clearly describe the steps and actions to take in response to common emergencies. Contingency plans should be in the form of a written checklist, easily accessible to all relevant staff.

Contingency plans should be treated like fire drills—it is good practice to rehearse the listed procedures at regular intervals so that store personnel know exactly what to do if a real event occurs.

The detailed content of a contingency plan will be site and equipment specific. However, the following key elements are universal:

- Ensure that all staff know how to follow safe storage rules in case of an emergency.
- Identify a range of emergency response options for each possible emergency situation to safeguard the vaccines; it is essential to identify alternative locations where vaccines can safely be stored or where ice can be obtained at short notice.
- Prepare and maintain at least two emergency response plans based on these options.
- Post emergency contact details where they can be always accessed.
- Clearly describe initial and follow-up actions that can be implemented both inside and outside working hours.
- Review the plan at least once a year to ensure that it is still valid.

The most common emergencies in a cold chain are:

- Breakdown of refrigerators
- Discontinuation of Electric power or Shortages of fuel
- Destruction of the vaccine store due to natural disasters/accidents, etc.

What to do when a vaccine refrigerator is not working: If your vaccine refrigerator stops working, first protect the vaccines and then repair the refrigerator.

a. Protecting the vaccines from damage:

Move the vaccines to other cold chain equipment until the refrigerator is repaired. For a problem that can be solved quickly, a cold box or vaccine carrier lined with conditioned ice packs (or cool water packs) can be used for temporary storage. For a problem that might take longer time to solve, another refrigerator is needed. If the health facility has no extra refrigerator, there might be a need to move a vaccine to a nearby health facility. Always keep a fridge tag or freezer indicator with the freeze- sensitive vaccines.

b. Restoring the refrigerator to working order

- Checktheelectricity,gas,kerosene,orsolar power supply and make arrangements to deal with any interruptions.
- If a lack of power or fuel is not the problem, repair the refrigerator or report to your repair technician or supervisor.

c. Document the emergency event: Complete the appropriate reports and inform the supervisor who will decide what follow-up action is to be taken (depends on volume of vaccine).

2.7.4. Cold chain equipment Inventory:

The cold chain equipment inventory should contain at least the following data:

- Equipment location (health posts, health center, hospital, etc.)
- Type of Equipment, manufacturer, model, and serial amount of equipment.
- Age or year of installation
- Functional status of equipment (working well, need to be repaired, out of order, etc.)
- Source of energy [Electric, kerosene, or solar]
- Capacity (storage volume, freezing capacity)
- Availability and type of functional temperature monitoring device
- Available spare parts

It is critical that the cold chain equipment inventory is up to date. It is suggested to update the inventory according to time intervals by using cold chain equipment database or standard forms. In addition to reporting to the next higher level, the collected data must be documented, analyzed, and used for action at all levels.

Video show (source: IA Watch - Cold Chain)

- Defrosting and Cleaning a Vaccine Refrigerator
- What to Do When a Vaccine Refrigerator Breaks Down

28. Chapter summary

- Forecasting using accurate number of target population is very essential to ensure availability of adequate stock of vaccines and related supplies at every stage of the immunization supply chain system.
- Appropriate stock management system must be in place to record and regularly update vaccines received, vaccines dispatched, used, and wasted.
- Keeping recommended stock level (Max, Min, safety & reorder level) is another vaccine management requirement.
- To avoid over stock and stock outs, properly filling VRF should be done timely, considering vaccine stock at hand, that can ensure bundling of vaccine and other EPI supplies.
- Regular monitoring vaccine wastage enable to figure out contributing factors and put in place strategies to minimize to acceptable level.
- Vaccinators at the health facility shouldn't forget to write the date of opening on every vial of vaccine for which MDPV applies to make sure that the opened vial hasn't passed 28 days
- The system used for storing & distributing vaccines in good condition is called the cold chain.

- Different levels within the national cold chain system require different types of equipment with different storage ability.
- Refrigerators and passive containers are cold chain equipment needed at health facilities
- Vaccines must be arranged inside cold chain equipment in a manner that helps ensure that they remain in good condition.
- Vaccine Temperature monitoring using proper and functional temperature monitoring device for each level is essential to ensure the potency and safety of vaccine.
- The health care worker assigned to manage vaccine and cold chain must have knowledge and skill that enable him/her to monitor the temperature.
- Preventive maintenance is the act of performing regularly scheduled maintenance activities to help prevent unexpected failures in the future
- Preventive maintenance Tasks for refrigerators can be divided into daily, periodic (weekly/monthly) and annual system

Chapter 3:

Demand Promotion & RISK/Crisis Communication

Time Allocated: 245 Minutes

Chapter description: This section aims to describe the effective communication methods, demand promotion strategies/approaches, and crisis communication for the implementation of immunization programs.

Primary Objective: At the end of this chapter participants will be able to:

- Demonstrate communication skills and strategies to enhance acceptance and uptake of vaccination among eligible individuals/ caregivers.

Enabling Objectives: At the end of this chapter participants will be able to:

- Explain the basics of communication.
- Identify communication gaps and barriers in immunization.
- Identify demand Promotion and communication strategies and approaches.
- Demonstrate effective Interpersonal Communication skills.
- Describe Risk and crisis in immunization and its management.

Chapter outline:

3.1. Basics of communication

3.2. Communication gaps and barriers in immunization

3.3. Demand promotion and communication strategies and approaches

3.4.Risk & Crisis Communication in immunization

3.5.Chapter summary

3.1. Basics of Communication

3.1.1. Communication

What is communication?

Communication is a process that involves sending and receiving messages through verbal and non-verbal methods. It is a two-way means of communicating informationin the form of thoughts, opinions, and ideas between two or more individuals with the purpose of consensus building and understanding.

At its core, the aim is to transmit information from one person to another so that the sender and receiver will understand the message in the same way. Even though the responsibility for clear communication falls on the sender (health care provider), the receiver also has the same responsibility to confirm for clear understanding of the message. Which makes communication a dynamic and cyclical process.

3.1.2. Effective communication

Effective Communication is a communication between two or more people, where the intended message is successfully delivered, received, and understood.

Being an effective communicator in our professional and personal lives involves learning the skills to exchange information with clarity, empathy, and understanding.

Effective communication involves exchanging ideas, thoughts, opinions, knowledge, and data to ensure clarity and understanding. When communication is successful, both parties feel satisfied.

3.1.3. Why is effective communication important?

Clear communication is vital in managing relationships with staff, customers, and stakeholders. Poor communication can damage reputation and result in loss of the intended objective.

3.1.4. Principles of effective communication contain five C's:

I. Completeness- Communication should convey all facts required by the audience.

- It is cost-saving and gives additional information wherever required. It leaves no questions in the mind of the receiver.
- Helps in better decision-making by the audience/readers/receivers of the message as they get all desired and crucial information.
- It encourages the audience.

II. Conciseness- communicating what you want to convey in the least possible words.

- It underlines and highlights the main message as it avoids using excessive and needless words.
- Concise message is more attractive and clearer to the audience.

III. Consideration- implies- stepping into the shoes of others. Effective communication must take the audience into consideration, i.e., the audience's viewpoints, background, mindset, education level, etc.

VI. Concreteness- Concrete communication implies being particular and clear rather than vague and general. Concreteness strengthens confidence. The concrete message has the following features:

- It is supported with specific facts and figures.
- It makes use of words that are clear and that build the standing of the audience.

V. Correctness- Correctness in communication helps to ensure the communication is factual and grammatically accurate to the listener. If an audience is aware of an error, this may distract them from listening to the rest of the messages.

Effective communication contributes to:

- Increase knowledge and awarenessof healthcare workers to disseminate appropriate messages about immunization.
- Build the confidence of healthcare workers to address rumors, misconceptions, and misinformation related to vaccines.
- Improve interpersonal communication skills of healthcare workers to facilitate discussions and provide counseling services to increase the uptake of vaccines.
- Support communities to identify and report Adverse Effects following Immunization /AEFIs/.

3.1.5. Terminologies/Operational definitions

- **Misinformation:** False claims about adverse vaccine side effects, regardless of intent to mislead this comes from poor understanding of how vaccination works: such as vaccines being the cause of autism, were already considered a threat or misbeliefs about the safety of vaccination..
- **Misconceptions:** is a wrong or inaccurate idea, perhaps the most common misconception is that a child's immune system can be "overloaded" if the child receives multiple vaccines at once that increase the risk of side effects or negative reactions.
- **Disinformation:** Deliberately pass false information (usually anti-vax messaging) by a certain group
- **Rumor:** Currently circulating story or report of uncertain or doubtful truth.
- **Hesitancy:** refers to the delay in acceptance or refusal of vaccination despite the availability of vaccination services.

3.2. Communication gaps and barriers in immunization

Different surveys and monitoring reports indicated that the availability of a number of communication gaps in Ethiopia's Immunization program, among which the following are the major ones.

- **Communication Gaps**
  - Poor interpersonal communication between healthcare providers and eligible individuals/caretakers

- Sub-optimal utilization of traditional, clan, religious, and community leaders for immunization communication.
- Shortage of targeted, inclusive, and culture/gender-sensitive immunization communication materials in different formats
- Over whelming and busy schedulesof health care providers with other competing issues

♦ **Communication barrier**

- **Physical Barriers: -** communication can be impeded by physical barriers such as structures, territories, restricted areas, closed doors, distance, lack of speakers, and large working spaces. To ensure communication, parties must be in close proximity.
- **Perceptions and Beliefs: -** people have varying perspectives and beliefs about the world, which can also happen in immunization services.
- **Emotional Barriers:-** this includes fear, mistrust, anger, and suspicion. The caretaker may fear health care workers at the first visit, which can inhibit open communication.
- **Cultural Barriers:-** specific practices and behaviors vary between cultures, making cross-cultural communication challenging.
- **Language Barriers:-** language barriers can hinder communication, as differences in language, accent, and dialect can cause confusion.
- **Gender Barriers:-** research shows that there are distinct differences between the speech patterns of men and women.
- **Absence of proper communication channels,** e.g., sign language deficit for deaf individuals.

3.3. Demand Promotion and Communication Strategies and Approaches

3.3.1. Demand promotion strategies

Communication encompasses the three major communication strategies, namely Advocacy, Social Mobilization, and Program Communication. Advocacy, social mobilization, and program communication play an important role in promoting demand and building confidence and trust in immunization programs among the eligible population and the communities in general.

Table 3.1. Summary of Immunization Communication Strategies, Target, Objective, and Activity

Communication strategies	Targets	Objectives	Activities	When will be done
Advocacy	Leaders at all levels, partners, religious and clan/community leaders, school heads, Women Development groups	To gain local political leaders will, decision, influence, and commitment.	■ One to one meeting with school principals, kebele leaders, clan leaders, religious leaders ■ Advocacy workshop at different level with higher officials at each level	- During New vaccine introduction - During campaign or SIAs - During outbreak or Epidemic - During crisis - When EPI performance is low
Social mobilization	Kebele administration, religious institutions (mosques and churches), NGOs, clan leaders, Community members, students and teachers, Women Development armies, social mobilization committee, block leaders, Idir, and other local associations	To build community participation and support To improve immunization service utilization To build the trust and confidence of communities in immunization service To mobilize resources for immunization services	► Sensitization on immunization at community level with all stake holders ► Message dissemination through those target groups at community level ► Community dialogue at community level by including husbands	- All time for RI - During new vaccine introduction - During outbreak/ Epidemic response - During Catchup and PIRI - During Immunization crisis - When EPI performance is low

			► Focused group discussion with a group of people at community level that encourages male engagement in vaccination ► Community mobilization for immunization service at kebele level ► Resource mobilization at facility and kebele level	
Program communication	√ Care givers/ Parents √ Targeted individuals √ Other departments of the facility (service integration) √ Immunization Service provider √ Social mobilizers	To improve their knowledge, attitude, and practices on immunization To improve demand for immunization service uptake To complete the immunization schedule timely	Health education at the facility or vaccination site Interpersonal communication with caregivers or targeted individuals during vaccination sessions including male involvement	- Daily or based on the HF schedule - Daily at HF or any vaccination site and contact with care givers - Whenever necessary - During new vaccine introduction - During Campaign/ SIA

		To integrated immunization messages with other departments To improve their capacity on immunization program To capacitate on how to mobilize the community for immunization		- During outbreak/ epidemic response - When EPI performance becomes low

3.3.2. Demand promotion approaches

The healthcare workers should properly utilize different demand promotion approaches in order to disseminate key messages to the target audiences and address their concerns.

3.3.2.1. Interpersonal Communication/IPC/

Interpersonal communication is a face-to-face verbal or non-verbal exchange of information and feelings between two or more people. IPC is taking place each time whenever the service provider has contact with a client. Having IPC skills for immunization techniques/ skills is very crucial for healthcare workers to convince and educate their clients. In order to make IPC effective, skills like active listening, negotiation, storytelling, speaking, presentation, and conflict regulation should be taken part.

Interpersonal communication is vitally important in supporting the transmission of key messages to the target audiences in order to enable:

- Persuading and convincing individuals and target audiences about the benefit of immunization
- Addressing concerns about the adverse effects of immunization.
- Explaining and responding to questions and doubts about immunization
- Explaining to caregivers/targeted individuals about the immunization status
- Telling about the next immunization(s) schedules
- Addressing any personal issues, the caregivers/targeted individuals may express.
- Building consensus for a concerted effort, for example, to bring all eligible adults and children for immunization.

Interpersonal communication skills

Skills for engaging in effective interpersonal communication/IPC/are divided into three categories.

A. Skills for caring
B. Skills for Problem-solving
C. Skills for counseling

A) Skills for caring

This refers to skills needed to make the client feel welcome and appreciated. These include skills for:

- Welcoming the client
- Emphasizing to the client
- Praising and encouraging the client

B) Skills for problem-solving

Apart from making clients feel at home and appreciated, healthcare workers should carry out effective skills of asking and listening.

Both skills will not only lead to understanding of clients better, but will also facilitate identification of the real problem that may hinder positive responses to the recommended health behavior.

Asking: Asking skills help individuals to engage in a conversation to verify information, observations, and impressions. It also helps people to find out how much they have been understood and appreciated or rejected during a conversation. Besides, the communicator gets to know the difficulties the target audiences may have with the messages and the help they may be needed to act positively.

To promote a smooth conversation, questions are asked in the following order:

- Start with short, general, easy-to-answer questions such as: What is your name? What is the name of your child? What is the child's father's name? Where do you live?
- Follow with questions that need some explanations, such as: How is the child feeling today? Does the child eat well? Why have you not brought the child to the health facility for the last six months (**if it happens**)?
- Then ask probing questions if needed. These include questions such as: why do you say that sick children cannot be immunized?
- End with checking questions: What doyou think about the conversation we have just had? How does immunization help the child? When will your child needto come back for the next immunization?
- When asking, encourage the other party to give more information, and avoid interruptions or premature judgments.

Listening: Listening is a crucial skill in a conversation. Practice active listening to encourage the person you are communicating with to volunteer for more information. In active listening, the people engaged in a conversation give gestures that show that they are listening and following what is being said. These include hand or head movements and remarks such as "yes", "I am listening" and "good."

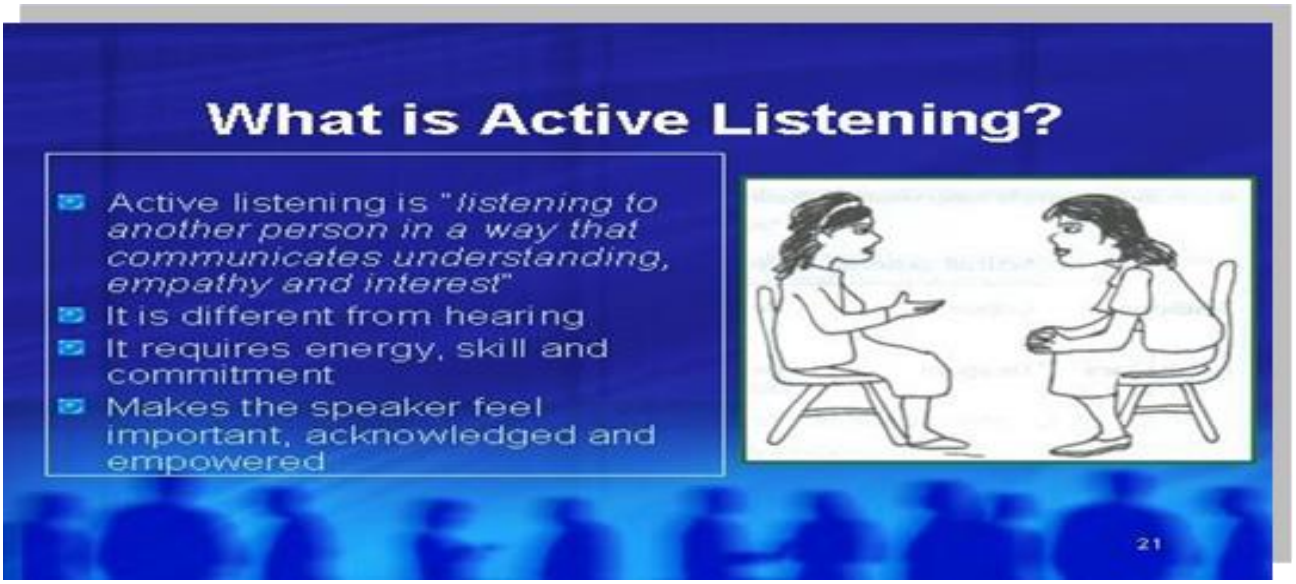


Figure.1: Sitting arrangement and position for effective listening during IPC

C) Skills for counseling

Counseling skills include the following:

Speaking simply and directly: This skill is important for health workers to explain things in a simple, clear, direct, and recognized manner. Use familiar words with which the natives can understand.

Explaining logically and systematically: People understand things better when they are explained by giving valid reasons before reaching conclusions in a correct and systematic way.

Exploring clients' beliefs: Beliefs stand in the way of acceptance of a message andpositive action. It is, therefore, important to understand what the client believes about the message. When his/her beliefs are known, they can then be discussed with a view to leading the client to a decision.

Correcting misconceptions: A client may refuse to bring his/her child for immunization due to preoccupied thinking about the negative consequence of vaccination (vaccine may cause sterility and bring other health problems like fever....). Healthcare workers should maintain such kinds of misconceptions and find a skillful way of correcting them. Good asking and listening skills should help the communicator to become aware of such misconceptions.

Using visual aids: Healthcare workers should utilize teaching aids (materials) effectively in order to improve communication with clients and for proper guidance.

Motivating clients and discussing concrete behavior change: During conversations, strong ideas to motivate caretakers to take a definite decision about immunization is vital. Ultimately, through motivation, a caretaker will:

(1) Need to be convinced that immunization is good for his/her child

(2) Decided to take his/her child for immunization

(3) Taking the child for immunization according to the schedule.

Summarizing key information: Summarizing skills help a person to give a brief statement of the main points of discussion. Summarizing also helps people to engage in a conversation to check and confirm areas of agreement and disagreement.

Checking for understanding: This skill encompasses clarification or offering back the essential meaning of discussion as understood by the listener of what they have just said. Thereby checking that the listener's understanding is correct and resolving any areas of confusion or misunderstanding.

Giving clients a chance to ask questions: At appropriate moments in the conversation, give the client an opportunity to ask any questions he/she may have, so that, you can respond and help the client to understand better.

Confirming follow-up steps: State and explain the next steps, what needs to be done, and when. It could be helpful to give the client a simple and easy memory aid. Memory aid with figures and images could be developed for illiterate clients.

Key messages during IPC

The following are the six essential immunization messages the healthcare worker is expected to tell the mothers/ caretaker/targeted individuals during IPC.

1. *What disease do the vaccines prevent (which the vaccine is given today).*
2. possible AEFI occurrence and how can be managed
3. number of visit that still needed to be complete the vaccination serious
4. *Not to miss the next schedule, even if the child gets sick.*
5. *Date, time, and place of next vaccination.*
6. *Remind a caregiver to keep the card and bring it with her*

Use the GALIDRAA approach for effective interpersonal communication:

Greet, ask, listen, identify, discuss, recommend, agree, and appoint (GALIDRAA) is an interpersonal communication method, is used in EPI behavior change programs to structure communication between front-line workers (FLWs) and beneficiaries:

GALIDRA elaborated as

1. Greets the mother and establishes confidence.
2. Asks the mother about vaccination related practices/ believes.
3. Listens to what the mother says about the practices /beliefs.
4. Identifies vaccination/immunization related difficulty, if any, causes of the difficulty, and selects with the motherthe difficulty to work on (E.g., schedule/ distance, personal issues (conflict) ...etc.
5. Discusses with the mother different feasible options to overcome the difficulty.

6. Recommends, negotiates, achievable points and actions: presents options and NEGOTIATES with the mother to help her select one that she can try.

7. Mother Agrees to try one or more of the options, and mother repeats the agreed upon action.

8. Makes an appointment for the follow up and visit

During immunization session the health care workers employ the following procedures:

At the start

√ Greet the caregiver/targeted individual in a friendly manner. Thank them for coming for vaccination and for their patience if they had to wait.

√ Ask the caregiver if they have any questions or concerns and answer them politely.

During the assessment

√ Write the date of the vaccination(s) being given on the immunization card and explain the disease(s) against which the vaccination(s) protect(s) in simple terms (in the local language). If there is a poster or chart, use it to help your explanation (Job Aid).

√ Mention possible side effects and explain how to handle them as described in the above section.

√ Explain the need for return for each contact in the immunization schedule to be fully protected. Use the immunization card as an instructional guide and congratulate the caretaker/ targeted individual if the child/ individual has completed a series.

√ Write the date for the next vaccination on the immunization card and if appropriate, associate the date with a well-known occurrence, such as a holiday or seasonal event that will help them to remember the next appointment.

√ Ask the caregiver/targeted individual to repeat the date to be sure it is understood.

√ Remind the caregiver/targeted individual to bring the immunization card when they bring the child back/ come for the next vaccination.

During Vaccination

√ Explain to the caretakers/targeted individuals the proper position for vaccination.

√ Proceed with vaccination.

√ Reassure, if there is any complaint

After Vaccination

√ Remind the caregiver/targeted individual when to return for the next appointment

√ In the event of any out-of-stock of vaccine at the time of the session, inform the caregiver/ targeted individuals where and when to return for the next doses.

- √ Remind the caregiver about other services given during immunization sessions, as per national policy, for example, vitamin A supplementation or Td vaccination for women.
- √ Ask the caregiver if they have any questions or concerns and answer them politely.

At the end especially for resistant /refusal / drop out client establish Possible follow up, negotiation visits to maintain the practice and/or negotiate another practice:

NB To make the Vaccination service moreuser friendly every vaccinator should have IPC skills

NB the HCWs should to talk to the child at vaccination session to improve his/her early child hood development.

Case scenario 1: Role play 1

"W/ro Marta is a resident of village 1; her home is three km far from the health facility. She is 21 years old, married, and illiterate. Marta went to the health facility seeking vaccination for her six weeks old baby girl. She met the healthcare worker (Hana) at the health facility of immunization service unit for the first time. Sr. Hanna provided all immunization services to the child.

Case scenario 2: Role play 2

A mother with 4 weeks old child who was not yet started vaccination came to the health center to get immunization service. Sr. Sadya who was working at the EPI room respected and appreciated the care giver for bringing the child and provide all vaccines based on the schedule.

Health education is mandatory to provideinformation in group or individually.

So, every health facility every morning expected to provide health educationbefore providing any service except in emergency conditions. EPI rooms serves for many care givers. Thus, individual or group health education and providing appropriate information on immunization should be amain activity.

3.3.2.2 Community engagement

Community engagement is a process of involving the community in decision-making, with the goal of creating informed actions and shared visions. It helps to better engage them to achieve long-term and sustainable acceptance and uptake of immunization services among the communities. Community engagement is more successful when it is done

within the community.

It is an important channel for reaching all target groups, especially socially distant, vulnerable, and at-risk groups. It will allow us to promote vaccination through credible, trusted community stakeholders. The goal is to build dialogue and trust with communities so that vaccination activities are designed in a way that is collaborative, making them more valuable and likely to be used by target populations.

The major activities to be done for wider engagement of communities in immunization are:

- Conduct community dialogue, focus group discussion (FGD) and community sensitization workshops by using existing community platforms like Idir, youth associations, women associations, religious leaders, clan leaders, social mobilization committee, block leaders, school representatives, and Women Development Army (WDA), FGD, Community dialogue and sensitizations will be effective if they encourage male involvement in vaccination.
- Distribute key messages through community social committee and using special community gathering opportunities (market days, youth centers, worship places, schools, and so on.
- Furthermore, engagement with civil society organizations, faith-based organizations, and religious leaders, has also been crucial to promote demand for immunization services.

In addition, addressing vaccine hesitancy and the negative influence of anti-vaccine rumors might be a challenge in convincing caregivers/ targeted individuals to utilize immunization services. Also, such kinds of thoughts are widely dispersed among the communities and could be the cause of an impediment to vaccine utilization among communities. The community's problem should get solutions by the communities themselves. Therefore, community engagement in immunization practice is mandatory.

In order to promote community engagement, the role of healthcare professionals is decisive. Healthcare professionals must be alert enough to arrange or utilize given platforms and meet communities' interest in vaccine utilization.

In general, to strengthen the immunization service uptake, periodic dialogue with communities through the available community structures/platforms is necessary and the healthcare professionals should organize and facilitate the discussions. The outcome should also be monitored periodically.

3.3.2.1.1. Community Dialogue

Community dialogue helps to build awareness about the immunization program's purpose and activities, visioning about children and child well-being, and lead to the identification of priority areas that lead towards planning

In order to promote vaccination and increase immunization coverage, the role of community dialogue in the communities is vital. As an established and already trustworthy source in many communities, health workers are uniquely able to facilitate trust-building through community engagement channeling with community dialogue.

In addition to maintaining regular dialogue with community leaders and caregivers, health workers can participate and lead community engagement by:

- Giving community members the opportunity to voice their thoughts and concerns about immunization.

- Allowing community members to participate in the actions taken to resolve issues
- Involving community members in the decision-making and planning process that leads to solutions
- Allowing community members to take responsibility for the progress achieved

Engage community partners to foster community ownership and participation in vaccination efforts at the community level. The health care workers should maintain these five steps.

1. Engage potential partners, establish a relationship, and agree upon roles
2. Maintain a continuous relationship with community partners and acknowledge the value of their support.
3. Schedule and facilitate community dialogue
4. Help community leaders to promote vaccination
5. Regularly monitor the progress

While interacting with potential leaders, community members, and partners, these are the essential elements to cover: Ask questions to understand their needs, and share information about vaccination and its benefits. ask for honest feedback and suggestions on the immunization program, invite them to share any questions or concerns they might have about immunization, discuss ways that vaccination promotion can be strengthened through their participation, agree upon the role that the community partner will take on, and how it will be implemented moving forward

Be sure to establish how communication with the community partner will be handled moving forward and be clear about the immediate next steps.

Case study 1:

Instruction: Read the case study and reflect your opinion to the facilitator

Tme:5 minute

In your kebele, there are many pregnant mothers who were registered during their pregnancy period and didn't bring their children to vaccination after their delivery. And also, there are many under two year's children who missed their vaccination schedule.

3.3.2.3 Communication materials utilization

Communication materials are the major communication channels to disseminate important information to the target audience and to help health workers remember key issues on certain health topics.

Those are materials such as (print materials-posters, brochures/flyers; Audio visual-video; Job Aids; and interpersonal communication guide) that need to be sued by health care providers, before, during, and after immunization sessions both in health facilities and community level.

3.3.2.3.1 Poster/ brochure /flyer

This kind of communication material helps to disseminate key messages for the public and sometimes it is prepared to target specific groups like students, parents/caretakers to give detailed messages to the community or specific groups on Immunization.

3.3.2.3.2 Audio-visual

This is another attractive way of passing on a message while the client stays in the waiting area. Following the audiovisual material, local level health care provider will give chance for the client to ask question after the audio-vision education to clarify issue the beneficiary may have.

3.3.2.3.3 Job Aid

These are communication materials prepared to help or aid health workers to remember the basic issues on immunization. They can be posted on the wall in health facilities or placed on the table or in the appropriate place where they can be seen by the health workers.

In general, using all the above-mentioned communication materials helps the health care providers to disseminate key immunization messages and to address the concerns of the target audiences before, during, and after immunization sessions.

Other demand promotion approach to know/ consider:

- Community Dialogue: Dialogue at deferent level (school level for eligible girls for HPV and COVID 19 vaccine) focus group discussion (FGD) at community and facility level for deferent purpose
- House to house approach using village and block organization through block or village leaders.
- Religious institutions (through religious leader)
- School plat form (through teachers and students)
- Media engagement (mainstream and social media): to be interviewed atfacility level – focus on the point to say, get prepared before the actual interview – be focused etc. ...
- Develop clear communication plan.
- Use communication guide /tool or job aids, different job aids for deferent purpose (material during campaign and material during routine immunization, material during IPC and material during community dialogue or FGD
- Communicate in advance.
- Identify local level mobilizer and orient to support / facilitate.

- Let community to discussions/ brainstorm about the issue.
- Encourage community member to response to questions communicate from participants.
- At the end give the correct information (scientific base)
- Agreed and plan for vaccination action (plan when to come or to conduct the mass vaccination/campaign.

3.4. Risk and Crisis communication

3.4.1. Risk communication

Risk: Chance or likelihood that something will harm or otherwise affect your health unless necessary measure and precautions taken this works for disease and services.

Risk communication: It refers to the exchange of real-time information,

The ultimate purpose of risk communication is to enable people at risk to take informed decisions to protect themselves and their loved ones. Risk management is concerned with identifying, assessing and mitigating any activity or event that could cause harm to the business. Risks can be strategicor operational in nature. Vaccine Risk communication Many vaccine fears have some basis in reality. However, there is often mismatch between people‘s fear and reality. Moreover, there is little evidence on the knowledge of risk assessed by professional, which influence the way public perceives and responds to risks and dangers. Risk communication is communication process that the communicator hopes to provide service (for the audience) with information about the expected type (good or bad) and magnitude (weak or strong) of an outcome from a behavior or exposure.

Crisis: can be defined: as any situation that affects the trust or reputation of an institution or its products.

3.4.2. Crisis communication: is defined as an adjusted response to an incident, that aims at restoring public confidence in the institution ‘s ability to manage the incident by keeping the public informed on what went wrong,why, and what is being done in response ‘.

A crisis in immunization can occur related to different reasons. Examples include: -

- An adverse event following immunization (AEFI):
- Events including rumors, misinformation, or fake news.
- Poor/inadequate communication in immunization (not addressing knowledge gaps a head of the vaccination program/ engaging relevant stakeholders)
- Increasing vaccine hesitancy amongst some groups due to various reasons

3.4.3. Crisis management in Immunization

The first rule of crisis management is to communicate. Early hours are critical and they set the tone for the duration of the crisis. Be as open as possible; tell what you know and when you become aware of it; explain who is involved and what is being done to fix the situation.

1. Get Prepared

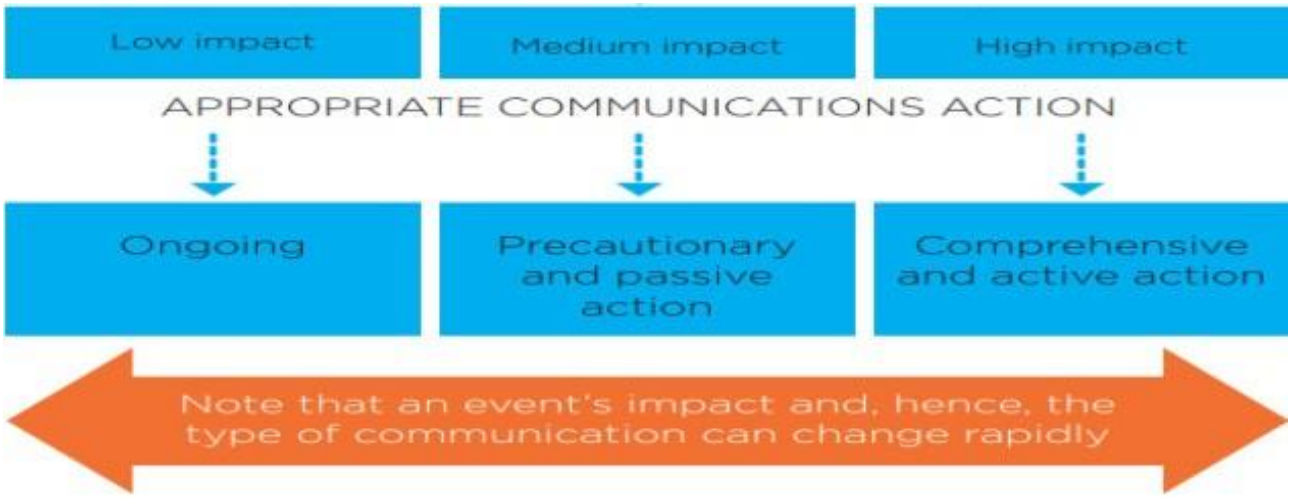
- Create a crisis communication plan including sources for crises, ToR, identify fund sources, Standard of Procedures (SoPs) etc.
- Ensure training/orientation is given for key stakeholders including Health Workers (HWs), community leaders/clan leaders, and other public influencers etc.

2. Implement: When crises occur

Analyze – When and where to respond, ifthe crises are a low, medium, or high impact event, and if it's getting public attention and affecting public trust in vaccines?

No.	Type of Event	Low Impact	Medium Impact	High Impact
1	Vaccine Reaction	• Reaction is not serious or dramatic • Reaction is serious but not relevant to the public (e.g. in another country with a vaccine not used in the country EPI program)	• Serious reaction in the country • Serious reaction with some relevance to public (e.g. in another country with a vaccine used in the program) • Anticipated media attention • Reaction among children, teenagers, or pregnant woman	• Actual media attention • Serious reaction(s) with unknown cause • Reaction that is dreaded, memorable, or dramatic • Serious reaction during a mass campaign • Serious reactions with a new vaccine
2	Rumors, Fake News or Media Report	• Story receives little to no public attention • Story does not play upon emotions and/or fears • Story is not believable	• Story receives some public attention • Story triggers some emotional fears • Story is plausible	• Story receives significant public attention; taps into emotional fears • Source has high readership/viewership • Source is credible and influential • Story is relevant

Actions to be taken based on the analysis



During the implementation....

- **BE PROACTIVE: -** Aim to stop the crises before it gets large and to build trust.
- **ACTIVATE: -** the crisis communication committee and plan
- **TAILOR: -** your message to the situation in the existing communication strategy
- **DESIGNATE: -** a respected and trained spokesperson if the crisis requires a public response.

- **COORDINATE: -** between technical and communication experts. And with other relevant parties – such as local health units and schools or others

3.4.4. Role of Health Care workers during immunization crisis

Key points to consider when communicating with the vaccine recipient or parents/ guardians of the patient and the community are:

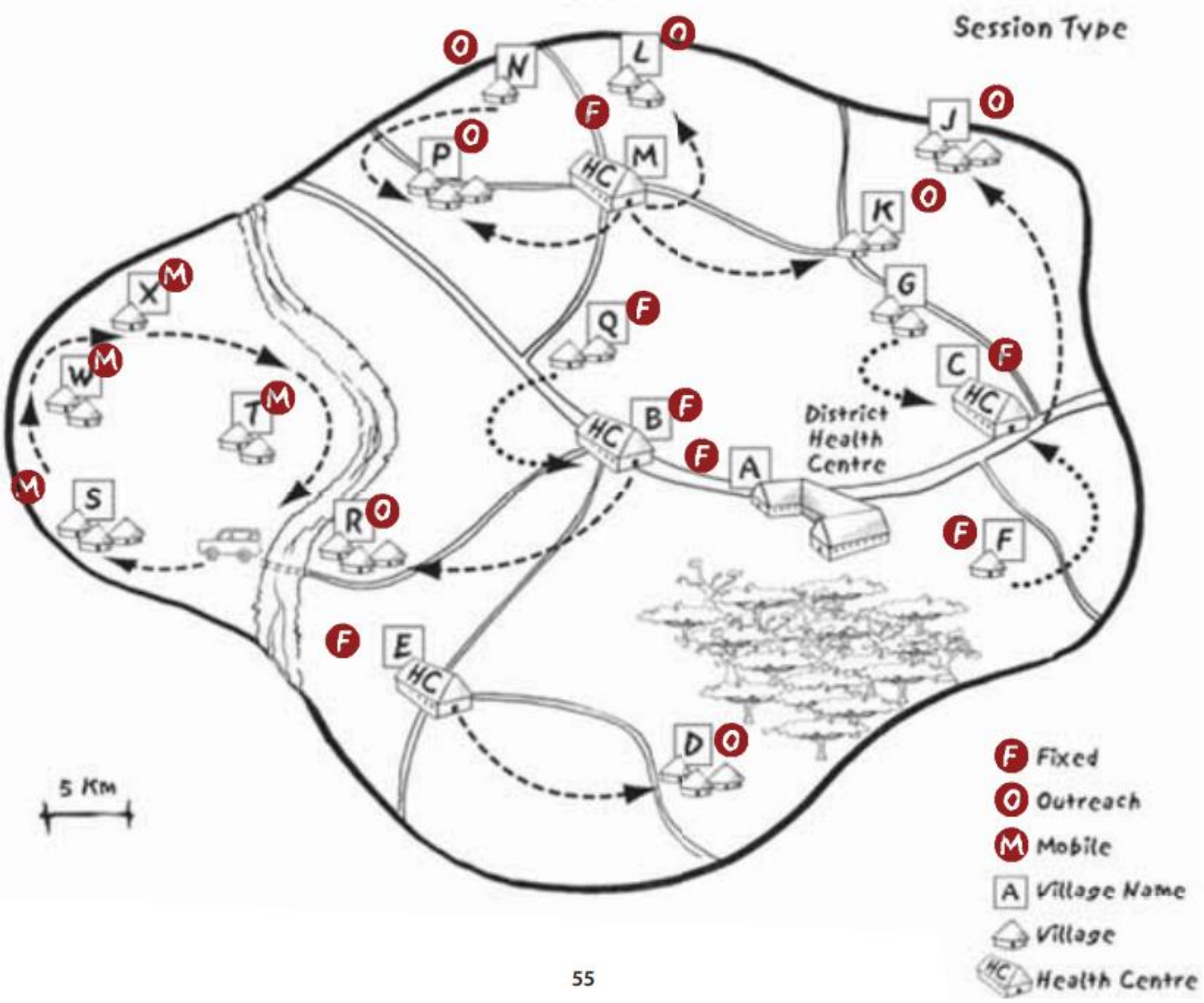
- Listen to the client, parents, or guardian and their concerns empathetically.
- Reassure and support the client, parent, or guardian but do not make false promises.
- Assist the client, parents, and guardian with hospitalization if necessary.
- Frequent communication with the client, parents, or guardian regarding the progress of the patient.
- Prepare a fact sheet on adverse events for the client, parents or guardian, community, health staff and media.
- Build up and maintain relationships among health staff and the community.
- Inform the individual client, parent, or guardian about possible common adverse events and how to handle it.
- Continuously communicate with the client, parent or guardian, and community during the investigation period to assure an understanding of the risk-benefit of vaccination.
- Communicate immediately with the Primary Health Care Unit (PHCU) / Woreda officials and Expanded Program in Immunization (EPI) experts.
- Use local community platforms to brief about the event with the engagement of Woreda/PHCU officials.
- Constantly reassure the public on the safety of vaccines.

3.4.5. Monitor the impact of the crisis management

- Assess the impact of communication messages/strategy to inform next steps/ potential changes based on the collected information (new) or as evidence emerged.
- Revise your communications plan accordingly.
- Document the steps and activities done to manage the situation/event, which will help in the future, if another related event happens.

3.5. Chapter summary

- Communication is a core component of immunization programs that enables the transmission of information from one person to another so that the sender and receiver will have a common understanding of the message.
- Communication involves both verbal and nonverbal methods.
- Even though the responsibility for clear communication falls on the sender (health care provider) the receiver has also the same responsibility to confirm for clear understanding of the message. This makes communication a dynamic and cyclical process.
- In order to make communication effective, it needs to follow the principles of completeness, conciseness, consideration, concreteness, and correctness.
- Communication will be ineffective, if it is influenced by the barriers such as physical, perceptions and beliefs, emotional, cultural, and language barriers.
- Advocacy, social mobilization, program communication, interpersonal communication (IPC), community engagement, posters, brochures, job aid and audio-visual material can be used as demand promotion and communication strategies and approaches.
- Every immunization program eventually faces events that have the potential to erode trust in vaccines and/or vaccination and the authorities delivering them.
- To manage any crisis in immunization, it needs to create a communication plan ahead of time, respond for the event and monitor and evaluate the situation with documentation for further replication and lessons learnt.
- Communication is the fundamental part of the immunization program to make the intended outcome successful.
- Applying effective communication skills in immunization program has an indispensable value to improve vaccine acceptance and its uptake among the eligible population.



Chapter 4:

Planning and Coordination

Time Allocated: 300 Minutes

Chapter description: This chapter focuses mainly planning and coordination on integrated routine immunization service delivery with life course approach.

Primary Objective: At the end of this chapter participants will be able to:

- Demonstrate immunization service plan

Enabling Objectives: At the end of this chapter participants will be able to:

- Identify immunization coordination mechanism
- Describe basic micro plan development processes
- Determine vaccine delivery strategies.
- Demonstrate immunization micro plan development

Chapter outline:

4.1.Immunization program coordination mechanism

4.2.Micro-plan development process

4.3.Immunization Session Plan Preparation

4.4.Chapter summary

4.1. Immunization program coordination mechanism

Individual Reflection **Time: 5 minutes**	1. What is Immunization program coordination? 2. What is the benefit of coordination at PHCU and Kebele level? 3. Who are the key actors for Immunization program coordination at kebele level?

Immunization program coordination will require key national decisions to be made both prior to, and during vaccine service implementation.

To be a successful immunization program coordination, there need to:

- Apply and strengthen inter-institutional and multi-sectoral coordination mechanisms.
- Coordinate participation from different sectoral offices: task force (TF), professional associations, NGOs, education office, transportationoffice, social and labor affairs office, women and children affairs office, civil society organizations (CSO), religious institutions, community representatives, peace and security office, and people with disability associations.
- Engage with MCH department, EPHI/ PHEM, logistic office, and EFDA
- Ensure coordination with local governments (woreda office heads, PHCU head, community health promoters, Kebele leaders, schools, agricultural office, and key public figures)
- Engage institutions dealing with populations of concern like; IDPs, refugees and returnees.
- The coordination mechanism at lower level established and/ or coordinated with PHCU head, HEWs, religions leaders, community health promoters, Kebele leaders, schools, agricultural office, key public figures, women affair, local organization like idir/debo/ dagu etc. All stakeholders should be engaged in session planning, resource and social mobilization, identification of newborn and defaulter tracing.

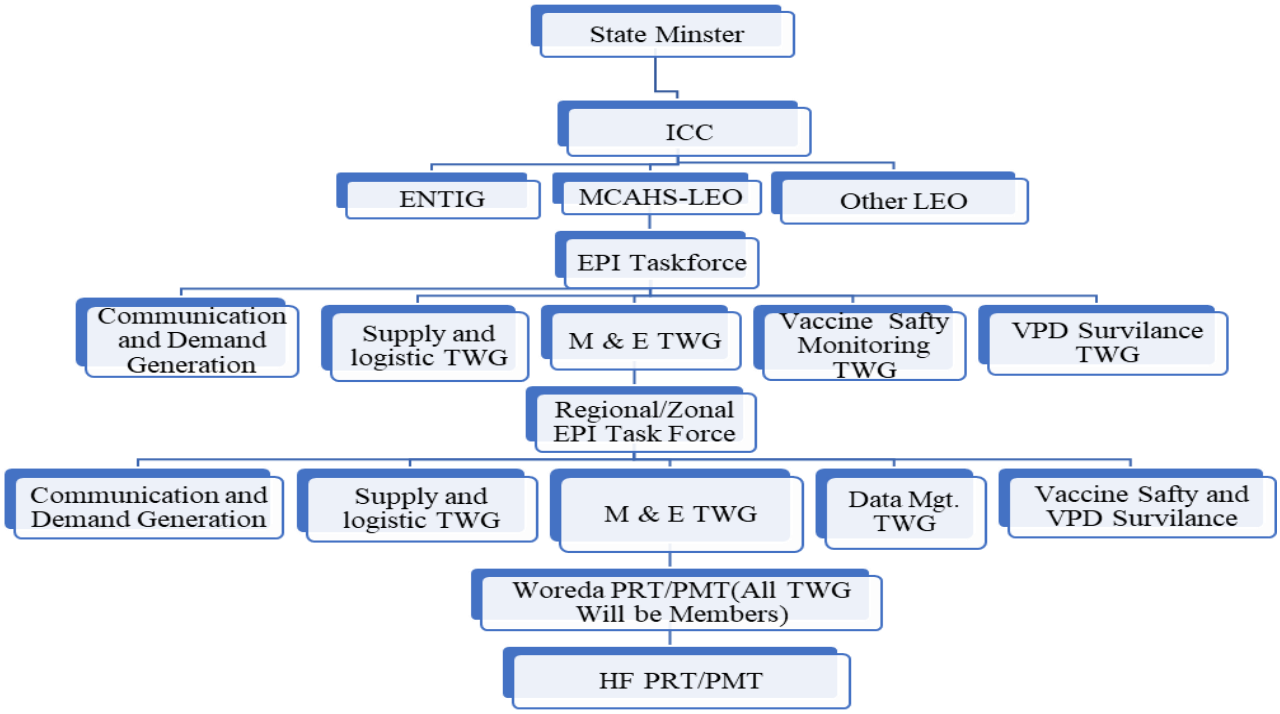


Figure 4.1. Immunization program Coordination Platform

4.2. Micro-plan development process

Individual Reflection **Time: 5 minutes**	1. What is microplanning (MP)? 2. How is MP developed? 3. Who is responsible for developing the MP? 4. What are the key considerations to develop MP?

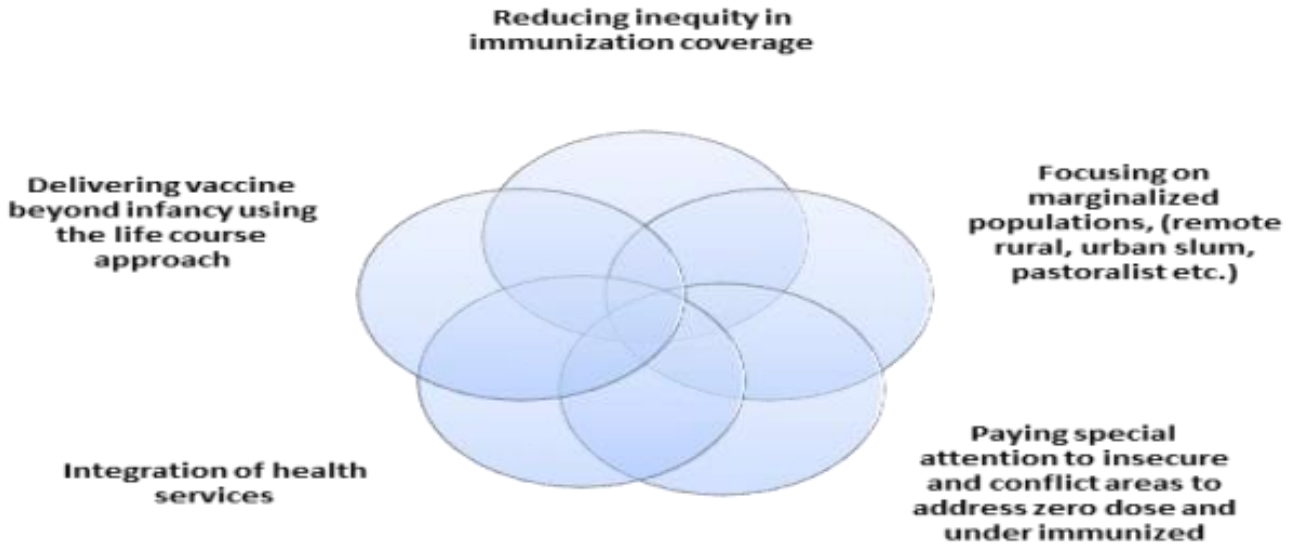
Definition of Micro-plan:

Microplanning is one of the tools that health workers use to ensure that immunization services reach every community. Microplanning is used to identify priority communities, to address barriers, and to develop work plans with solutions.

Micro planning exercise is a detailed bottom-up approach of planning and should start at the Kebele and HF levels. Microplanning at woreda levels should be developed using head count of target population. The bottom-up micro planning should use a standard micro-planning template and should include a detailed map of the Kebele and PHCU.

This exercise should provide valid and realistic estimates of resources needed and information regarding existing and locally available resources (e.g., human resource, functional and non-functional cold chain equipment, transport, financial resource).

- **Five important areas for immunization program to be considered in planning and coordination.**



Rational for Micro Plan Development

- It improves coverage and equity of immunization service
- It improves service delivery quality
- Can be used as advocacy tool to mobilize resource

Reach Every District/Reach Every Child (RED/REC): is a strategy to achieve the goal of95% immunization coverage in all districts. RED aims to fully immunize every target with all vaccines included in the national immunization schedule.

RED guide is organized by five interlinked components;

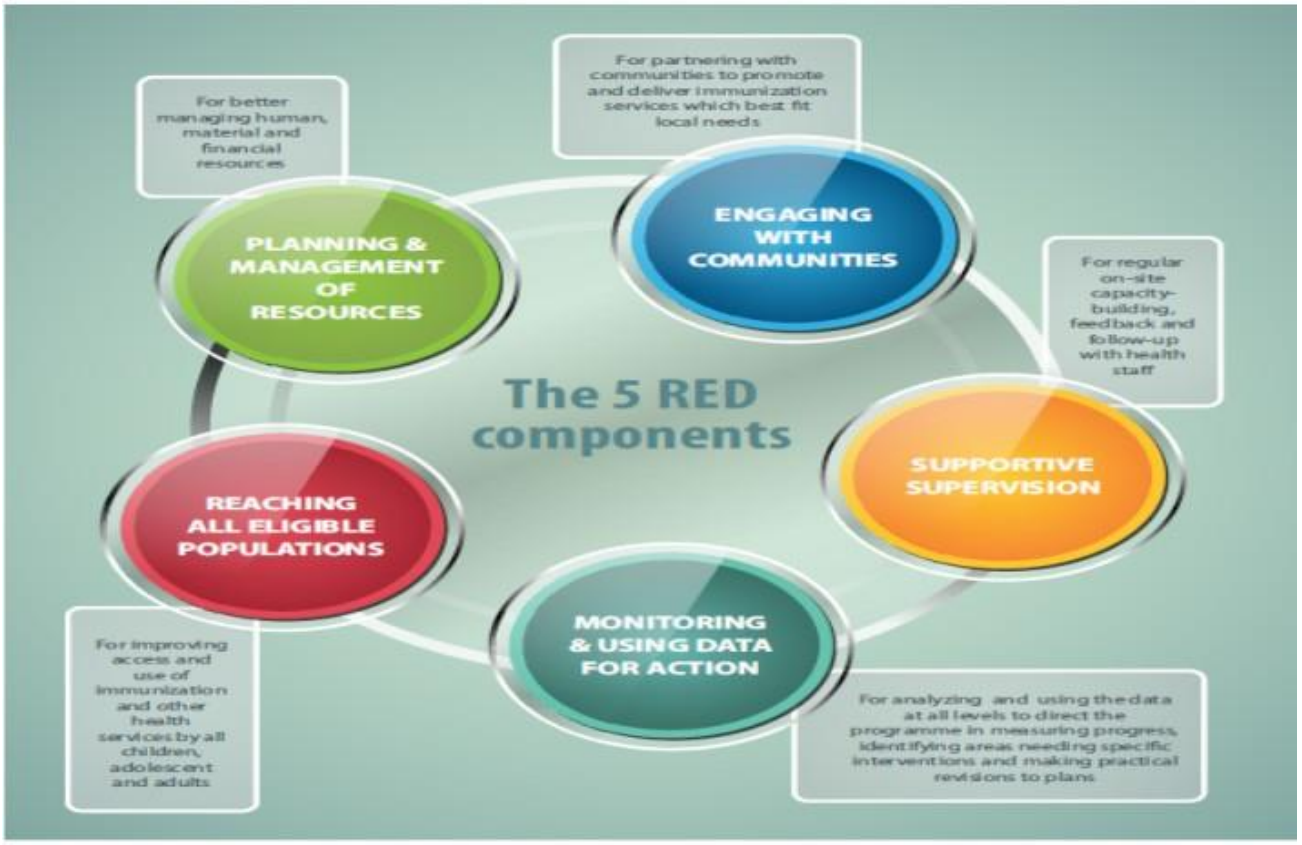


Table 4.1 : Key information and activities for micro-planning development

Required Data/ information to develop the PHCU Micro-plan	Key activities to be accomplished while developing the micro-plan at PHCU level
List of targets in their PHCU.	Determine the required amount of vaccine, syringes, safety boxes, tally sheets, registration books, immunization cards, PPEs/ IPC supplies (gloves, masks, and sanitizer), and waste disposal points.
Inventory of cold chain equipment (cold boxes, ice packs for cold boxes; vaccine carriers, ice packs, ice pack freezing facilities etc.)	Identification and quantification of target groups

Inventory of transportation facilities	Determine the number of vaccination posts and duration of vaccination
List of high-risk population including IDPs, refugees, returnees, and differently abled people.	Estimate recording and reporting formats
Copies of planning forms for each HFs and stakeholders	Estimate the required human requirement and training needs (coordinators, supervisors, vaccinators, screeners, volunteers, cold chain personnel, waste management personnel).
PHCU map (physical and social map)	Identifying strategies to reach hard to reach area
List of hard-to-reach target areas	Determine the transportation needs to prepare and implement the vaccination.
Information about the local stakeholders; level of participation and their contact person and Identification of health facilities where the waste will be disposed (indicate on map).	Plan for advocacy, social mobilization and communication and IEC/BCC materials needs.
Information on vaccine and dry supply requirements	Identification and mapping of hesitant/ refusal groups, and design strategies
Information on required recording and IEC/ BCC materials	Explore ways to strengthen inter-sectoral collaboration
	Plan vaccine and supply storage and distribution points
	Plan for waste management
	Costing of activities and supplies

4.2.1. a Catchment Area mapping

Catchment area map display the important geographical features and population centers of the whole catchment area. It should also show the locations of the health center and the satellite health posts under PHCU supervision. Area maps should be develop or updated biannual at woreda and quarterly base at facility level.

Kebele Catchment Area Mapping: Start with orientation of map working team on how to do kebele catchment area Map.

- Locations of every village /sub-kebele in the catchment area, including those that are not reached and/or are new;
- Landmarks and significant buildings, for example, religious centers, markets, schools, bus stations;
- The total population and target populations in each community in the catchment areas.
- Settlements of urban poor and migrants within towns and cities, conflict affected, areas, Urban Slums, remote rural, urban hard to service community (Condominium and Apartments);
- Approximate distances, travel times and Strategies to each village/sub-kebele;
- Community volunteer names and their mobile phone number
- Map should be updated regularly to include any change in the area

Figure 4.2: Hypothetical kebele map

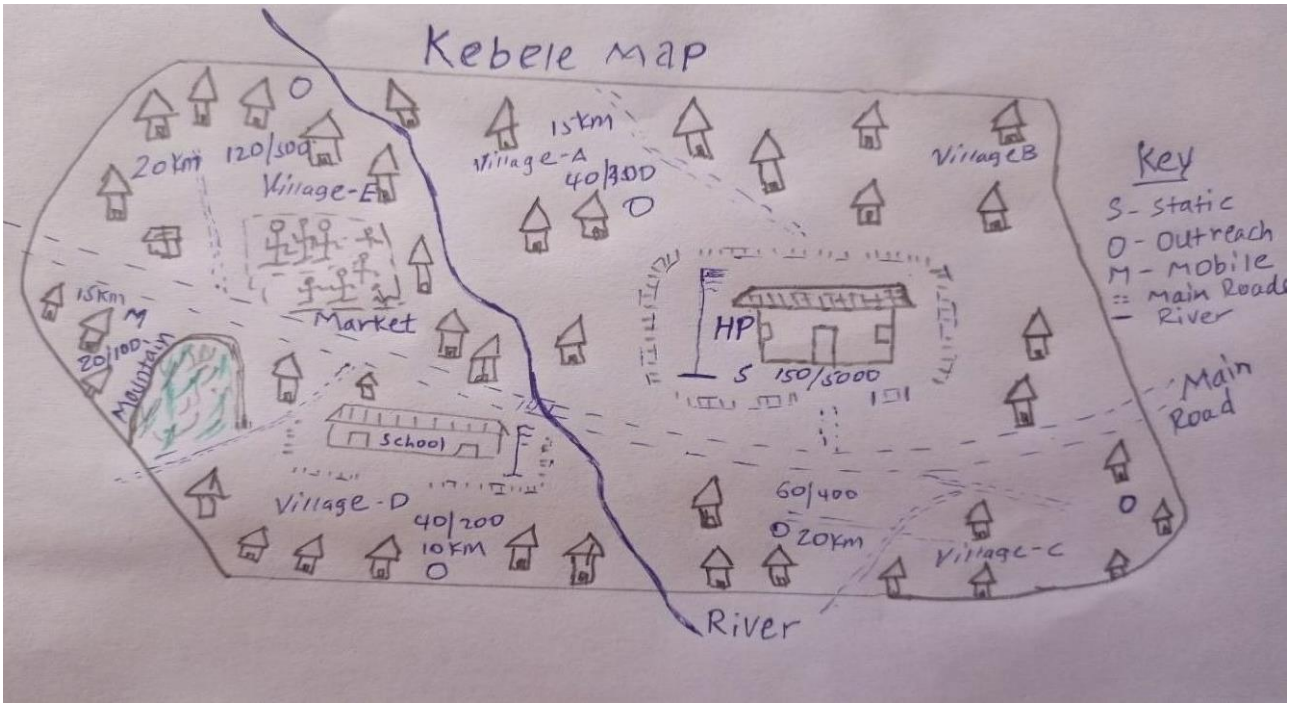


Table 4.2: Kebele catchment area communities and populations

Community/ Village Name	Total Population in the community	Total target Population the Village/ sub-kebeles	Distance b/n HPs and Village/sub-Kebeles	Name of contact person in the community	Strategies (F, O, M)	Phone number of community focal person
Village 1						
Village 2						
Village 3						
Village n						
HC/HP Total						

PHCU Catchment Area Mapping:

- List of health posts with their catchment areas shown as boundaries and their distances to the health center and community facilities marked.
- List of communities such as urban, towns, villages, rural settlements, isolated households; Rivers, mountains, valleys and other similar geographical features and landmarks;
- Natural seasonal barriers, such as flood zones during the rainy season; Roads and tracks. It needs to include urban poor and migrants.
- PHCU and health facility maps should include all eligible population groups in their catchments;

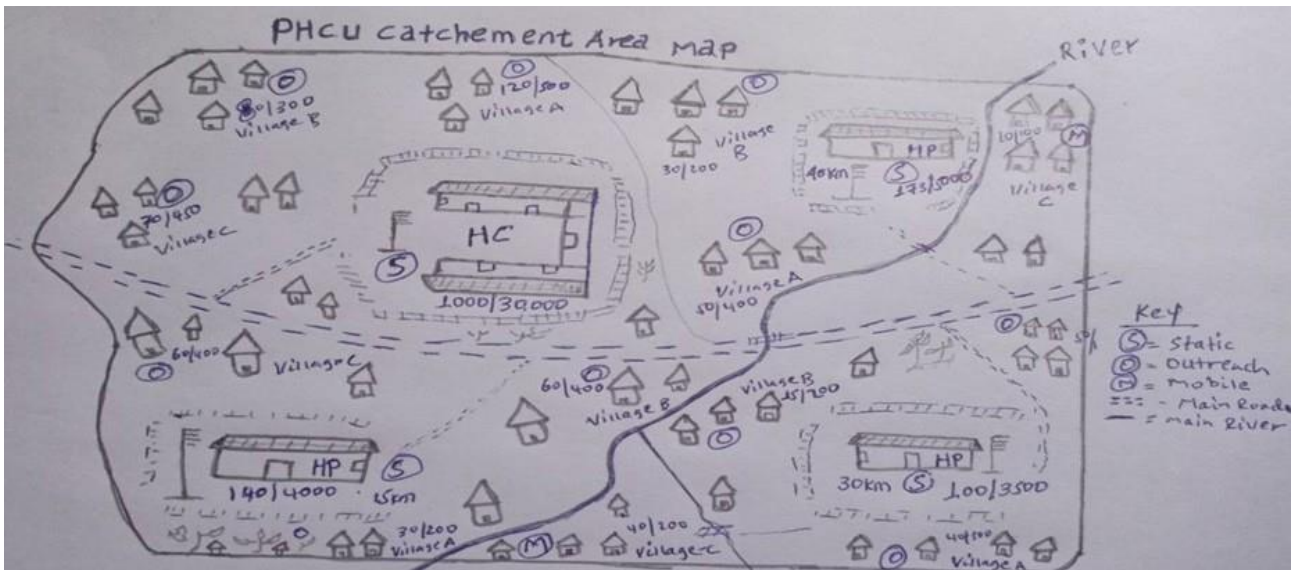


Figure 4.3 : Hypothetical PHCU catchment area sketch map

Table 4.3: PHCU catchment area-level list of peripheral HFs and their catchment area populations

Health Facility Name	Total population in the HF catchment area	Target Population of the catchment area	Distance Between HC and Health post		Name of contact person in the HF	Phone number of contact person
			Km	Hour		
HP1						
HP2						
HP3						
HP4						
HP5						
HC*						
Cluster total						

4.2.1b Target Setting

Target setting is the process of setting goals. The purpose of target setting is to provide direction. It is counting annual target and can be done by using head count of eligible target population in specific sub-kebele level. The bottom-up target setting process can be done by using a standard micro-planning template at sub Kebele level inventory form prepared for this purpose. Use annexed MP Template **(Annex 1 and 2: Kebele Inventory Form K1 and K2).**

4.2.2. Problem Analysis and Prioritization

Two levels of analysis lead to the identification of priority health posts and communities:

- At health post level; analysis of community immunization data for the past year should identify those in need of priority visits. Visits may be needed for evaluation of zero dose, low coverage,and the reasons behind it.

- At Health center catchment area level; analysis of health post immunization data for the past years should identify those health post and communities in need of priority support

I) How to prioritize communities using health post immunization data

- Use all available information to complete the analysis of health post data; to best assemble all available information, the input of community and administrative leaders is needed
- List every community, including new ones and those that do not have regular access to services (for example, urban slums, and distant rural communities).
- Rank communities by number of zero dose and unvaccinated target; the one with the highest number of zero dose and unimmunized target is ranked first (1) and so on (Table 4.4). The community ranked 1st has the highestpriority, and so on.
- Look for any monthly variation in immunizations given in a community when reviewing data from the preceding 12 months and note any seasonal changes in the last column (for example, decrease during the rainy season).

Table4.4: Health post data analysis over the past 12 months

Name Of Village/ Sub-kebele	Target population < 1 (a)	Penta 1 Doses Given During the Year(b))	Penta 3 Doses Given During the Year (c)	MCV1 doses given during the year(d)	Zero dose Children = (a-b)	Unvaccinated missed, Penta 3 Doses= (a-c)	Distance from HP(Km)	# Of planned outreach sessions	# Of outreach visits conducted	Maine Community Characteristics: urban, poor, semi-urban, rural, migrant, ethnic minority, new settlements,
Village1										
Village2										
Village3										
Total										

Name Of Village/ Sub-kebele	Target population (9 yrs. of age)	HPV 1 Doses Given During the Year	Target Population (12yrs and above)	COVID 19 vaccine doses given during the year	Unvaccinated missed HPV 1 Doses)	Unvaccinated missed COVID 19 Doses)	Distance from HP(Km)
Village1							
Village2							
Village3							
Total							

4.2.3. Analysis of PHCU catchment area immunization data

- Table 4.5 shows a format for analysis of PHCU catchment area immunization data from the last 12 months.
- The format identifies and prioritizes high risk health posts where immunization performance is problematic. Health posts are ranked and prioritized primarily based on the number of zero dose and penta-3 unimmunized in their catchment areas (table 5).

II) How to prioritize health post using PHCU catchment immunization data

- Use all available information to complete the analysis of immunization data; to best assemble all available information, the input of community and administrative leaders is needed.
- Rank Health Posts by the number of zero dose and unimmunized eligible; the one with the highest number of zero doseand unimmunized children is ranked first (1) and so on. The health post that ranked first has the highest priority, and the like.
- Consider prioritizing health post with inaccurate data such as Health facility that shows negative values for zero dose and unimmunized children due to inaccurate population data, negative vaccine wastage rates may need to be given priority coverage and with known Management Problems (supervision findings).

Situational analysis; In actual micro planning planners should know about eligible population, past immunization trends, catchment area map and population data based on number of Zero dose and unimmunized for Penta 3 in their catchment.

Table 4.5: PHCU catchment area immunization data analysis for the past 12 month

Health Facility Name	Annual Target Population	Doses Of Vaccine Administered			Unvaccinated children			Prioritize HFs (highest # of zero dose and penta3 un immunized as priority1 and soon)
		Penta1	Penta3	MCV1	Penta 1	Penta 3	MCV 1	
HP1								
HP2								
HP3								
HC								
Total								

III. How to prioritize health post by using RED/REC categorization tool

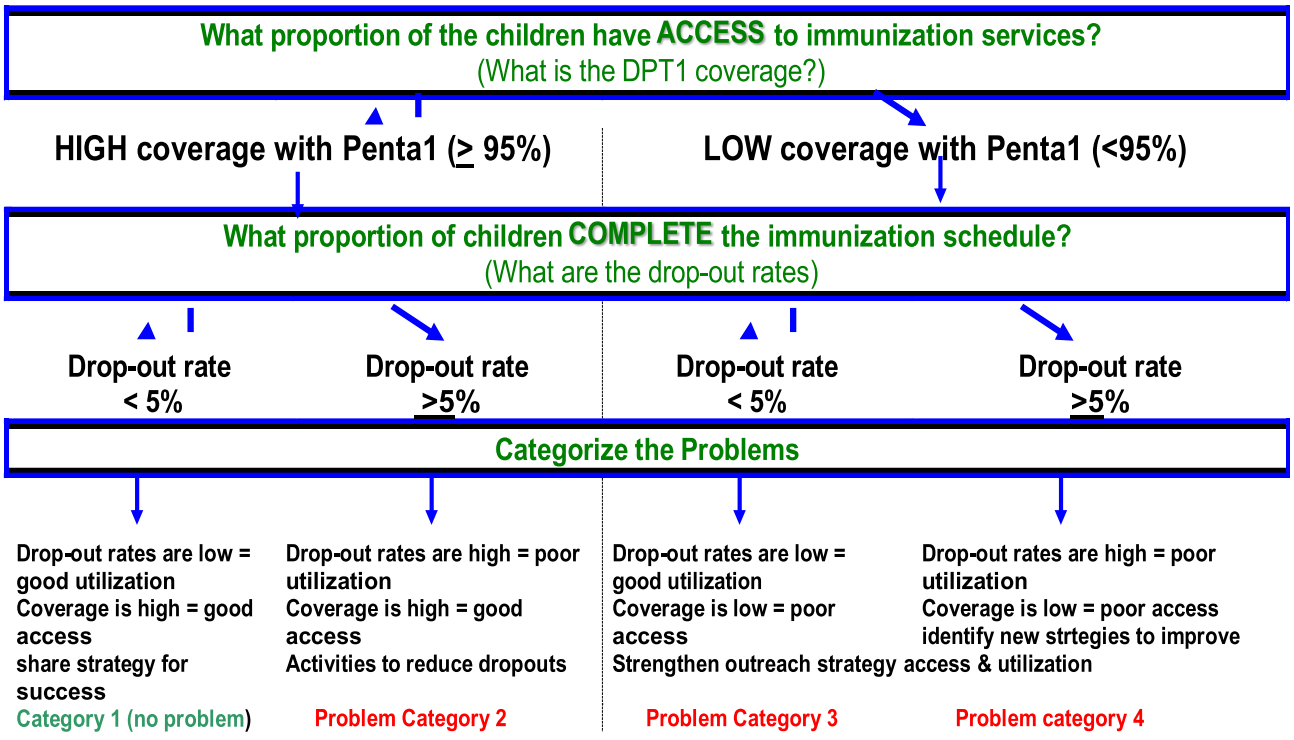


Table 4.6: PHCU catchment area immunization data analysis for the past 12 months based on Penta one coverage and Penta 1-3 DOR.

Health Facility Name	Annual Target Population	Doses Of Vaccine Administered			Coverage			Penta 1-3 DOR	Prioritization			
		Penta 1	Penta 3	MCV 1	Penta 1	Penta 3	MCV 1		Access	Utilization	Cat.	Priority
HP1												
HP2												
HP3												
HC												
Total												

4.2.4. Identifying barriers to access and utilization

To identify and understand the issues that become barriers to access and utilization, prioritized communities need visits from teams of catchment Health center and health extension professionals from catchment. Community administrator, leaders and volunteers must be engaged in evaluation visits. Permission from community authorities is essential before conducting surveys, focus groups and similar exercises to identify barriers. **Annex 7**:

- Two basic evaluation exercises are included here: household survey and community discussion.

Household survey of immunization status

In a small community, a sample of five partially vaccinated or unvaccinated children aged 12–23 months by household may be sufficient, but in a larger community such as an urban slum, where there may be different subgroups of people, a sample of at least 10 children is needed.

Vaccine information given by households can be checked with the immunization register/ integrated EPI card.

The household survey should be done bythe PHCU staff by using household survey questioner annexed for this purpose. After reviewing the immunization performance, the survey team chooses a village with a high number of unvaccinated children. Then from the center of the village, a starting house is randomly selected.

From the first house, move to the next houses until a total of five partially immunized or zero dose children are obtained.

Community discussion

It aims to gather information on community perceptions and ideas for improvement and is meant to complement the household survey. It requires the Involvement of Caregivers, community health workers and community leaders.

Interviews may be done with individuals or groups separately or together as appropriate for the situation. The questions can be modified as needed and the exercise is intended to take about an hour. Responses will be applicable only to the community involved but are necessary for solving local issues. **See Annex 7 Community Discussion Guide.**

4.2.5. Identifying solutions and preparing a work plan

This section is a guide to take the information collected in the portion covered above from 4.2.1a-4.2.4 and plan solutions to overcome the barriers to access and utilization identified. Solutions should be added to a work plan to guide a practical approach, and it should be developed foreach priority community.

A) How to list identified solutions

- Hold a brainstorming session with key people from the health facility, community and PHCU catchment area to gather ideas.

- Be sure to include assessing on how higher performing health centers and communities have been able to solve their problem (this will give evidence-based ideas).
- List the main health facility and community-level problem-solving activities
- Make a schedule for completing the activities over the next six months
- Get consensus on the main problems (not every problem) and list the priority ones.
- To Address the problems, limit priority problems to about three.
- Working on a longer list of problems usually becomes too difficult for a practical approach.
- Choose practical and feasible activities that solve the prioritized problems, since:
- Health facilities problem-solving activities should be within existing capacity and resources;
- Community activities may be limitedto the capacity of its volunteers since additional resources are often not available;
- PHCU catchment area-level activitiesmay provide support to the health facilities with extra technical or financial resources.

B) Make a work plan to Implement Identified Solutions

Work plan is a plan that indicates the identified solution for prioritized problem to be prepared and implemented based on specific time period with an action by using **annex 8** attached for this purpose.

4.3. Immunization Session Plan Preparation

Making a session plan

A session plan lists all communities served by the health facilities and specifies how frequently each community will be reached based on such factors as distance, target population, workload and other relevant operational issues. This section provides an example format and gives a simple method for choosing session frequency, scheduling dates and organizing the supplies needed to complete a session plan that reaches every community in a health facility catchment area. The aim is to plan sessions so that staff time is used efficiently.

I) Immunization session plan

It compiles a list of communities and the distances from the health center that is responsible for their immunization services. The type of session needed – fixed (at the health HC and HP) outreach (at a site in the village)–for rural communities usually depends on distance of the community from the health post or on the travel time needed if the landscape is difficult. Mobile sessions may be appropriate for communities living beyond the outreach areas.

The type of session needed for urban communities may depend on social factors or convenience for the groups being served.

The frequency of sessions needed depends on the number of infants expected at each session.

The number of infants an immunization program should expect to serve in a community depends on its total population.

II) How to determine Session frequency based on average injection load

This method of planning session frequency is based on average injection load per session per kebele. The steps are shown below:

***Step1.* Determine annual target population**

To determine the target beneficiaries, use overhead count (the best estimate figures), stating source and year of the population figures. Each catchment area is expected to register and update the number of target population continuously with existing community-based structure by using **annexed MP Template (Kebele Inventory Form K1 and K2) from Session 4.2.1b.**

The target for different antigen is calculated based on the overhead count/proportion of target population for specific antigen in the catchment.

Table 4.7: How to calculate target population for immunization services

Antigen	Target population	Formula**
BCG, OPV & Hep B, birth dose	Total Number of Live Birth	▪ **Use Overhead count-Recommended** ▪ Total population multiplied by proportion ofcrude birth (Total pop* % of LB/)
Penta, Measles, PCV, IPV, Rota	Total Number of Surviving Infants	▪ **Use Overhead count-Recommended** ▪ Total Population Multiplied by proportion ofSurviving infants (Total pop. * %SI) ▪ For MCV2 we use the target population, theprevious year surviving infants
Td	Total Possible No of Pregnancies	▪ **Use Overhead count-Recommended** ▪ Total Population Multiplied by proportion of possible number of pregnancies in the region(Total Pop*%PW)

Vitamin A	Children Aged 6-59 months	▪ **Use Overhead count-Recommended** ▪ Total population multiplied by proportion of children aged 6- 59 months in the region.(Total pop. * % children 6-59 months)
HPV	Girls of 9 years of age	▪ **Use Overhead count-Recommended** ▪ Total population multiplied by proportion of9 years age girls
COVID-19 Vaccine	People age 12 yrs. and above	▪ **Use Overhead count-Recommended** ▪ Total population multiplied by proportion of12 years age and above
Men A	Total Number of Surviving Infants	▪ **Use Overhead count-Recommended** ▪ Total Population Multiplied by proportion ofSurviving infants (Total pop. * %SI)
Malaria	Total Number of Surviving Infants	▪ **Use Overhead count-Recommended** ▪ Total Population Multiplied by proportion ofSurviving infants (Total pop. * %SI)
Yellow fever	Total Number of Surviving Infants	▪ **Use Overhead count-Recommended** ▪ Total Population Multiplied by proportion ofSurviving infants (Total pop. * %SI)

**If overhead count data is not possible due to different reason often population proportions are provided by central statistics authority or regional bureau

After the annual number of target population for vaccines and vitamin A is determined, the monthly target can be obtained by dividing the annual target population by 12.

Example-1 – Childhood vaccination

If the total catchment population of the PHCU is 30,000 with a crude birth rate of 3.7%and surviving infants of 3.2%, then calculate the number of eligible children for BCG, MCV, Penta. And Td

Solution: Total population=30,000, Live Birth=3.7% of total population, SI=3.2% of total population.

Answer for BCG eligible children= Total Population* % of LB/100=30,000*3.7%= 1,110 children.

Exercise 1: Calculate the number of eligible children for MCV, Penta and Td for pregnant women based on data given on example1.

Step2: **Determine number of injections needed per year**

To determine the number of injections required per year, it is assumed that a child will need a total of twelve injections to complete his/ her immunization including: three for pentavalent, three for PCV, one for BCG, two for measles, one for Hep B birth dose and 2 for IPV. In addition, three Td Injections are needed to immunize pregnant women. This makes a total of twelve infant injections, plus three injections of Td for pregnant womenwhich makes up fifteen injections in all forfull immunization of all eligible (under two and pregnant women).

Since most areas of the country for HPV is fully covered through mostly school based and out of school campaign, the target is mostly estimated at the woreda level. Hence, injection for HPV doses is not included in the calculation.

Therefore, the total number of injection load will be calculated for each village by multiplying the number of eligible targets for each village by 15.

Divide the total number of injections needed per year by12 to get the number injections needed per month

Step3: **Determine type of immunization strategy for each community**

Based on the number of children to be immunized per month, the settlement pattern of the communities in each village, decide the type of immunization strategy (Static, outreach or mobile).

Fixed session can be planned for communities within 5 km radius to health facility.

Outreach sessions are often planned for rural communities that are 5–10 km far from the health center/Health Post and urban populations who use convenient locations such as markets, community centers and schools.

Mobile session is often planned for rural communities that are living beyond the outreach areas.

N.B. Any health facility equipped with WHO prequalified vaccine refrigerator/PQS is expected to provide vaccination on a daily basis even for a single eligible person. For facilities that opened session on daily base we aren't expected to calculate session number determination.

Step4: **Determine number of sessions based on average injection load per session**

For example, assumed that a static, outreach and mobile session can serve average 40,30 and 20 injections per session respectively. Therefore, divide the number of monthly injections by 40 for static,30 for outreach and 20 for mobile to determine the number of sessions required per month.

Classwork activity #1

Calculate The Number of outreach sessions needed per month for a community with total no. of surviving infants 120.

Exercise 2: Calculating Number Of outreach, static and mobile sessions for remaining sub kebeles based on example done for sub kebele A by using below **table 4.8**

Table 4.8: Calculating Number Of outreach, static and mobile sessions based on injection load

Sub kebele	Total pop.	SIs (3.2%)	Session type	Total # of expected injection (SI*15)	# of injections/ month	Number Of Session/month (30 injection per session per outreach)	Actual Sessions Planned Per Month
A	3,400	109	OR	1,635	136	5	HC outreach (one session /week) for 3WK and 2 sessions for 1WK
B	4,000	128	OR				
C	5,000	160	OR				
E	1500		Static				
F	3500		Mobile				
G	25,000		Static				

Table 4.9: Session plan to show the date and place of each session-based session planning template annexed with MP Template form K4(Annex 4).

Session Planning Template

Region/Zone:_____Woreda:_____Health Facility: _____ Kebele_____Form K4_____

Name of service delivery site	Session plan (F, OR, M)		July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
	Static	No session planned												
		No session conducted												
	Outreach 1	Date scheduled												
		Date held												
	Outreach 2	Date scheduled												
		Date held												
	Mobile 1	Date scheduled												
		Date held												

Case Scenario for immunization program planning

Case scenario 1 – How to prepare detail Micro Plan for health Post and PHU by using MP template annexed

X" Health Post serves a total population of 6,000 with 1 static at HP level and 4 outreach sites. In these HP there is one functional SDD refrigerator, one cold box and 4 vaccine carriers one for each Gott. The community lives in four rural Gotts and all Gotts are accessible by both Motorbike and car.

Gott A=2,000 population with overhead count of 72 pregnant mothers,68 LB, 71 SI, 66 children age 12-23 months, 182 children age 24-59 months, 69 nine years old girls, 1,030 individuals age 12 years and above). In Gott A there is two KG, one primary school and one protestant church. In these Gott there are three HEW all are trained on IIP and with there over head count they found 52 children vaccinated penta1, 48 children vaccinated penta3, 46 children vaccinated MCV1, 38 children vaccinated MCV2, 32 nine years old girls vaccinated HPV1 vaccine and 51 pregnant mothers vaccinated Td2+. There is one static session at HP and one functional outreach site in these Gott which is 8 km to Sothern part from HP. From total target 35% addressed by static session at health post level and the rest 65% target addressed by outreach.

Gott B=1,400 population with overhead count of 54 pregnant mothers,51 LB, 48 SI, 46 children age 12-23 months, 136 children age 24-59 months, 49 nine years old girls, 795 individuals age 12 years and above). In Gott B there is one KG and one primary school. In these Gott there are two HEW both are trained on IIP and with there over head count they found 52 children vaccinated penta1, 44 children vaccinated penta3, 41 children vaccinated MCV1, 36 children vaccinated MCV2, 29 nine years old girls vaccinated HPV1 and 41 pregnant mothers vaccinated Td2+. There is one functional outreach sites in these Gott which is 9 km to Northern part from HP

Gott C=1,600 population with overhead count of 57 pregnant mothers,54 LB, 52 SI, 51 children age 12-23 months, 141 children age 24-59 months, 53 nine years old girls, 799 individuals age 12 years and above). In Gott C there is one primary school and one Christian church. In these Gott there are three HEW and two of them are trained

on IIP and with there over head count they found 52 children vaccinated penta1, 50 children vaccinated penta3, 48 children vaccinated MCV1, 42 children vaccinated MCV2, 46 nine years old girls vaccinated HPV1 vaccine and 49 pregnant mothers vaccinated Td2+. There is one functional outreach sites in these Gott which are 13 km to Western part from HP

Gott D=1,000 population with overhead count of 47 pregnant mothers,44 LB, 42 SI, 41 children age 12-23 months, 131 children age 24-59 months, 43 nine years old girls, 789 individuals age 12 years and above). In Gott D there is one primary school and one Christian church. In these Gott there are two HEW and both of them are not trained on IIP and with there over head count they found 32 children vaccinated penta1, 31 children vaccinated penta3, 30 children vaccinated MCV1, 26 children vaccinated MCV2, 22 nine years old girls vaccinated HPV1 vaccine and 31 pregnant mothers vaccinated Td2+. There is one functional outreach site in these Gott which is 11 km to Eastern part from HP.

1. Draw the map of the X-health post catchments area and put the corresponding population size to each Gott in the map and mark the immunization sites (use thealphabets M, F and O for mobile, fixed and outreach sites respectively)

2. Fill out kebele inventory form K1 annexed in participant manual (given to you for these exercise) and present to large group.

3. Prepare a session plan by using sub kebele session plan form K2 for the X-Health Post (assume 40 injections per session for static session and 30 injection per session for outreach session).

4. Prepare sub kebele data analysis and prioritize Gotts based on identified problems by using kebele data analysis form K3 for the X-Health Post annexed in participant manual (given to you for these exercise) and present to large group.

5. Prepare health facility session monitoring form K4 annexed in participant manual (given to you for these exercise) assume the first session on July 22 of new EPY for all Gotts.

Case scenario 2 – How to prepare detail Micro Plan for PHCU by using MP template

Assume previous case scenario 1 X-Health Post as Y-PHCU and Take Gott A-D as a health post under Y-PHCU/Health Center:

1. Draw the map of the Y-PHCU catchments area and put the corresponding population size to each Health Post in the map and mark the immunization sites(use the alphabets M, F and O for mobile,fixed and outreach sites respectively)
2. Fill out Cluster HC inventory Form Cluster 1 annexed in participant manual (given to you for these exercise) and present to large group.
3. Prepare Cluster HC data analysis and prioritize Health Posts based on identified problems by using Cluster HC data analysis Form cluster 3 for the Y-PHCU annexed in participant manual (given to you for these exercise) and present to large group.
4. Prepare Cluster PHCU/HC plan by using Form Cluster 4 for the Y-PHCU and present to large group.
5. Prepare Y-PHCU budget and other resource plan by using Form Cluster 5 given to you for this exercise and present to large group

4.4. Chapter Summary

- Immunization Program Coordination Platform is crucial for immunization program.
- Ensure the engagement of all stakeholders to strengthen the planning and coordination mechanism at PHCU level.
- Micro plan defines the way to reach target population, and integrated plan helps to maximize resources.
- Micro plan development should be bottom-up approach.
- Micro plan preparation should be participatory- involve all stakeholders and community.
- The interlinked components of RED are, planning, engaging communities, supportive supervision, monitoring and reaching every eligible population.
- The type of session needed during micro plan development – fixed (at the health HC and HP) or outreach (at site in the village).

Chapter 5:

Injection safety and waste management

Time Allocated: 110 Minutes

Chapter description: This chapter introduces participants with Safe injection practices and measures to ensure injection safety. It also focuses on waste management and prevention of needle stick injury.

Primary Objective: At the end of this chapter participants will be able to:

- Demonstrate injection safety and waste disposal practices.

Enabling Objectives: At the end of this chapter participants will be able to:

- Demonstrate safe injection practices.
- Apply proper waste management practices.

Chapter outline:

5.1.Safe injections practice

5.2.Waste management practices

5.3.Chapter Summary

5.1. Safe injection practice

Definition: Safe injection practices are part of standard precautions and are aimed at maintaining basic levels of client safety and provider protection. It includes the safe handling, regular monitoring of injection materials availability, and proper disposal of used injection martials. Proper vaccine storage and handling as well as clinical assessment and administration at immunization sessions are essential component of safe injection practice.

General steps for safe injection practice

1. Remove the syringe from its plastic wrapping or detach the plastic caps.
2. Take off the needle cap without touching the needle.
3. Insert the needle in the vaccine vial – its tip should be in the lowest part or bottom of the vial.
4. Pull the plunger back to fill the syringe just past the 0.5 ml or 0.05 ml and 0.3 ml(Pfizer) mark.
5. Remove the needle from the vial. To remove air bubbles, hold the syringe upright and tap the barrel. Then carefully push the plunger to the volume mark. making sure to empty the full contents of the vial.
6. Proceed with the injection at the appropriate
7. Push the plunger forward and inject the vaccine. At the beginning or just at the end of the injection, the plunger will automatically lock so the syringe cannot be reused.
8. Do not recap the needle after use.
9. Dispose of the needle and syringe in a safety box,
10. Syringes and needles must never be reused.

Table 5.1 Incorrect vaccination practices and possible adverse events following immunization.

Incorrect practice	Possible adverse event following vaccination
Non sterile injection due to -Reuse of disposable syringe or needles -Contaminated vaccine or diluent	Infections such as local abscess at injection site, sepsis, toxic shock syndrome, or death, transmission of blood borne infections such as hepatitis and HIV
Reconstitution error due to - Inadequate mixing of vaccine -Reconstitution with incorrect diluent	Local abscess at injection site Vaccine Ineffective

-Drug substituted for vaccine or diluent -Inappropriate reuse of reconstituted vaccine in subsequent session	Negative effect of drug (for example Insulin, Oxytocin, muscle relaxant) Death
Injection at incorrect site such as -BCG given subcutaneously -Penta/Td too superficial -Injection into buttock	Local reaction or abscess Sciatic nerve damage
Inappropriate vaccine handling such as -VVM color change -Clumping of adsorbed vaccine	Local reaction Vaccine ineffective
Contraindication ignored during vaccine administration	severe reaction

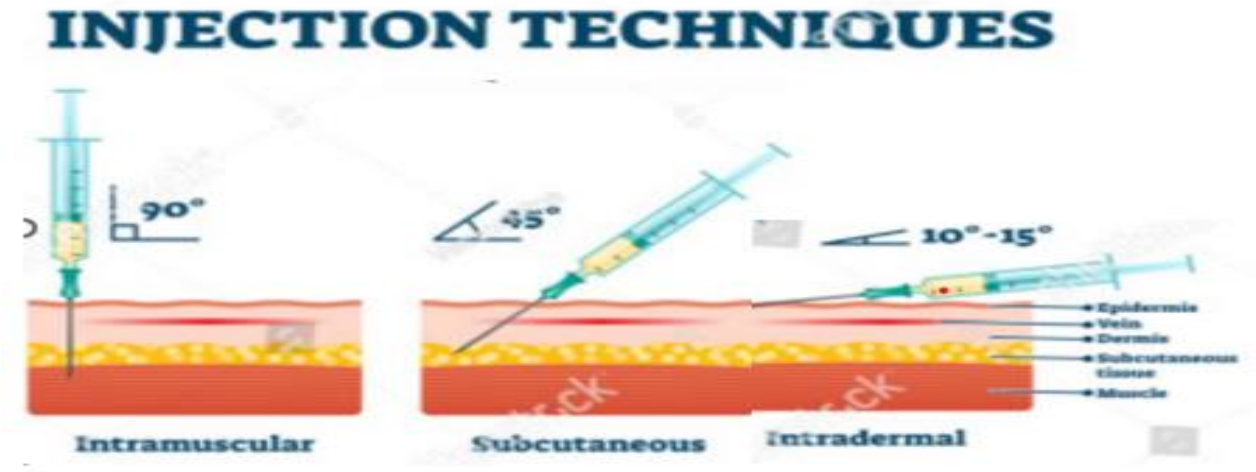


Fig 5.1 Injection technique

5.1.1. Measures to ensure injection safety.

- Prepare injections in a clean, designated area that is free from blood and body fluid contamination.
- Prepare each dose immediately before its administration – do not prepare several syringes in advance.
- Never leave the needle in the top of the vaccine vial.
- Follow product-specific recommendations for storage, handling, and use of vaccines.
- Follow safe procedures to reconstitute vaccines.
  - The correct diluent must be used for reconstituting freeze-dried vaccines.
    - Use only the diluent supplied by the same manufacturer for each vaccine – check the labels.

- Diluents must be cooled at +2c to+8c for 24 hrs. before reconstitution.

- Dispose used AD needles and syringes in a safety box.
- Follow national multi-dose vial policy for opened vials.
- Use a new AD syringe for every child.
  - Inspect the packaging very carefully.
  - Discard the needle and syringe if the package has been punctured, torn or damaged in any way.
  - Do not touch any part of the needle.
- Discard a needle that has touched any non-sterile surface.
- Position the child carefully to minimize risk of movement and injury.

5.1.2. Preventing needle-stick injuries.

Needles can be dangerous. They can injure health workers and, if contaminated with hepatitis B, hepatitis C, HIV or other infections, they can transmit diseases.

Needle-stick injuries can happen at any time, particularly during and immediately after an injection.

Practices to reduce needle stick injury risks:

- Place a safety box close to theperson giving vaccinations so used needles and syringes can be disposed immediately, easily and without walking to find a sharps container.
- Avoid recapping the needle
- Do not remove the used needle from the syringe with your hands.
- Do not carry used syringes and needles around the work site for any reason.
- When ready to administer, draw the vaccine into the syringe, usingcorrect positioning the child, give the injection and dispose of the syringe in the safety box without putting it down between steps.
- Close the safety box securely when it is 3/4 full.
- Do not manually sort needles and syringes.

Session setup to minimize needle stick injury:

- The vaccinator should be between the child and all needles and sharp objects.
- The vaccinator should be able to see the opening of the safety box when discarding needles.
- The safety box should be placed in a position that the vaccinator is able to reach easily and without much change in position.
- The vaccinator should dispose of used needles and syringes directly in the safety box without putting them down on other surfaces.
- The vaccinator should have only one child – with caregiver(s) – at a time in her/his workspace.
- Each vaccinator should have a separate safety box, especially at busy sites
- Putting children in the right Position for safe injections

Activity 1. Group Discussion

1.1. Safe Injection -

a. Define injection safety.

b. List and discuss measures for ensuring safe injection practice.

c. List steps for avoiding stick needle injury.

1.2. Demonstration of safe injection practice-

Teams are expected to demonstrate preparation of injection area and vaccines for injection, positioning of the infant, appropriate route of administration and waste disposal practices.

5.2. Waste management Practices

5.2.1. Introduction of waste management practices

Safe health-care waste management is fundamental for the provision of quality, people-centered care, protecting patient, staff and safeguarding the environment. As part of broader water, sanitation and hygiene (WASH) and infection prevention and control (IPC) efforts, safe management of health-care waste reduces health-care-related infections, increases trust and uptake of services, increases efficiency and decreases cost of service delivery.

5.2.2. Health-care waste categories and risks

About 85% of the waste produced by health-care providers is comparable to domestic waste and usually called **"non- hazardous"** or **"general health-care waste".**

It comes mostly from the administrative, kitchen and housekeeping functions of health- care facilities and may also include packaging waste and waste generated during construction and maintenance of health-care buildings. The remaining 15% of health-care waste is regarded as **"hazardous"** and can pose a number of health and environment risks.

Categories of Health-Care Waste

Non-Infectious Wastes: Noninfectious wastes include: empty vials(except nOPV vials), vaccine vials discarded due to VVM change(except nOPV vials). syringe plastic cover,needle cap, droppers etc. these wastes should be collected at the end of the session and disposed appropriately.

Infectious Wastes: Infectious wastes can be sub classified as sharp and non-sharp wastes. Sharp wastes can cause serious health

problems to human and the environment. Unsafe disposal can spread some of thesame diseases immunization programmers are working to prevent.

a. **Dangers to human health:** Leaving used syringes and needles in the open or on the ground puts the community at risk. Most frequently, children are the unfortunate victims of needle-stick injuries from haphazard disposal of needles.

b. **Dangers to the environment:** Inappropriate treatment of wasteleads to environmental pollution. Open burning and low-temperature incinerators release toxins into the air; they should not be used for disposing infectious wastes. Throwing used needles and syringes into water bodies can contaminate the natural environment and injure wildlife. Waste disposal materials such as safety box, waste bin, glove, and incinerator must be available.

5.2.3. Segregation and collection of waste

The correct segregation of health-care waste is the responsibility of the healthcare provider and/or patient and caregiver who produces each waste item. Health-care facility managers are responsible for making sure that there is a suitable segregation, transport and storage system in place and that all staff adhere to the correct procedures. Education and training must be provided to all staff who are responsible for both segregation and collection of waste. The appropriate waste receptacle (bags, bins, sharps boxes) should be available in each medical and other waste-producing area in a health-care facility.

Three-bin segregation system

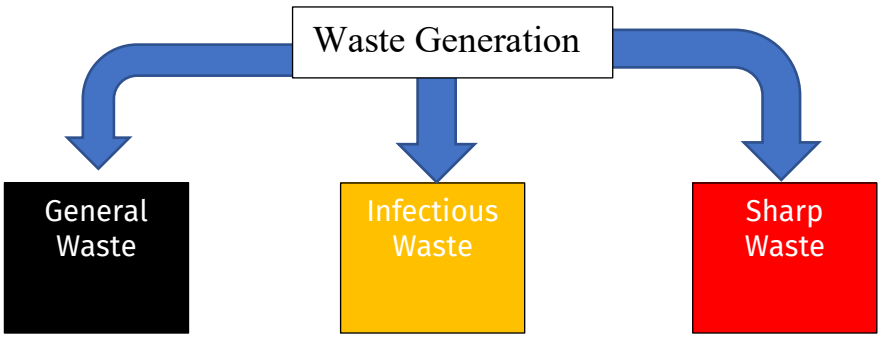


Fig 5.2 Three-bin segregation system.

Basic three-bin system: The simplest and safest waste segregation system is to separate all hazardous waste from non-hazardous general waste (which is generally of a larger quantity) at the point of generation.

5.2.4. Waste Transport within health-care facilities

On-site transportation should take place whenever possible during less busy times (i e in the evenings or very early morning). Set routes should be used to prevent exposure to staff and patients and to minimize the passage of loaded carts through patient care and other clean areas. Depending on the design of the health-care facility, theinternal transportation of waste should use separate floors, stairways or elevators from patients as far as possible. Regular transportroutes and collection times should be fixed and reliable. Transport staff should wear adequate personal protective equipment (PPE) including gloves, closed shoes, overalls and masks. Education and training must be provided to all waste transport workers and include how to safely handle waste containers that leak or are broken.

Note: Hazardous and non-hazardous waste should always be transported separately!

5.2.5. Waste storage requirements

A storage location for health-care waste should be designated inside the healthcare facility. Space for storing wastes should be incorporated into a building design when new construction is undertaken. These storage areas should be sized according to the quantities of waste generated and the frequency of collection. These areas must be totally enclosed and separate from supply rooms or food preparation areas. Only authorized staff should have access to the waste storage areas.

5.2.6. Waste Disposal options

Incineration is a high-temperature (850°C to 1100°C) dry oxidation process that reduces organic and combustible waste to inorganic, incombustible matter and results in a very significant reduction of waste volume and weight.

Incineration is conducted in an “incinerator,” which is a type of furnace designed for burning hazardous materials in a combustion chamber.

Used or filled safety boxes must be disposed by incineration. Incineration can destroy needles and syringes. Its compound should be secure and fenced. Staff members conducting the incineration should wear safety glasses, heavy gloves, and any other personal protective equipment.

If there is no functional incinerator in the health facility, filled safety boxes should be transported to facilities with functional incinerator for disposal.

Fig 5.3. Incinerator with fence and ash pit.

Activity 2. Group Discussion

Waste management;

a. Define waste management.

b. List the waste management materials.

c. Good waste management practice

5.3. Chapter summary

- Safe injection practices aimed to ensure basic levels of client safety and provider protection through safe handling and proper disposal of used injection materials.
- Wrong vaccination practice leads to adverse events following immunization and infections
- Health workers may contract infections such as hepatitis B, hepatitis C, HIV or other infections, from needle stick injury.
- Wastes can be classified as infectious and noon infectious wastes.
- Infectious wastes can be sub classified as sharp and non-sharp infectious wastes.
- Good waste management practice includes appropriate waste handling and disposal starting from the point of waste production to the disposal site.
- Waste disposal materials include safety boxes, incinerator etc. Needles must be safely disposed into the safety box. Immediately after ¾ of the box is filled, it should be disposed into the incinerator and burned.
- At all steps of waste management, staff members conducting the waste disposal should use appropriate personal protective equipment.

Chapter 6:

Immunization service delivery

Time Allocated: 430 Minutes

Chapter description: This chapter touches on topics that are not covered in more detail in other chapters and references are specified in the text. Mainly focuses on immunization service delivery to deliver high quality immunization services and systems.

Primary Objective: At the end of this chapter participants will be able to:

- Describe immunization service delivery strategies and session.

Enabling Objectives: At the end of this chapter participants will be able to:

- Identify strategies to improve quality of immunization service delivery
- Demonstrate for immunization session
- Demonstrate accurate information for immunization key messages
- Demonstrate assessment of infants/targets for vaccination
- Administer vaccines
- Demonstrate immunization data recording
- Demonstrate proper closing of the vaccination session

Chapter outline:

6.1. Immunization service delivery strategies

Time allocated: 20 Minutes

Activity 1: Read in group, discuss and present immunization service delivery strategies and the services those recommended to integrate during vaccination sessions.
Instruction: Divide in three groups
Group 1: Read and discus in group on immunization service de livery strategies which are commonly used (page 147)
Group 2: Read and discuss in group on Special immunization strategies / approaches (page 148)
Group 3: Read and discuss in group on Immunization integration with other health services and Vice Versa (page 149)

Immunization is a key component of primary health care and an indisputable human right.

Immunization services should be regularly available on daily basis in all health facilities including in, government, NGOs and private health facilities with functional vaccine refrigerator and trained health care workers (vaccinators). Greater understanding of strategies to increase and sustain vaccination coverage is necessary to create lasting, effective immunization delivery systems.

The following immunization service delivery strategies are commonly used;

1. **Fixed (static) strategy** is the regular daily delivery of vaccinations in a health facility on the daily basis of the week that are consistent and regularly communicated to the community settling within 5 km radius.
2. **Outreach strategy** is the delivery of services to people who cannot go to health facilities or who can do so only with the difficulty. This usually covers settlements from 5 km to 10 km from the health facility.
3. **Mobile strategy** takes more than one day to several days by health workers to deliver services to people living in remote areas which are not covered by health facilities. Mobile teams may spend several days travelling to reach the community and can cover several settlements in one trip. Mobile services are more appropriate for pastoralist and hard to reach areas.

In addition, using various immunization service delivery approaches such as catchup in the form of PIRI, Integrated SIA, African Vaccination week, other health service

integration and etc. are believed effective service delivery strategies/approaches to improve immunization services to attain herd immunity.

Special immunization strategies / approaches;

Catch up vaccination: it is the action of vaccinating an individual who, for whatever reason, is missing or has not received doses of vaccines for which they are eligible, per the national immunization schedule.

Catch-up vaccination can be conducted through regular routine immunization service delivery (fixed, outreach, mobile, school-based), periodic intensification of routine immunization (PIRI) activities, or through innovative local strategies that ensure individuals have the opportunity to receive routine immunizations for which they are overdue and eligible.

Routine immunization services should be delivered to eligible throughout the year, however, ensuring that all missed children get catch-up vaccination will require designing and delivering a mix of effective service delivery strategies. These strategies include enabling catch-up through routine immunization, integrating with other health services, school vaccination checks, andneed based efforts such as PIRI, SIAs, and integrated regular outreach Services).

Periodic intensification of routine immunization (PIRI) is a spectrum of time-limited, intermittent activities used to deliver routine vaccinations and capacity building including catch-up doses to zero dose and under-immunized populations and raise awareness of the benefits of vaccination. Briefly PIRI is an intermittent intervention within a time limit. PIRI is used either in focused areas with poor access to immunization services to target certain population groups (e.g., mobile communities). The doses in a PIRI activity should be provided after reviewing an individual's vaccination status and are considered routine vaccinations and recorded as such in the immunization register and on the home-based record.

African vaccination week is celebrated every year in Ethiopia to advocate strengthening routine immunization uptake especially in low performing areas by creating demandat a community level, tracing defaulters, identifying zero doses and vaccinating them by arranging additional vaccination sessions. It could be catch-up for a week period by mobilizing resources at from partners and government. In areas where there is any other Health events, the health facility could plan and implement catch-up vaccination integrated with other health services and reaches zero dose children and under immunized children.

Integrated Supplemental Immunization Activities (SIAs); Preventive and follow up campaigns for Measles and Polio are happening periodically in Ethiopia as a means to mitigate outbreaks and susceptibility to VPDs by closing immunity gaps. Routine immunization should be integrated during supplemental immunization activities are a good opportunity to identify zero-dose or under immunized children who have missed

doses and vaccinate during the SIAs. SIAs vaccination team should communicate with caregivers to vaccinate or refer them to routine vaccination delivery points (static, outreach and mobile).

Immunization integration with other health services and Vice Versa;

Immunization is one component of comprehensive plans for disease control and services should be managed as part of an integrated whole rather than working in isolation from other health activities. Every health contact should be used as an opportunity to review vaccination status and to administer doses for which is eligibleor to refer to an immunization provider for vaccination, well-child visits, under five clinics, nutrition screening, before being discharged from hospital. Integrating vaccination during family health visits during outreach and mobile clinic visits.

Immunization follows a schedule with multiple contact points, which overlap with other interventions for the same target populations; e.g. Vitamin A supplementation, deworming. Relatively high immunization coverage rates - considered a "strong platform" to reach people (particularly those < 2 years). Immunization can also provide a contact point for the caregiver to receive services or referrals e.g. family planning or HIV testing. Integration of immunizationinto other services can facilitate delivery throughout the life course e.g. antenatal care for maternal immunization, school health for adolescents. Integration of immunization with other services throughout the life course supports comprehensive approaches for disease control e.g. HPV vaccination, screening and treatment, malaria control programs and others. It reflects a growing need for multi-sectoral approaches, e.g. cholera vaccination and WASHES interventions, school-based delivery of immunization.

Immunization integration with other health services and Vice Versa as illustrative examples:

a. Early Childhood Development/ECD

Immunization service delivery points should encourage children to play and communicate. The immunization service delivery points are expected to be clean, ventilated, convenient, child friendly and encourage early childhood development.

ECD counseling card is developed by MOH which can be used for counseling mothers/ care takers integrated with other programs including immunization. Immunization service delivery point can also asses the developmental assessment of the child before provision of any RI antigen. Service providers in the well-baby clinic should link the babies to immunization service after completion of the ECD service to minimize missed opportunities.

b. Vitamin A supplementation;

The infants/child should be linked to the services during the vaccination for the vitamin A supplementation according to the national schedule and vice versa.

6.2. Preparing for immunization session

Activity 6.1. Group Discussion:

Total Time allocated: 40 Minutes

Instruction: Read and discuss in four groups and present your discussion for the larger group using a flip chart

- Group 1: Planning for immunization session
- Group 2 preparing for immunization session
- Group 3 and 4: Preparing for session site arrangements (Static and outreach)

6.2.1. Plan the immunization session

Each health facility should have a session plan showing where and when immunizations will be given. This session plan shouldbe developed with and communicated to the community as part of micro-planning. Immunization sessions should be held regularly at fixed, outreach or mobile sites.

For outreach, health facility staff should get to know people in the community and learn who can help with arranging the session, including choosing a suitable time (for example, religious days, market days etc...) and tracking children who are due and overdue for immunization. A place where it is known, accessible, and agreed by the community should be selected with the community to plan, prepare and conduct immunization session

6.2.2. Preparing for immunization session

Preparation for sessions should be partof micro planning. This begins well before the day of the session and should continue throughout the session to include feedback for improving the planning of then exit sessions.

The order of the steps may vary by site; for example, for outreach sessions, vaccines have to be packed for transport at the health facility before the work place is preparedat the remote site. Community focal person should set up as much of the outreach site as possible before the vaccinators arrive.

6.2.3. Prepare the session site

The final arrangement of site for an immunization session will depend on whether it is being held in a fixed health facility or

outreach site, and whether other services are being provided (for example, sick child clinic, nutrition screening, antenatal care and/ or health education).

Figure 6.1 below shows an example of the basic requirements for a fixed or outreach site. The ideal site should be:

- Easily accessible and identified with as sign stating “Immunization Site”;
- Located in the same place each time;
- In a clean area, out of the sun, rain and dust;
- Near a sheltered/shaded area where those needing vaccination can wait;
- Large enough to provide space to have separate stations for registration and assessment, immunization and record keeping and screening/education on other health issues; and
- Quiet enough for health workers to be able to explain what they are doing and to give advice.

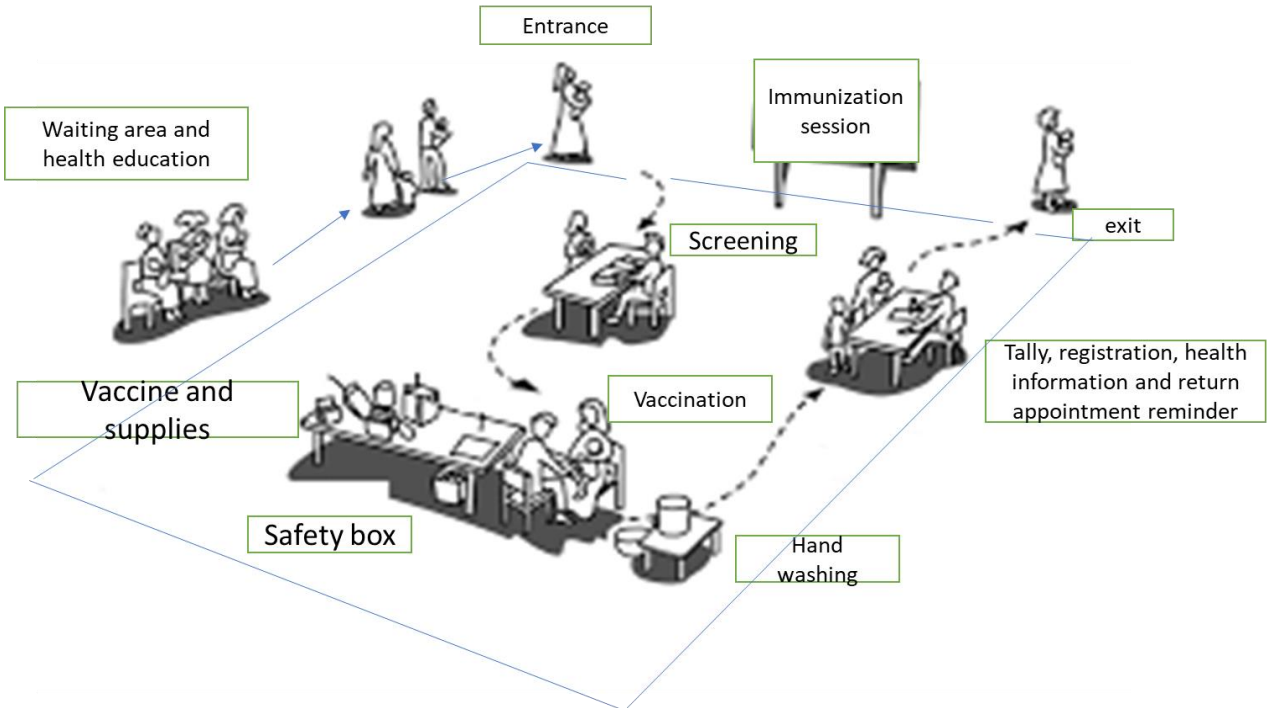


Figure 6.1: Immunization session: example of a workplace arrangement

6.2.4. Prepare vaccines and injection supplies basic list including prepare supplementary materials and equipment

A list of needed materials should be reviewed before all sessions!

Activity 6.2: Group Discussion

- Time allocated: 40 minutes
- Activity: Discuss in four groups, list and present on flip chart
- Case: Imagine if you are assigned as EPI focal for the X health center and you are supposed to prepare immunization session,

Instruction: list out the basic lists for the vaccines and injection supplies including supplementary materials and equipment

National immunization schedule including catch -up schedule: A basic list of supplementary items includes

- Adverse Events Following Immunization (AEFI) kit; example Adrenalin
- water container, basin, soap, towel for hand washing and drying;
- metal file to open ampoules, if needed;
- AD syringes and
- Reconstitution syringes
- immunization register;
- Immunization diploma;
- new immunization/child health cards
- scissor
- safety box
- vaccine carrier with foam pad
- immunization tally sheets;
- cotton wool/ cotton swab
- container for waste that does not go into a safety box;
- paper, pencils and pens;
- table(s);
- chair(s);

For sessions at the health facility, required vaccines should be taken from the fridge beforehand to reduce the number of times the fridge is opened

For outreach, enough vaccine has to be taken to meet demand since the refrigerator will, of course, not be nearby during the session. Extra vaccine should be added to meet unexpectedly high demand at the session. For e.g, an extra 10% can be added to the estimated need. Practically, the quantity of each type of vaccine should be calculated from a list of children who are due and overdue. When such lists are not available, the quantity can be estimated based on previous session demand, especially if this is stable. Verify that vaccines are safe to use. Before opening the refrigerator, estimate the number of each vaccine needed for the session as noted above. When opening the fridge, first check the temperature and the freeze indicator. If there has been freeze exposure, as fridge tags, check the alarmand duration do a shake test on the freeze-sensitive vaccines.

Select vaccines from the refrigerator in the order given below.

- Opened vials kept in the so-called “use first box” in the fridge
- Unopened vaccine vials that have been returned from outreach sessions or have been outside of the refrigerator and returned (usually also in the “use first box”).
- Vaccine vials with VVMs that have started to change to stage 2

In general, vaccines should be organized in the refrigerator by expiry date, with those with the closest expiry date kept in front and used first.

When selecting vials from the refrigerator, check each vaccine and diluents vial/ ampoule and remember to:

- Use only vials/ampoules in good condition; discard vials/ampoules that are damaged and/or have no label
- Discard any vials/ampoules that have passed their expiry date;
- Discard any vials/ampoules with VVMs past the discard point(stage III & IV)
- Do not use any vials/ampoules with fluid that has changed color or contains particles: seek the advice of your supervisor if any are found.
- Include an adequate number of auto-disable syringes and safety boxes
- Ensure correct use of water packs and vaccine carriers. Cool water packs are recommended to avoid freezing vaccines.
- Keep open vials inserted in the foam pad of the vaccine carrier during immunization sessions.
- Do not keep opened vials on ice.
- The two holes (made for holding) on the of cool water pack.

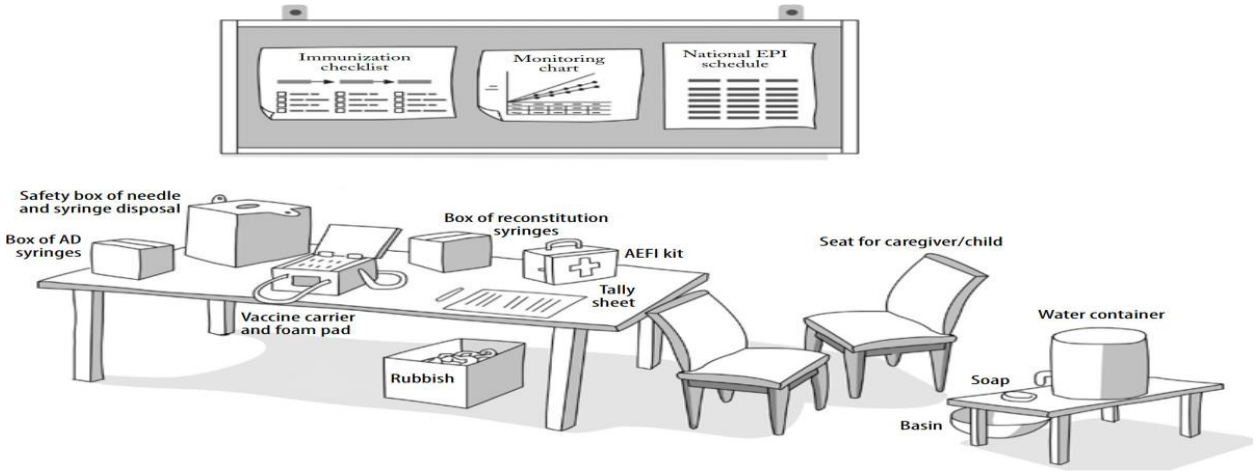


Figure 6.2: Immunization station: example of an arrangement

6.3. Communicating accurate information

Activity 6.3: Group Discussion

Allocated Time: 90 minutes

Activity: Discuss and present in groups for essential elements of communicating accurate information, contraindications for the vaccinations.

Instruction: Please be in four groups, then discus and present on the flip chart
Group one : communicating care take /key message
Group two : Assessing the eligibility including contraindication
Group three : present on flip chart national RI schedule (RI, Catch up & COVID 19)
Group four: Administering vaccine including demonstration (IM,SC & intradermal)

Communication during each encounter/contact with the care giver at the start Greet the caregiver in a friendly manner. Thank her or him for coming for vaccination and for her/his patience if s/he had to wait. Ask the caregiver if s/he has any questions or concerns and answer them politely.

The essential elements of every encounter are:

- Advice what is to be given: Advice on the types and benefits the of the vaccines to be given
- Alert for possible adverse (side) effects and how to respond (the response needed)
- Reassure the care giver that reactions, such as fever, pain or swelling at the injection site, and changes, such as the child being irritable or off color, are common and indicate a good response to the vaccine. Instruct the care giver that paracetamol may be given and specify the appropriate dose and timing for the target infant explain that placing a clean, cold, damp cloth can help to ease pain if there is a local injection site reaction.
- Tell the caregiver /target to take/go the health facility if the condition worsens or the reaction continues for more than a day or two, since the target may develop an illness, unrelated to immunization, that needs treatment.
- Arrange for when to return (next appointment)

Communicating other measures to help keep target safe and healthy

Additional specific information to convey depends on the major concerns for children in a community. In general, hand washing, exclusive breastfeeding for the first six months of life and appropriate complementary feeding after the first six months should be promoted.

6.4. Assessing infants/targets for vaccination

Before administering a vaccine to an infant/target, it is important to check which vaccines are due.

6.4.1. Assessing eligible for vaccination & assess possible contraindications

Before administering a vaccine to an eligible it is important to check which vaccines are due.

The steps below should be followed at any health care visit as well as at any immunization session.

1. Verify the eligible age on the immunization card and ensure the consistency from the parent/caregiver, if the eligible does not have an immunization card, ask the caregiver for the eligible age. If the caregiver does not know the eligible age, estimate it by asking if the eligible was born during/around on a table community event, for example duringa certain season or celebration. A local events calendar can help with this.
2. Verify which vaccines the eligible has formerly received by reviewing the immunization card: If the eligible does not have an immunization card but has come to the health facility before, check the register and fill out an award. If the eligible is new to the health facility, ask the caregiver/eligible questions to prompt recall of each vaccine the eligible should have received and fill out a new card.

3. Verify all vaccines the eligible needs at this session to allow efficient preparation follow the national schedule for the national recommendations one vaccine remembering these general points:

- If the child is eligible for more than one type of vaccine, reassure the /mother/ caregivers that it is safe to give the different vaccines at different injection sites during the same session.
- Never give more than one dose of the same vaccine at one time. E.g. Penta one and Penta two should not be given the same day.
- If the vaccine is overdue, do not restart the schedule. Simply provide the next needed dose in the series including Td
- If there is a delay in starting the immunization schedule, give the vaccine(s) and an appointment for the next dose at the interval recommended in the national schedule.
- For the first dose of a vaccine, assess the general status of the child to rule out signs of serious illness. For a subsequent dose in a vaccine series, ask the caregiver whether any adverse events, including anaphylaxis, occurred following the previous dose(s).
- All eligible should be immunized except in these situations and do not give a vaccine if the eligible has had anaphylaxis (a serious allergic reaction) or other severe reaction to a previous dose of the vaccine.
- Rota vaccination may be postponed in case of ongoing acute gastroenteritis or fever with moderate to severe illness.
- Recommendations for immunization of HIV-infected children, do not give BCG and yellow fever vaccines to a child with HIV infection or symptomatic HIV infection/AIDS
- Do not give a vaccine if the caregiver objects to immunization for a sick eligible after an explanation that mild illness is not a contraindication. Ask the caregiver to come back when the eligibility is well.

The following are not contraindications and eligible with these conditions or circumstances should be immunized:

- Allergies or asthma, with the exception of a known allergy to a specific component of the vaccine as mentioned;
- Ongoing treatment with antibiotics;
- Family history of adverse events following immunization;
- Prematurity or low birth weight;
- History of jaundice at birth;
- Recent or upcoming surgery;
- Chronic non-communicable diseases of the heart, lung, kidney or liver;
- Stable neurological conditions, such as cerebral palsy or Downs syndrome
- Family history of convulsions, seizures

<u>Vaccinating sick eligible</u>

Many health workers do not like vaccinating an eligible who is ill. He/she can have many illnesses, but delaying immunization puts them at risk of vaccine-preventable diseases when they could receive the protection safely.

- For eligible with a minor illness and/or fever below 38.5°C (axillary), vaccinateas usual. This includes respiratory tract infections, diarrhea and similar mild infections without significant fever.
- For malnourished eligible vaccinate as usual. Malnourished eligible do develop immunity after vaccination, and when they do not receive vaccines, they are more likely than well-nourished children to die from vaccine-preventable diseases.

6.5. Administering the vaccines

Immunization is a routine procedure for health workers, but can be frightening for children and adults attending the session. There are many things a health worker can do to make an immunization experience a safe and positive one. This section focuses on techniques for injection preparation, the comfortable and safe positioning of children, and the safe disposal of materials. The order in which vaccines should be given will depend on be according to (see Table 6.1 the national immunization including catch-up schedule below):

Table 6. 1 National immunization schedule

Vaccine	When to give	Dose	Route	Site
BCG	At birth or as early as possible till one year of age	0.05ml	Intra-dermal	Right Upper Arm
Measles	9 months and 15 months	0.5 ml	Sub-continuous	Left Upper Arm
Pentavalent	At 6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra-muscular	Antero-lateral side of left mid-thigh
OPV	At birth, 6 weeks, 10 weeks & 14 weeks	2 drops	Mouth	
IPV	14 weeks and 9 months	0.5 ml	Intra-muscular	Right (outer) mid-thigh
PCV	At 6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra- muscular	Antero-lateral side of right mid-thigh
HPV	9-14years old girls, 1stcontact	0.5ml	Intra- muscular	Left deltoid

Rotasil	At 6 weeks, 10 weeks and 14 weeks	2 ml	Mouth	Oral (inside check)
Td	At first contact, 4 weeks after Td1, 6 months after Td2, one year after Td3 and one year after TT4	0.5 ml	Intra- muscular	Left Upper Arm

Remember!

A child is considered as protected at birth against NNT if infant born to a mother who received:

- A child is considered as protected at birth against NNT if:
- A mother vaccinated two doses of TT/Td during the last pregnancy given that the second dose is provided two weeks before the birth; or
- A mother vaccinated the 2nd TT/Td dose within the last 3 years; or
- A mother vaccinated the 3rd TT/Td dose within the last 5 years; or
- A mother vaccinated the 4th TT/Td dose within the last 10 years; or
- A mother vaccinated the 5th TT/Td doses

Table 6.2 Recommended National catch-up vaccination schedule for different antigens to be delivered through routine immunization service delivery:

Vaccine Antigens	Total Doses	Minimum age for dose 1	Minimum interval between doses	
BCG	1	At Birth	N/A	Up-to one year of age
OPV	4	At Birth	OPV0-OPV1: 6 weeks All subsequent doses: 4 weeks	Up to 59 months

Rotasil	3	6 weeks	4 weeks	Up to 24 months
PCV	3	6 weeks	4 weeks	Up to 24 months
Penta	3	6 weeks	4 weeks	Up to 24 months
IPV	2	14 weeks	2nd dose at 9 months; Minimum 4 weeks between dose 1 and 2 if dose 1 is given late	Up to 24 months
Measles	2	9 month	2nd dose at 15 months; Minimum 4 weeks between dose 1 and 2 if dose 1 is given late	Up to 59 months

Table 6.3 National Covid-19 vaccination Schedule:

COVID-19 Vaccine Type	Target age group	Route	Dosage	No. of doses to be administered	Schedule	Handling procedures
AstraZeneca	18 years and above	IM	0.5ml	2 doses	1st dose at start	Freeze and light sensitive.
					2nd dose after 8-12 weeks	The vaccine has no VVM.
SinoPharm	18 years and above	IM	0.5ml	2 doses	1st dose at start date	Freeze and light sensitive.
					2nd dose 3 to 4 weeks after the 1st dose	Mostly the vaccine has no VVM. Some batches may have VVM
Janssen (J&J)	18 years and above	IM	0.5ml	Single	Single	Light sensitive.

						Never refreeze thawed vials.
						The vaccine has no VVM.
Sinovac	18 years and above	IM	0.5ml	2 doses	1st dose at start date	Freeze and light sensitive.
					2nd dose 2 to 4 weeks after the 1st dose	The vaccine has no VVM.
Pfizer	12 years and above	IM	0.3ml	1 dose	Single Dose	The vaccine has no VVM. Transport (2-8C) -Up to 12 hours (Purple Cap) and For Grey Cap no limit within 10-week period

6.5.1. Preparing to vaccinate

Injectable vaccines can be ready to use or can require reconstitution (mixing) with diluent. Oral vaccines may require manipulation of the packaging to enable administration.

Please consider the following while preparing to vaccinate eligible;

- Firstly, use aseptic technique to prepare vaccines:
- Start with hand washing; use soap and water and dry your hands thoroughly;and Work on a clean table;
- Prepare vaccines individually for each child; do not prefill syringes.

Whenever possible, prepare the vaccineaway from the child and caregiver; be aware that injection materials may cause anxiety. Try to talk to the caregiver while preparing injections as showing interest in them is reassuring.

6.5.2. Reconstituting vaccines

Common vaccines that need to be mixed with diluent before use include BCG, yellow fever, measles, MR and MMR. The correct diluent must be used.

Points to remember about diluent

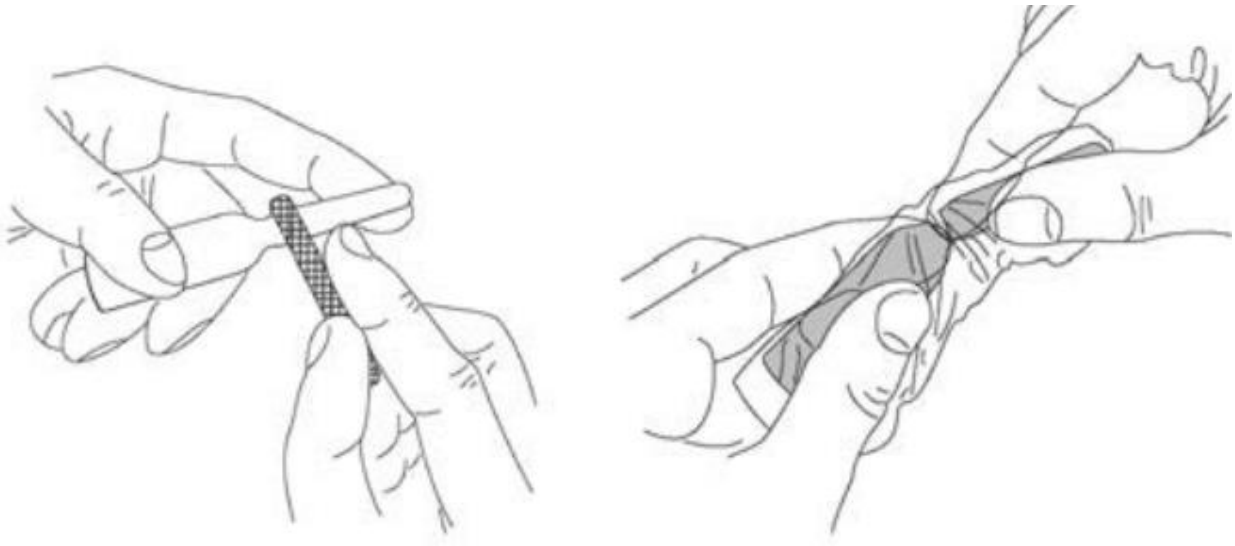
- Always use diluent from the same manufacturer as the vaccine.
- Diluent is not interchangeable, different vaccines have different diluents. Administering a vaccine with the wrong diluent has led to serious adverse events, including death.
- Diluent should be cooled but not frozen (kept at least for 24 hours before use) before being mixed with the vaccine.
- Vaccines should be reconstituted with diluent immediately before use.
- Unused reconstituted vaccine must be handled vaccine re-constituted should be discarded 6 hours after reconstitution vaccine or by the end of the session whichever comes first

Steps for Reconstitution

1. Double check the presence of and status of VVM before the vaccine can be used
2. Double check each vial/ampoule to make sure it is not past its expiry date and read the label carefully.
3. Open the vial. For a metal cap, use a file to lift the pre-cut center and bend it back; for a plastic cap, flip it off with your thumb or slowly twist it
4. Open the glass ampoule by holding the ampoule between the thumb and middle finger and supporting the top with the index finger; scratch the ampoule neck with a file, then gently break of the top, taking care to avoid injury from the sharp glass (see Figure 6.3 below). If you injure yourself, discard the ampoule since the contents may have been contaminated. Cover the wound before opening a new ampoule.
5. Draw the entire diluent out with a new disposable reconstitution needle and syringe.
6. Insert the needle of the reconstitution syringe into the vaccine vial and empty all the diluent – depress the plunger slowly to avoid frothing inside the vaccine vial.
7. Draw the fluid slowly and gently in and out of the vial several times to mix the diluent and vaccine or gently swirl the vial to mix the diluent and vaccine. Take care not to touch the rubber membrane or opening.
8. Remove the reconstitution needle and syringe and discard them in the safety box.
9. Put the reconstituted vaccine vial in the foam pad of your vaccine carrier.

6.5.3. Making vaccination easier and more

Figure 6.3: Scratching and breaking the neck of the vial



comfortable;

The way a health worker interacts with children and their caregivers has a huge psychological impact and they will respond positively to a friendly, welcoming attitude.

Recent recommendations for new vaccines and catch-up dose schedules often mean giving two (or more) injections to an eligible during the same session. Giving multiple injections at the same time is, of course, more difficult, but it is a skill that must be learned. With practice, giving injections quickly and safely with little distress to the eligible caregiver will become routine. Even the most experienced vaccinator should take time to review their injection technique and seek out refresher materials that might improve their skills. Vaccinators should also share their knowledge and learn from each other

6.5.4. Good general technique

Welcome the family/eligible: Put them at ease by smiling and maintaining a kind, reassuring manner. Ask if they have any questions or concerns and take time to answer them.

Complete the assessment. If more than one injection is needed, explain this and confirm that the caregiver agrees that it is better to vaccinate according to the schedule than to miss the opportunity.

Be prepared: After assessing the eligibility, prepare the necessary vaccines and place them close at hand in the order of administration.

6.5.5. Positioning the infant for vaccination

The choice of position will depend on the number of vaccines to be given, the age of the child and the materials available. The aimof positioning is to keep the child still and the caregiver and vaccinator comfortable. Check that the caregiver is willing to hold the child while the injection/s is/are given. If they are not willing, ask someone else to help.

Take time to comfortable position; explain how the eligible will be positioned. The vaccinator needs to move from one site to another, with minimum delay.

Follow a preset sequence for administering

the vaccines based on national immunization schedule.

Using the same site for each eligible can help during follow up (for example, PCV should always be given in the right anterior thigh and pentavalent always in the left anterior thigh). This can help, if the card is lost and recall questions need to be asked, or if any adverse events occur. The order in which vaccines are given to each eligible can help make administering them easier; in general, the suggestion is to give oral vaccines first, while the child is still calm, and then follow with the injectable ones. The choice of whether to give a new vaccine first or last usually depends on local factors. Table 46 shows a suggested order based on the current WHO schedule. Remember that spendinga little time, particularly on welcoming and positioning, will help the procedure go more smoothly and efficiently.

6.5.6. Administering the vaccine & Video Session

Immunization is a routine procedure for health

Learning Activity: Participants will read and discuss on the mode of vaccine administration watch video sessions on immunization site and route of administration.

Instruction: divide in three subs groups and attend the video session, then each sub-group will reflect on it.

- Video 1: Giving an Intramuscular Injection: 3:50 Minutes
- Video 2: Giving a Subcutaneous Injection: 3:14 Minutes
- Video 3: Giving an Intradermal Injection: 4:59 Minutes

workers, but can be frightening for children and adults attending the session. There are many things a health worker can do to make an immunization experience a safe and positive one.

This section focuses on techniques for injection preparation, comfortable and safe positioning of eligible, and safe disposal of materials.

Intramuscular injections for older children and adults;

Please take into your attention the following key activities during vaccine administering to an eligible;

- Wash skin that looks dirty with water. It is not necessary to swab clean skin. Hold syringe barrel between thumb, index and middle fingers.
- Do not touch the needle.
- The plunger can go back and forth only once, so health workers should not draw up air to inject into the vial as this will disable the syringe.
- Insert needle with a smooth action. It is not necessary to aspirate first.
- Use thumb to push the plunger without moving the syringe around. Pull needle out quickly and smoothly (less painful than doing it slowly)
- Ask the parent to press the site gently with a clean swab for a few seconds (to stop bleeding and relieve pain).
- Do not rub the area where the injection was given.

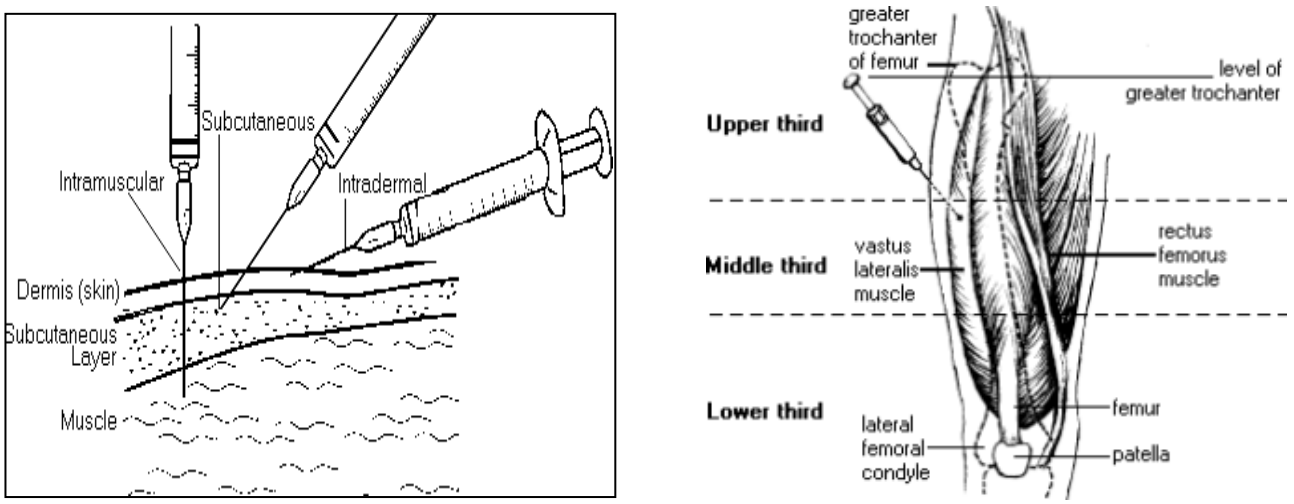


Figure 6.4: Different needle position.

For vaccinating older children, adolescents and adults, the deltoid muscle of the upper arm may be used. In eligible and young children under 15 months of age the deltoid muscle does not provide a safe intramuscular (IM) site due to the superficiality of the radial nerve and the deltoid muscle being insufficiently developed to absorb medication adequately. Td vaccine (for women): intramuscular (IM) injection in the left arm Ask the woman to sit down. Tell her to drop her shoulder and place her left hand behind her back or resting on the hip. This relaxes the muscle in the arm and makes the injection nearly painless. Put your finger and thumb on the OUTER part of the upper arm. Use your left hand to squeeze up the muscle of the arm quickly push the needle straight down through the skin between your fingers. Go deep into the muscle. Press the plunger with your thumb to inject the vaccine. Pull out the needle quickly and smoothly andask the woman to press the site gently with a cotton pad in case of bleeding.

Completing the eligible immunization card;

- Complete the immunization card by writing down the date for each vaccine administered or vitamin A supplement given and return the card to the parent.

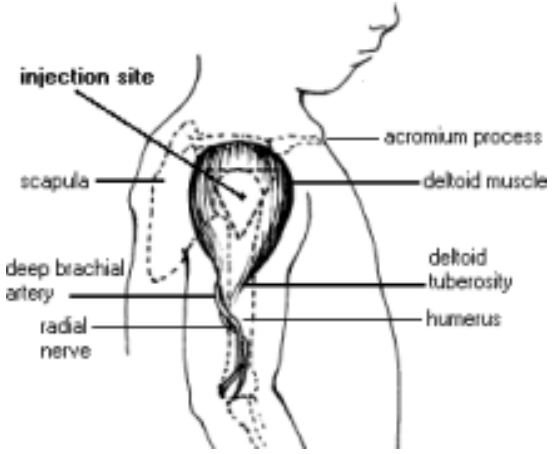
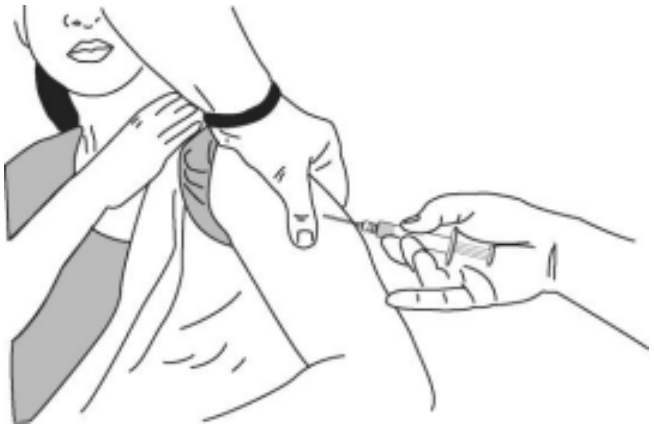


Figure 6.5 Diagram showing how to locate deltoid



- Immunization cards should be kept by theparents and not by the health staff. Markthe next immunization date on the

card after every dose, and tell the parent when and where to return for the next dose of vaccine.

- Tell the parent that the card must bekept in good condition. Explain that it is an important document because it keeps track of her eligible health and immunization status and will help health workers understand how to treat her eligible in the future.
- Tell the parent that the card should be brought along every time the eligible comes to the health center, whether or not the eligible is coming in for services or not.
- Ask to see immunization cards for both

mothers and eligible every time they come to your health center.

- Assess whether they are eligible for any vaccine or vitamin A supplementation.
- Do not miss an opportunity to immunize: health workers should be in the habit of asking for and reviewing immunization cards for each child at each visit regardless of the reason for coming.

Complete the eligible immunization and reminder cards

Follow these steps to complete eligible immunization and reminder cards:

- Write the date for each vaccine administered in its corresponding section on the card.
- Mark the next immunization due date on the card if another dose is needed, and ensure that the care giver understands when and where to return for the next dose(s) of vaccine(s).
- If new vaccines are not included on immunization registers and/or cards, ask your supervisor for instructions about how to record them on all reporting tools.
- Use the immunization card to update the reminder card/due list kept in the health facility as shown in Chapter 8(Monitoring, evaluation, learning and accountability).
- Return the immunization card to the caregiver.
- Explain to the care giver that the immunization card must be kept in good condition since it is an important document for future health care visits.
- Remind the caregiver that the card should be taken to all of the child's health care visits for review.

6.6. Recording data

Please be reminded that;

Accurate and reliable records are vital, not only for the individual child but also to track the immunization status of communities through monthly and annual reporting see chapter 8(Monitoring, evaluation, learning and accountability).

During a session, individual immunization cards and health center records– such as registers, reminder cards and tally sheets–have to be completed. Tallysheets need to be totaled after the session and these totals need to be added toprogram monitoring data.

6.7. Closing the session

Material collection: Materials must be stored safely or disposed of after immunization sessions. Equipment and sites must be cleaned and maintained for their next use. Discard or store opened vials depending on vaccine type according on national open multi-dose vials and acts accordingly;

After outreach sessions closing, the following steps are required for vaccines and supplies collection;

- Pack the vaccine carrier. Check the water packs to make sure that the cool water pack if cool pack thermometer in the vaccine carrier shows a temperature above+8° C, all vaccines inside the vaccine carrier should be discarded unless they have VVMs that show they are still safe to use, so check each vial.
- Place unopened vaccines and opened vials for which the multi-dose vial policy is applicable inside the carrier. Put empty vials and opened vials of reconstituted vaccines in a separate container for transport to a disposal site.

- Return vaccines to the refrigerator. Return vaccines with acceptable VVMs to the use first box in the refrigerator. If the cool water pack is above+8° C vaccine during the trip back to the health center, discard the vaccine vials unless the VVMs indicate that they are safe to use. Put the cool water packs from the carrier into the freezer and record the temperature of the refrigerator.
- Clean the vaccine carrier. Wipe the carrier with a damp cloth and check it for cracks. Repair any cracks with adhesive tape and leave the carrier open to dry.
- Return other supplies. For example, place immunization registers, unused AD syringes and immunization cards in their designated storage areas.
- Dispose of used vaccine vials and injection equipment safely. Safety boxes containing used needles and syringes must be disposed of properly, see Chapter5 (injection safety and waste management).
- Leave the site clean and tidy. Specifically, after using an outreach site:
- Do not leave anything behind that might be a health threat to the community.
- Clean and return tables, chairs and other equipment to their owners.
- Thank the local people who have helped to organize the session and remind them of the date of then extension.

Prepare a summary of the session

Calculate total numbers of vaccines given, supplies used and stock remaining for inclusion in monthly report data, as described in chapter 8(Monitoring, evaluation, learning and accountability).

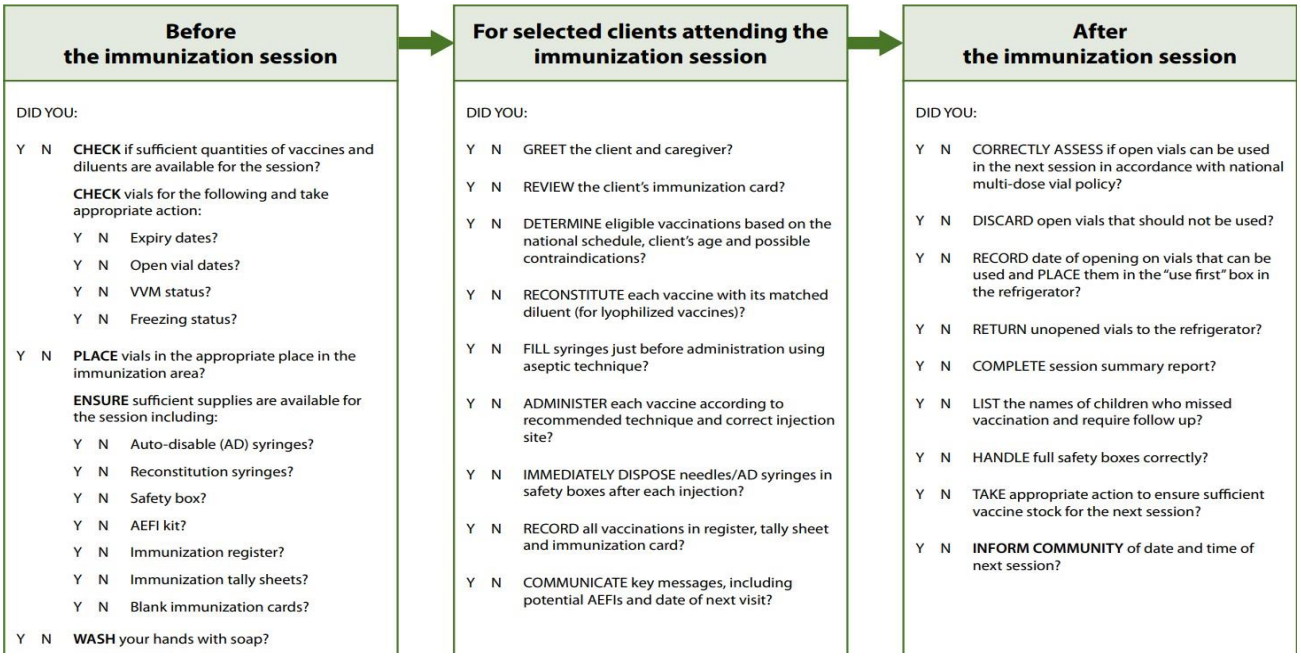
Prepare a defaulter tracking list

At the end of each session, use the immunization register and/or reminder cards to make a list of children who were due for vaccines but did not attend the session. The format for the list is shown in chapter 8. The list should be used for defaulter trackingand for program monitoring activities (as described in Chapter 8). Inform community

members who help with defaulter tracking of the infants on the list; ask them to mobilize the defaulters for the next immunization session using the immunization session checklist.

Figure 6.6: shows a checklist that can help ensure safety before, during and after immunization. This checklist is a reminder of key points in preparation, vaccination and closure of sessions that are described above, and is meant to reinforce positive actions. Health workers should be familiar with national immunization schedules, vaccine administration, waste disposal, data collection and other details of standard operating procedure from relevant national program documents and be able to quickly recognize and complete the checklist items. A printed copy of this checklist can be posted on a wall in the immunization area for easy viewing throughout sessions.

Figure 6.6: Immunization session checklists



Before the immunization session

DID YOU:

Y N **CHECK** if sufficient quantities of vaccines and diluents are available for the session?

CHECK vials for the following and take appropriate action:

- Y N Expiry dates?
- Y N Open vial dates?
- Y N VVM status?
- Y N Freezing status?

Y N **PLACE** vials in the appropriate place in the immunization area?

ENSURE sufficient supplies are available for the session including:

- Y N Auto-disable (AD) syringes?
- Y N Reconstitution syringes?
- Y N Safety box?
- Y N AEFI kit?
- Y N Immunization register?
- Y N Immunization tally sheets?
- Y N Blank immunization cards?

Y N **WASH** your hands with soap?

For selected clients attending the immunization session

DID YOU:

Y N GREET the client and caregiver?

Y N REVIEW the client's immunization card?

Y N DETERMINE eligible vaccinations based on the national schedule, client's age and possible contraindications?

Y N RECONSTITUTE each vaccine with its matched diluent (for lyophilized vaccines)?

Y N FILL syringes just before administration using aseptic technique?

Y N ADMINISTER each vaccine according to recommended technique and correct injection site?

Y N IMMEDIATELY DISPOSE needles/AD syringes in safety boxes after each injection?

Y N RECORD all vaccinations in register, tally sheet and immunization card?

Y N COMMUNICATE key messages, including potential AEFIs and date of next visit?

After the immunization session

DID YOU:

Y N CORRECTLY ASSESS if open vials can be used in the next session in accordance with national multi-dose vial policy?

Y N DISCARD open vials that should not be used?

Y N RECORD date of opening on vials that can be used and PLACE them in the "use first" box in the refrigerator?

Y N RETURN unopened vials to the refrigerator?

Y N COMPLETE session summary report?

Y N LIST the names of children who missed vaccination and require follow up?

Y N HANDLE full safety boxes correctly?

Y N TAKE appropriate action to ensure sufficient vaccine stock for the next session?

Y N **INFORM COMMUNITY** of date and time of next session?

Activity 6.4: General Exercises:

Total time allocated: 80 minutes

Instructions:

- From a three group to conduct all the exercises
- Group presentation on exercises:
  - Group One: Exercise 1, 2 & 3
  - Group two: Exercise 4 & 6
  - Group three: Exercise 7 & 8

Activity 6.5: Case Studies

Instructions: Read each case study individually and reflect you answer to the facilitator

Time: 80 minutes

Case Study 1

Baby Sara is 3 months old. She has diarrhea with no dehydration Immunization history: BCG, HepB-BD, OPV 0, OPV 1, OPV 2, DPT1-HepB1-Hib1 and DPT2 –HepB2-Hib2, PCV1, PCV2, Rota 1, and Rota 2 given 5 weeks ago

a. What immunizations, if any, does Sara need today?
b. What immunization will she receive at her next visit?
c. After the next visit when should Sara return for next immunization?

Case Study 2

W/ro Fatuma and M/rt Chaltu, the two health extension workers run outreach sessions once a week in a crowded market neighborhood to the village health post. W/ro Fatuma registered clients, weighing the children and decides which vaccine or vaccines a client should take. She then writes the date in the corresponding space or spaces on each client's immunization card. W/rt Chaltu examines the card and gives the vaccine or vaccines indicated by the date recoded in the immunization card.

One day, two children with fever, and. generalized maculopapular (i.e. non-vesicular) rash, and. cough, coryza (i.e. runny nose) or conjunctivitis (i.e. red eyes) to the health post for treatment. W/ro Fatuma examines their immunization cards and finds that they all have record for measles immunization. She asked the parents whether their children have taken measles vaccine on the date indicated in the immunization card. One of the mothers says she left the outreach site without her child getting the injection, because she was late for cooking lunch for her family. The second child received Penta 3 in the same day and his mother says that she did not know whether the child needed another vaccine.

a. Find out why these three children missed the vaccination.
b. Identify possible ways to prevent such events

Case Study 3

Shalom was brought by her grandmother to the neighboring health facility when she was six weeks old and she received OPV1, Penta1 vaccines. Three days later, shalom became very sick and lost her consciousness. After a brief hospitalization, she recovered fully. Subsequently, when shalom was 11-month-old, her mother brought her to health center to be treated for a cold. What would you do if you were a health worker in this health center?

Case Study 4

Mohammed is 6 months old. He has a common cold, anemia and is underweight. Immunization history: BCG, OPV 0, OPV 1, OPV 2, Penta 1, PCV 1, Penta 2, PCV2, Rota 1, Rota 2 given 6 weeks ago.

a. What immunizations, if any, does Mohammed need today?
b. When should he return for his next immunization?
c. What other health services do you recommend to integrate and provided for him?

Case study 5

Selam is 20 years old and 20 weeks pregnant she visits health for ANC care, her immunization history is she vaccinated Td1 two years ago.

a. Does Selam restart Td 1 on this visit? Discus the reason for your response
b. When should she return for her next immunization?
c. What immunization will she receive at her next visit?

Case Study 6

What immunization can you give on the same day to an 11 months old child who has never been immunized?

Case Study 7

Ujulu 16-month-old boy who was brought by caretaker to the health facility, during the assessment, it was found out that Ujulu Received all vaccines except MCV.

A. What Vaccine will you provide him?
B. when do you give the next appointment and what antigen will be provided by the next appointments?

6.8. Chapter summary

- Different Immunization service delivery strategies such as
- Fixed, mobile and outreach
- Other Immunization service delivery strategies
  - Catch-up
  - PIRI
  - African vaccination week
  - RI integration with SIA

- Service integration, ECD and etc. are recommended strategies which help EPI program to improve immunization coverage boost herd immunity.

- Plan and conduct immunization session including site preparation, assessing the eligible, communicating, administering a vaccine, recording and closing session.
- Preparation for sessions begins before the day of the session and should continue throughout the day to include feedback for improving the planning of after exit sessions. The main objectives are informing the community in advance, and plan immunization session, prepare workplace, vaccines and supplies.
- During immunization session it is important to communicate using correct communication technique, assess the child's eligibility for vaccination and contraindications.
- For eligible with minor illness and fever below 38 0c /axillary, vaccinate as usual. When vaccinating use aseptic techniques, using the same site of injection for the same vaccine, which will help follow up of which vaccines given.
- Immunization integration with other health services and Vice Versa
  - Immunization integration with other health services and Vice Versa
- At the end vaccine administered, complete immunization reminder card, complete registration and tallying collect materials and prepare summary of the session.

Chapter 7:

Vaccine Preventable Diseases and AEFI Surveillance

Time Allocated: 235 min

Chapter description: This chapter will describe the basic VPD and adverse events following immunization (AEFI) surveillance, case definition and use of appropriate reporting tools. It enables participants to describe VPD and AEFI surveillance at their respective level.

Primary Objective: At the end of this chapter participants will be able to:

- Explain VPDs and AEFI surveillance activities

Enabling Objectives: At the end of this chapter participants will be able to:

- Describe concepts of surveillance
- Describe case definitions of Vaccine-Preventable diseases.
- Detect and notify VPD.
- Define AEFI, describe types and classification.
- Explain AEFI surveillance and its importance.
- Detect and notify AEFI.

Chapter outline:

7.1.Vaccine preventable Diseases Surveillance

7.2.AEFI Definition, describe types and classification

7.3.Chapter Summary

7.1. Vaccine preventable Disease surveillance

Reading and Individual Reflection, Time:15 Minutes

(20minute, Page 176-177)

1. What is VPD surveillance?
2. What are the types of VPD Surveillance?
3. What is the importance of VPD surveillance?

7.1.1. Concept of VPD Surveillance

VPD surveillance is the continuous and systematic collection, analysis, and interpretation of VPD data needed for planning, implementation, and evaluation. Surveillance for VPDs provides critical, long-term data for the timely detection of, and response to VPDs to guide the optimal use of vaccines.

Vaccine-preventable disease surveillance includes for which vaccination is recommended for use by national immunization programs, as well as those diseases for which baseline surveillance data are required to define disease burden before vaccine introduction, diseases with vaccines in clinical development, and diseaseswith vaccines primarily used for outbreak response.

VPD and surveillance in general can be classified as passive, active and sentinel surveillance.

- **Passive or routine Surveillance:** health system receives routine reports submitted from health facilities, such as hospitals, clinics and public health units, the community, or other sources.
- **Active Surveillance:** Regular collection of surveillance data on specific diseases through the review of medical records and registers during regular visits to reporting sites.
- **Sentinel Surveillance:** Collectionand analysis of data by designated institutions selected for their geographic location, medical specialty, and abilityto accurately diagnose and report high quality data. It is an active type of surveillance.

Importance of VPD surveillance:

- Identify unreached and under-immunized populations

- Monitor disease elimination and eradication efforts (e.g., polio eradication, measles, and neonatal tetanus (NT) elimination.)
- Detect outbreaks and new pathogens (e.g., SARS-COV-2) for timely response
- Provide evidence for new vaccine introduction
- Identify circulating strains of vaccine-preventable pathogens and changes in those circulating strains.
- Evaluate vaccine effectiveness, impact on disease burden or both comparing VPD cases pre-and post-vaccine-introduction.
- Guide optimal use of vaccines, such as defining high-risk groups or modifying vaccine schedules for VPDs

7.1.2. Case definitions of VPDs

It is a set of criteria used to decide if a person has a particular disease, or if the case can be considered for reporting and investigation. It can be categorized as standard case definition and community case definition.

Standard Case Definition: It is a case definition that is agreed upon to be used by everyone within the country. It can be classifiedas Confirmed (Laboratory confirmed of agent), Probable (Typical clinical features of illness +Partial lab. Result, & Epi-link to a laboratory confirmed case) and Possible/Suspect (Typical clinical feature of illness but Missing Lab & Epi information. These definitions must be used at all levels including the community, health professionals working at health posts, healthcenters, hospitals, health offices at different levels, private health facilities, other government health facilities and NGO clinics.In the case of some vaccine preventable- diseases additional case definitions can be used when we are less confident that the case is a true case.

Community Case Definition: It is a case definition of disease and conditions adapted to suit health extension workers (HEWs) working at a health post level. The community case definitions were modified for simplicity and ease of understanding by HEWs. A list of 22 diseases and conditions are identified to have community case definitions. A more simplified, symptomatic, and loose case definition is used by the community members to detect any public health risks/conditions happening within the community.

Table 7.1. List of standard and community case definitions

Disease	Suspected cases	Confirmed case	Community case definition
Measles	Any person with fever and maculopapular (non-vesicular) generalized rash and cough, coryza or conjunctivitis (red eyes) or any person in whom a clinician suspects measles	Suspected case with laboratory conformation of recent measles virus infection (Igm+ antibody)	Any person with fever and rash
Poliomyelitis (Acute flaccid paralysis)	Any child under 15 years of age with acute flaccid paralysis or any person with paralytic illness at any age in whom the clinician suspects poliomyelitis.	A case with acute paralytic illness with without residual paralysis, and Isolation of Wild polio virus from the stool either the case or its contacts	AFP: Any child under 15 years of age with a sudden onset of weakness and /or inability to use the hand(s) and or leg(s)
Neonatal Tetanus	Any newborn with a normal ability to suck and cry during the first two days of life, and who, between the 3rd and 28th day of age, cannot suck normally, and becomes stiff or has convulsions or both	Suspected NT case found during case investigation to have all three of the following: Normal ability to suck and cry during the first two days of life and Could not suck normally between 3 and 28 days of age and Developed muscle stiffness and/or spasms (jerking).	

7.1.3. Steps of VPD Surveillance

Individual reflection

1. Describe standard and community case definitions.
2. Write the standard and community case definition for measles, Polio and NNT.

For conducting VPD surveillance, the routine steps may include:

- **Case detection:** It is identifyingsuspected cases or events. Standardized case definitions are used to detect cases of vaccine-preventable diseases. Trained clinical and laboratory staff at community and health facility level should use standardized case definitions to detect cases of vaccine-preventable diseases along with PHEM staff and data team.

- **Notification:** informing the higher-level health system about the identified or detected Immediately reportable disease. Notification is the process whereby the informant (clinician or health care worker) informs the public healthsystem when there is a suspected case. Notification of VPDs should occur either immediately or weekly based on the PHEM guideline. Immediate notifications can occur by phone, SMS, email, or paper-based format from health facilities or community informants to public health authorities as indicated in the national guideline.

- **Case investigation**: Is collection of detailedinformation about the suspected caseusing the case investigation form. Thisis mostly conducted for certain types of Disease; Measles, NNT, and AFP. Detailedcase investigation,

    - **sample collection, and lab testing;** are the next steps in surveillance for which designated public health surveillance staff, clinicians, or health facility focal points can do it. For diseases that are under surveillance clinicians/laboratory staff should collect

the sample. For more details, refer to the updated national PHEM guideline. The main goal of case investigation includes:

- Confirming (or discarding) the case according to established case definition
- Determining the source of the infection
- Evaluating the extent of infection (limitedto one case or clusters of cases in the community)
- Collecting detailed information to allow appropriate epidemiologic analysis and potential responses. **Sample collection and laboratory testing:** Used to confirm the suspected case.
- **Case classification:** After laboratory test or after detail investigation of the case, the clinician or the trained personnel will classify the case as confirmed, compatible or negative case
- **Data analysis and interpretation:** epidemiological and program analysis will be conducted to take potential response as well as to inform the routineimmunization program.
- **Reporting:** timely submission of suspected cases using standard reportingformats which is following can happen following notification for immediately reportable VPD diseases. Reporting is the timely submit of the notified case to higher level using standard reporting formats such as line list and case- based reporting. Nationally more than
36 modifiable diseases and conditions including important VPDs, these diseases are divided into immediate and weekly reportable diseases identified for reporting by the PHEM program.

- **Feedback:** After analyzing the collected data or after receiving the samples collected, the national level Surveillance unit should provide feedback to the reporting region and dawn to the health facility and community level based on the structure.

7.1.5. VPD surveillance recording and reporting tools

Communication between the different levelsof the surveillance system is essential. Frequent communication and regular feedback should flow both up and down the surveillance chain between informants, surveillance officers, supervisors, and laboratory personnel. Laboratory results and feedback on surveillance reporting will be shared back to informants and reporting units via direct communication, surveillance bulletins, etc. Timely communication with surveillance stakeholders is critically important.

7.1.4: Priority notifiable and reportable diseases

Activity 1: Group discussion

Participants to be in five groups

What the basic criteria of reportable disease prioritization

- List down immediately reportable disease
- List down weekly reportable diseases
- Identify VPDS among immediately reportable diseases
- Identify VPDs among weekly reportable diseases

In Ethiopia, Vaccine-preventable disease (VPD) surveillance is coordinated by Ethiopian Public Health Institute (EPHI). The priority vaccine-preventable diseases that include Measles, meningococcal meningitis, acute flaccid paralysis/Polio, Neonatal Tetanus, COVID-19, and yellow fever are a fewVPDs among the 36 Priority reportable diseases and conditions" disease and conditions under surveillance in the country.

These VPDs are either immediately reportableor weekly reportable in Ethiopia along with other Priority diseases. These priority diseases and conditions are selected based on the following criteria:

- They have a high potential for causing epidemics.
- They have been targeted for eradication or elimination.
- They have significant public health importance (causing many illnesses and deaths)
- They can be effectively controlled and prevented.
- Diseases/conditions required internationally under IHR2005

Definitions of Control, Elimination and Eradication

- Control: Refers to managing the spread and impact of a disease within a population
- Elimination: Reducing the incidence of a disease to zero in a specific geographic area
- Eradication: worldwide reduction the incidence of a disease to zero

Table 7.2. list of weekly and immediately reportable diseases in Ethiopian IDS system

Immediately	Weekly
1. Anthrax	23. Malaria
2. Measles	24. Diarrhea with dehydration in children less than 5 years of age
3. Human influenza caused by new subtype	25. Acute Jaundice Syndrome within 14 days of illness
4. Adverse Events Following Immunization (AEFI)	26. Severe Pneumonia in children under 5 years age
5. Neonatal / Non-Neonatal Tetanus	27. Dysentery
6. Rabies	28. Relapsing Fever
7. Smallpox	29. Meningitis
8. severe acute respiratory syndrome (SARS)	30. Severe Acute Malnutrition (SAM)
9. Yellow Fever	31. Scabies
10. Poliomyelitis (Acute Flaccid Paralysis)	32. New HIV cases
11. Chikungunya	33. Hypertension new cases
12. Cholera	
13. Dracunculiasis (Guinea Worm)	34. Diabetes new cases
14. Dengue Fever	35.Tuberculosis
15. COVID-19/SARS COV-2	36. Moderate Acute Malnutrition (MAM) in U5C and PLW
16. Monkey pox virus	
17. Brucellosis	
18. Rift Valley Fever	
19. Viral Hemorrhagic Fever (VHF)	
20. Maternal death	
21. Perinatal death	
22. Obstetric Fistula	

Tools used for vaccine-preventable diseases surveillance in health facilities.

- Rumor Logbook
- Tally sheet
- Case investigation format
- Line listing
- Cased -based reporting form

Rumor Logbook: is register used to record any rumors.

Tally sheet: The total number for each type of disease should be added for reporting to central levels. It is often done monthly in a summary form. The tally should be matched

Case investigation form: The Case investigation form is designed to collect data obtained from persons with suspected, probable, or confirmed specific cases. Data may be collected prospectively or retrospectively.

Line list: During specific disease outbreaks, suspected cases may need to be listed individually, with details of address and history including immunization status and management of each patient.

How to use a line list? After determining that a case meets the standard case definition of a reportable disease, start with the case identification number, and fill in all the items across the line for that case. The format of the line list may vary by disease and disease control activity requirements, but the column headings should be a guide to filling it in correctly.

Case based reporting form: is type of report for any single case report.

Activity 7.2

Objective: To complete measles Case-based report form

Instruction: Be in group of 4-6 people, select rapporteur, read, and analyze the case scenario stated below in your groups. Discus in a group, post the VPD case-based reporting form and through gallery walk explain to the whole participants.

Time required: 30 minutes (10 minutes for group work and 10 minutes for gallery walk & discussion)

Scenario: On 27 January 2019, a mother brought her 14 months child to health center you are working on. The child had a fever and cough of three days duration. A maculopapular rash with onset of two days prior to health facility visit. He is afraid of sun and difficulty of opening his eyes. Even if he is 14 months boy, he didn't receive a single dose of vaccine. Surprisingly, his family reside near to the health facility you are working on. The case was notified the same day to the date the child seen in facility. appropriate samples were collected and sent to regional laboratory for investigation.

Activity-

- What do you suspect from the case study?
- After you suspect a particular VPD, what will be your next step?
- Fill the case-based reporting form based on the scenario given.

Time :30 minute

7.2. Adverse event following immunization

Reading and group reflection

1. Define AEFI?
2. What are classifications of AEFI?

Vaccines, which are used in national immunization programs, are considered safe and effective if used correctly. However, no vaccine is perfectly safe and adverse reactions can occur following immunization usually happen within six weeks of vaccination. Of course, apart from vaccines themselves, the process of immunization is a potential source of adverse events.

Adverse event following immunization (AEFI) is any untoward medical occurrence that follows immunization, and which does not necessarily have a causal relationship with the usage of the vaccine. The adverse event may be any unfavorable or unintended sign, abnormal laboratory finding, symptom or disease. Adverse events can range from minor side effects to more severe reactions and can be a cause of public concerns about vaccine safety. Therefore, vaccine safety monitoring is very important because it helps professional healthcare workers to avoid problems with immunization and protect the health of people from adverse events during immunization. AEFI can be classified on severity, seriousness and cause..

AEFIs classification:

AEFI can be classified based on it's severity, seriousness or cause

A. Based on severity

Ideally, vaccines will cause no, or only minor (i.e., non-severe) adverse reactions. They are caused when the recipient's immune system reacts to antigens or the vaccine's components contained in the vaccine. Most AEFIs are minor and settle on their own. Minor AEFI could be local or systemic. Severe is used to describe the intensity of a specific event (as in mild, moderate, or severe).

Table 7.3: Minor vs. Severe Adverse Event following immunization

Minor reactions	Severe reactions
Usually occurs within a few hours of injection	Usually do not result in long-term problems
Resolve after a short period of time and pose little danger	Can be disabling
Local (includes pain, swelling, or redness at the site of injection)	Are rarely life-threatening
Systemic (includes fever, malaise, muscle pain, headache, or loss of appetite)	Include seizures and allergic reactions caused by the body's reaction to a particular component in a vaccine

B. Based on seriousness

AEFI can be serious or non-serious. It is important to note that there is a difference between the terms "serious" and "severe" adverse events or reactions. A serious adverse event or reaction is a regulatory term, which is defined as, any untoward medical occurrence that at any dose results in death, requires inpatienthospitalization or prolongation of existing hospitalization, results in persistent or significant disability/incapacity, congenital malformation, or is life-threatening.

C.Based on cause

Table 7.4: AEFI classification

S.no	Classification	Description	Example
1	Vaccine product-related reaction	An AEFI that is caused or precipitated by a vaccine due to one or more of the properties of the vaccine product itself	Extensive limb swelling following Pentavalent vaccination
2	Vaccine quality defect-related reaction	An AEFI that is caused or precipitated by a vaccine that is due to one or more quality defects of the vaccine product, including its administration device as provided by the manufacturer	Failure by the manufacturer to completely inactivate a batch of inactivated polio vaccine leads to cases of paralytic polio.
3	Immunization error-related reaction	An AEFI that is caused by inappropriate vaccine handling, prescribing, or administration and thus by its nature it is preventable	Transmission of infection by the contaminated multi-dose vial
4	Immunization anxiety-related reaction	An AEFI arising from anxiety about the immunization	Vasovagal syncope (fainting) in an adolescent during/ following vaccination.
5	Coincidental event	An AEFI that is caused by something other than the vaccine product, immunization error, or immunization anxiety.	A fever occurs at the time of the vaccination but is in fact caused by malaria

Activity 7.3: Case study #1

Case study

Instructions: Read the case study and reflect your answer to the facilitator

The HPV vaccine was given to adolescent age (9–14) groups at primary schools located in remote areas of Ethiopia during the national mass vaccination campaign. Four of the children fainted while a vaccine was being given to the first student in queue, after receiving first aid in the classroom, they were sent to the hospital. Further examination revealed that none of the students who fainted had received the immunization.

- What type of AEFI is the following incident?

Time:5 minutes

Reading and group reflection
1. What is AEFI Surveillance?
2. What is the importance of AEFI surveillance?
3. What are components of AEFI surveillance?

Surveillance of AEFIs: is an effective means of monitoring vaccine safety and contributes to the credibility of the national immunization programs. It allows for proper management of AEFIs and avoids inappropriate responses to reported AEFIs, which in the absence of AEFI surveillance can give rise to a sense of crisis.

To maintain and improve public confidence in national immunization programs, all healthcare providers should be well aware of all aspects of AEFIs and remain prepared to respond to public concerns at any time. Timely response to public concerns aboutthe safety of vaccines as well as prompt communication will protect the public and preserve the integrity of the immunization programs.

Importance of AEFI surveillance

- Identify problems with vaccine lots that lead to vaccine reactions caused by the inherent properties of vaccines.
- Detect, correct, and prevent immunization program-related errors
- Prevent false blame arising from coincidental adverse events following immunization
- Maintain confidence in immunizationby properly responding to parent/ community concerns and increasing awareness about vaccine risks.
- Generate new hypotheses about vaccine reactions that are specific to the population of specific areas
- Estimate rates of occurrence of AEFIs in a given population compared with others

Components of AEFI surveillance

Components of AEFI surveillance are detection, notification, reporting, investigation, analysis, causality assessment and feedback

AEFI identification/detection: when the adverse event is first identified by the vaccine recipient, caregiver, or healthcare provider. Detection requires effective training to ensure an accurate diagnosis of AEFIs based on clear case definitions and guidelines.

AEFI notification: when the event is brought to the notice of the healthcare system, either by the patient or by their relative.

AEFI reporting: when the first information of the event is obtained by a healthcare worker (any person in the healthcare system) and the information on the event is documented in an AEFI reporting form and is sent to the next level. Suspicion alone is sufficient for reporting, and the primary reporter is not expected to assess causality.

Who is responsible?

- All healthcare professionals and consumers are responsible for reporting AEFIs.

What to report?

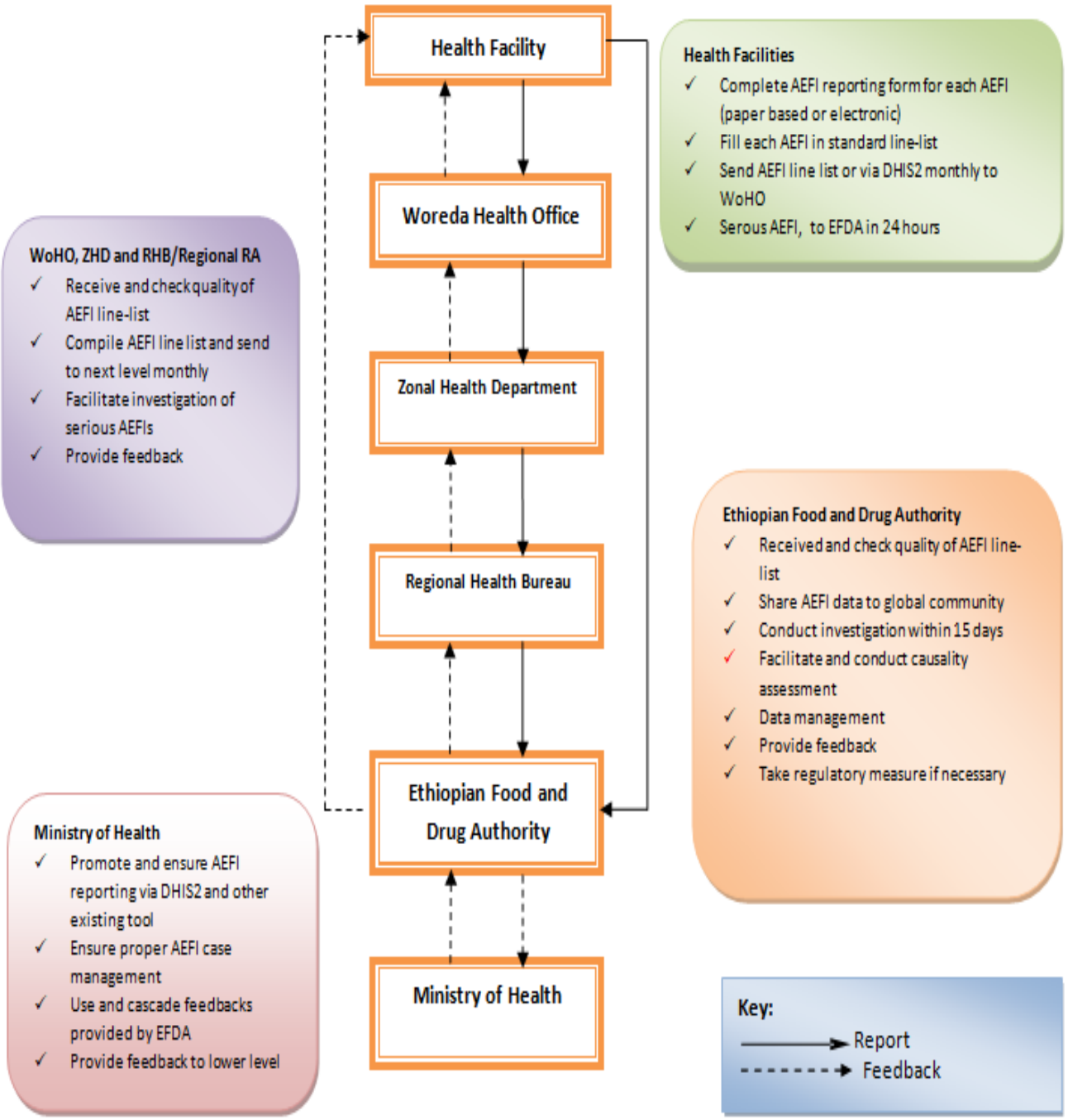
- All AEFIs must be reported regardless of seriousness/severity.
- It could be injection site pain, fever, headache....healthcare professionals

Fig 7.1: Cycles of AEFI Surveillance

When to report?

A report must be made as quickly as possible so that an immediate decision can be made on the need for action and investigation. In case of serious AEFI, vaccine administrators should inform their supervisor immediately, complete the reporting form within 24 hours, and send it to the next level and/or to Ethiopia Food and Drug Authority (EFDA). In the case of minor AEFIs, individual cases have to be listed and sent to the next higher level on at least a monthly basis.

AEFI Reporting Route, Timeline and Actions



How to report? All serious AEFI reports should be reported by a standard AEFI reporting form. Whereas minor AEFIs should be reported using a line list. However, for new vaccines, all AEFI cases regardless of seriousness/severity should be reported using the standard AEFI reporting form.

Individual Reflection

- Mention types of AEFI reporting tools that you are using at your health facility.

Types of AEFI Reporting tools

1. Paper-based reporting tools

Yellow AEFI reporting format and line list form, which are used by healthcare professionals at the healthcare facility level. All fields of the reporting template in the AEFI reporting form (Annex...) or line list form (Annex...) should be filled to provide as much information as possible for subsequent investigation.

2. Electronic reporting tools

Healthcare professionals at the healthcare facility level can also use electronic reporting mechanisms to report an AEFI. EFDA has adopted a web-based reporting tool from WHO-UMC drug safety monitoring center, which is available on the authority's website. Once the report is submitted by the reporter and received at EFDA, the system will generate an automatic response to the reporter. Please use the following steps to use EFDA electronic reporting tools

- Go to the EFDA website www.efda.gov.et
- Click on Services
- Click on the link e-Reporting of ADR
- You will find a page as indicated in this picture
- Thick I accept the term
- Click on "I'm reporting as a health professional"
- Enter all the information on the next page and submit the AEFI report

3. Mobile application

Another online reporting system is a mobile application reporting tool which is called Med- safety. This application can be downloaded from the Google play store for Android phones or the APP store for IOS users. By creating an account using an email address, health workers and immunization officers can send an AEFI report to the authority directly. Use the following steps on how to use the mobile app.

4. Emailing to EFDA

In addition to the above reporting means, any healthcare professional can report an AEFI by sending a scanned copy of the legibly filled standard AEFI reporting form to an email address of pharmacovigilance@efda.gov.et

5. EFDA toll-free service (8482)

EFDA has also availed a toll-free phone call service to be used for notifying and reporting an AEFI by health care professionals, vaccine recipients, and caregivers as well.

Activity 7.4 Case study #2-

A caretaker from Kebele 01 brought a 9-month-old boy who had got the measles vaccine three days before at Gedera health center then the child had developed a generalized body rash, a fever, and pain at the injection site.

Activity: Paired and answer the following questions based on the above case.

1) Fill in the AEFI reporting formats (paper-based, med-safety, and electronic reporting formats)

2) List any missed information from case that you think

3) when will you report the case to the next AEFI reporting level?

AEFI Investigation

It is a process of seeking detailed information on a reported AEFI case (s). The purpose of case investigation is to gather detailed information that helps: to find the cause of an AEFI or cluster of AEFIs; prevent similar

events from occurring in the future and take appropriate corrective actions to maintain public confidence in the immunization program. Not all AEFI reports will need investigation. In general, the following medical incidents (trigger events) should be investigated.

- All serious cases of AEFIs
- Clusters and events above the expected rate and severity
- Evaluation of suspected signals
- Other AEFIs
- Immunization error is suspected
- Events causing significant parental and community concerns

Investigation can be done by woreda, zone, region or national team, and it should begin as soon as possible, ideally within 24 hours but a maximum within seven days of notification to the health worker.

AEFI Causality Assessment

It is the systematic review of data about an AEFI case to determine the likelihood of a causal association between the event and the vaccine(s) given. In Ethiopia, causality assessment is being done at the national level by the National Pharmacovigilance Advisory Committee which is composed of health professionals with different specialties. The committee is independent and free of real or perceived government and industry conflicts of interest.

Causality assessment is important for:

- Identification of vaccine-related problems
- Identification of immunization error-related problems
- Exclude coincidental events
- Detection of signals for potential follow-up, testing of hypothesis and research
- Validation of pre-licensure safety datawith a comparison of post-marketing surveillance safety data

Response and action after causality assessment

The most important part in causality assessment is the action that is going to be taken after the outcome of the causality assessment. Findings should be promptly and clearly communicated, and the messages should be clear on any next steps to be taken, including communicating reassurance or the need to take action around the program including training, research, modifying systems, refining tools, and revocation of marketing authorization and recall of the vaccine and so on to avoid and/or minimize recurrences.

General AEFI case Management

- Early identification of AEFI cases
- Reassurance and Psychological support
- Symptomatic relief (Analgesia, home remedies…)
- Emergency life support (ABC of life, Adrenaline…)
- Timely referral
- Reporting of AEFI

Table 7.5: Common AEFI case management

Type of AEFIs	Local reaction (Pain, swelling and/or redness)	Fever	Irritability, malaise, and non-specific symptoms
Management	-Cold cloth at injection site -Paracetamol*	- Give extra fluid. - Wear light cool clothes. - Tepid sponge or bath - Paracetamol*	Symptomatic

*Paracetamol dose up to: 15mg/kg/dose every 6-8 hours, maximum 4 doses over 24 hours.

1. Table 7.6 Distinguishing acute stress response and anaphylaxis”

Manifestation	Anaphylaxis	Acute stress response	
		General	Vasovagal reaction with syncope
Onset	Usually, 5 minutes after immunization but maybe delayedupto60minutes	Sudden, occurs before, during or shortly after (< 5 minutes) immunization	Sudden, occurs before, during or shortly after (< 5 minutes) immunization. May present after 5 minutes if the individual stands suddenly
Clustering of cases	Rare	Can occur	Can occur
System			
Skin	Generalized urticaria(hives) or generalized erythema, localized or generalized angioedema, generalized pruritus with or without skin rash, red and itchy eyes	Pale, sweaty, cold, clammy	Pale, sweaty, cold, clammy
Respiratory	Persistent cough, noisy breathing, and airway constriction: wheeze, stridor. If very severe, respiratory arrest	Hyperventilation (rapid, deep breathing)	Normal-to-deep breaths
Cardiovascular	↑heartrate, ↓blood pressure, circulatory arrest	↑heartrate, normal or ↑systolic blood pressure	↓heart rate with or Without *transient* ↓in blood pressure
Gastrointestinal	Nausea, vomiting, abdominal cramps	Nausea	Nausea, vomiting
Neurological and other symptoms	Uneasiness, restlessness, agitation, Loss of consciousness, little response when supine or lying flat	Fearfulness, light-headedness, dizziness, numbness, weakness, tingling around the lips, spasms in hands, feet	Transient loss of consciousness, good response once supine or lying flat, with or without tonic-clonic seizure

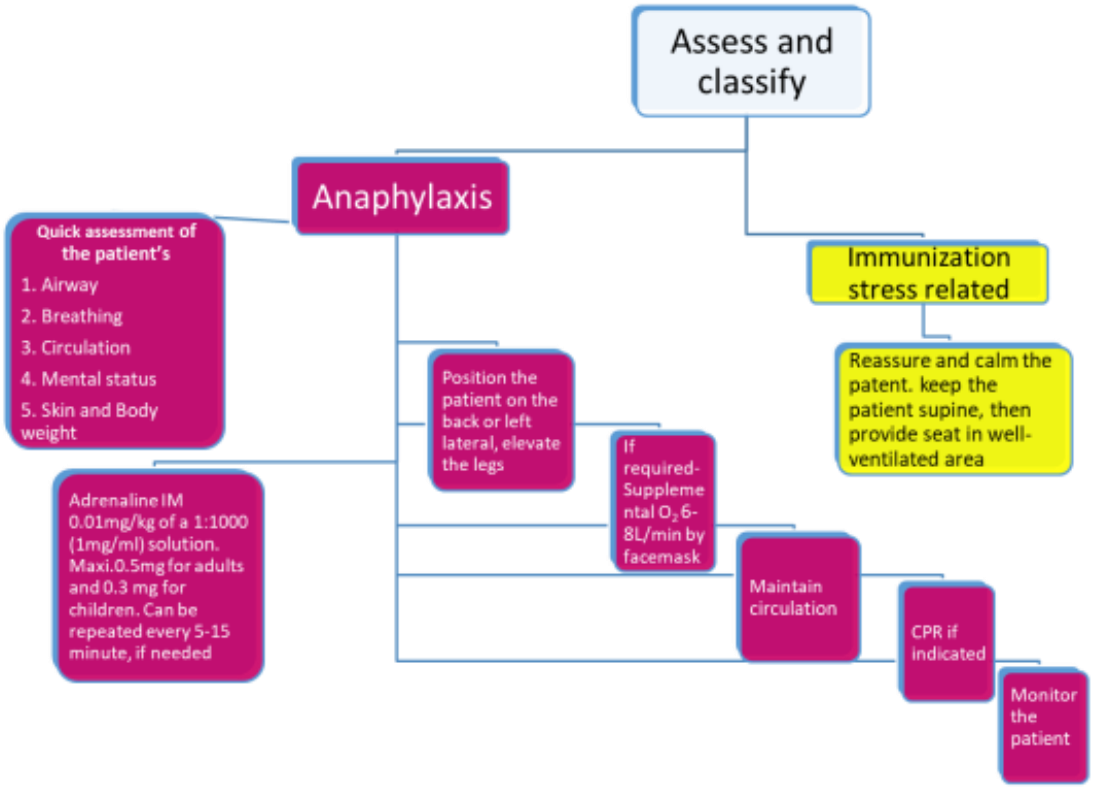


Fig 7.2: Algorithm for Anaphylaxis and Immunization Stress Related case management

Dose adrenaline is based on 0.01 mL/kg up to a maximum of 0.5 mL injected intramuscularly. If the weight of the vaccine recipient is unknown, an approximate guide as in the table below can be used.

Table 7.7 Adrenaline dose According to age

Age	Dose*(mL)
12months	0.10
18months–4years	0.15
5years	0.20
6–9years	0.30
10–13years	0.40
14 years and older	0.50

Activity 7.5: Group Discussion

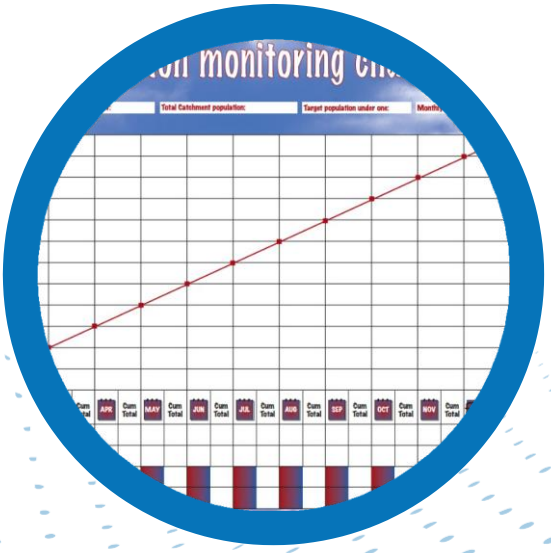
Based on case study 2 discussed in groups and answer the following questions

A.How do you manage this child?

B.What advice will you give to the caregiver?

7.3. Chapter Summary

- VPD surveillance is the continuous and systematic collection, analysis, and interpretation of vaccine-preventable disease data for action.
- The types of surveillance are passive and active surveillance. Under active surveillance community-based surveillance and sentinel surveillances are included.
- Nationally there are modifiable diseases including important VPDs, these diseases are divided into immediate and weekly reportable diseases identified for reporting by the PHEM program
- The vaccine preventable surveillance in health facilities uses different reporting tools including rumor logbook, tally sheet, cases investigation form, line list and summary report form.
- AEFIs can be classified based on the cause and severity as well as by frequency.
- Any event, either minor or sever cases should be reported using paper or electronic reporting tools. (line list , Yellow sheet, med-safety , EFDA web site and email and8482)
- Suspicion alone is sufficient for reporting, and the primary reporter is not expected to assess causality.
- Reports of Serious adverse events should reach EFDA within 24 hours.
- The purpose of the AEFI investigation is to find out the cause of an AEFI and implement the follow-up action.
- Performing causality assessment is important for the identification of vaccine-related, immunization error-related problems, coincidental events, and the detection of signals for potential follow-up.
- All AEFI cases should be managed properly.



Chapter 8:

Monitoring, evaluation, learning and accountability

Time Allocated: 225 Minute

Chapter description: This chapter describes the concepts of immunization program monitoring and evaluation, recording and reporting tools, data quality self-assessment techniques, analysis and use of basic immunization program indicators, documentation of best practice and lessons and concepts of evidence-based accountability.

Primary Objective: At the end of this chapter participants will be able to:

- Describe the immunization program monitoring and evaluation system

Enabling Objectives: At the end of this chapter participants will be able to:

- Describe basic concepts of immunization program monitoring and evaluation
- Demonstrate immunization data recording and reporting tools
- Operate immunization data quality self-assessment techniques
- Interpret basic immunization program monitoring indicators/KPIs for improvement
- Identify ways to document lessons and share best practices
- Explain basic concepts of evidence-based accountability

Chapter outline:

8.1.Basic concepts of immunization program monitoring and evaluation

8.2.Immunization monitoring, recording and reporting tools

8.3.immunization data quality Assurance

8.4. Immunization program data analysis and use

8.5. Lesson learned and best practice documentation

8.6.Evidence based accountability

8.7. Chapter Summary

8.1. Basic concepts of immunization program monitoring and evaluation

Individual Reflection

Time:5 minutes

- What is monitoring and evaluation?

Monitoring: is a systematic and continuous process of examining data, procedures and practices to identify problems, develop solutions and guide interventions. It is an essential component of a plan. It is conducted on a regular basis (daily, weekly, monthly and quarterly). It is linked to implementation of program activities. The information collected is used to direct program activities on a continuous basis.

Monitoring can help improve the quality of the immunization program by ensuring that:

- All targets of the immunization are vaccinated
- Vaccines and safe injection equipment are delivered in correct quantities and on time.
- Staff are well trained and adequately supervised.
- Information on disease incidence and adverse events following immunization (AEFI) are collected, reported and analyzed.
- The community has confidence in the vaccines delivered and the immunization service they received.

Evaluation: is a periodic assessment of overall program status: effectiveness and efficiency in achieving the target.

Indicator: is a variable that is used to measure progress towards the achievement of targets and objectives. It is used to compare performance in terms of efficiency, effectiveness and results. It is also used to measure impact of interventions.

Identifying Indicators able to specify

- Target population (for whom)
- Quantity (how much)
- Quality (how well)
- Location (where)

Immunization program Key performance Indicators

Immunization key performance indicators	formula	
Hepatitis B -Birth dose (BD) immunization coverage	(Number of live births who received a HepB-BD within 24 hours after birth/ Estimated number of live births)	x100
DTP-HepB3-Hib1 (Pentavalent first dose) <1 year	(Number of children under one year of age who have received first dose of pentavalent vaccine immunization coverage/Estimated number of surviving infants)	x100
DTP-HepB -Hib3 (Pentavalent third dose) <1 year	(Number of children under one year of age who have received third dose of pentavalent vaccine immunization coverage/Estimated number of surviving infants)	x100
OPV 3 (Oral Polio Vaccine third dose) Immunization Coverage (< 1 year)	(Number of surviving infants who have received third dose of oral polio vaccine/ Estimated number of surviving infants)	x100
Pneumococcal conjugate vaccine (PCV3) immunization coverage (< 1 year)	(Number of children under one year of age who have received third dose of pneumococcal vaccine/ Estimatednumber of surviving infants)	X100
Rotavirus vaccine 2nd dose (Rota2) immunization coverage (< 1 year)	(Number of surviving infants who have received 2nd dose of Rotavirus vaccine /Estimated number of surviving infants)	X100
Rotavirus vaccine 3rd dose (Rota2) immunization coverage(< 1 year)	Rotavirus vaccine2nd dose (Rota2)/ immunization coverage(< 1 year)	X100
IPV 1(Inactivated Polio Vaccine) Immunization Coverage (< 1 year)	(Number of surviving infants who have received 1st dose of inactivated polio vaccine / Estimated number ofsurviving infants)	X100

IPV2(Inactivated Polio Vaccine second dose) Immunization Coverage (< 1 year)	(Number of surviving infants who have received 2nd dose of inactivated polio vaccine /Estimated number of surviving infants)	X100

Measles (MCV1) immunization coverage (< 1year)	(Number of surviving infants who have received first dose of measles Vaccine / Total number of surviving infants)	X100
Measles second dose (MCV2) immunization coverage (15-23 months)	(Number of children aged 15 to 23 months of age who have received measles second dose vaccine/ Total surviving infant of the previous year)	X100
Full immunization coverage (< 1 year)	(Number of children who received all vaccine doses before their first birthday / Total number of surviving infants)	X100
Proportion of infants protected at birth against neonatal tetanus	(Number of Infants whose mothers had protective doses of Td[3] / Estimated number of live births)	X100
HPV (Human Papillomavirus vaccine coverage (9 years old girls)	(Number of girls 9 years of age who have received one dose of human papillomavirus vaccine/Estimated number of girls (9 years old)	X100
VWR: Vaccine wastage rate	Vaccine Wastage Rate = 100% – Vaccine usage Rate	
	Vaccine Usage Rate = (Number of Doses Given Sum of Doses Opened, damaged/expired)	X100
Penta1 to Penta 3 Dropout Rate	(Number of surviving infants who have received first dose of pentavalent - Number of surviving infants who have received third dose of pentavalent) /Number of surviving infants who have received first dose of pentavalent	X100
Penta 1 to MCV1 Dropout rate	(Number of surviving infants who have received first dose of pentavalent - Number of surviving infants who have received first dose of MCV) /Number of surviving infants who have received first dose of pentavalent	X100
COVID-19 vaccination coverage (Completed vaccination series)	(Number of target population (Age 12 years and above who have completed the recommended series of doses/ Total target population age 12 years and above)	X100

[3] Protective dose of Td means a child born from a mother who have received Two doses of Td during the recent pregnancy or at least three doses of Td in the past

82. Immunization monitoring, recording and reporting tools

Immunization Register

The immunization register is used to record the immunizations received by each child. It is a book or a form that stays in the health facility. Its main purpose is to keep track of the immunization service provided to each child through the second year of life and life course approach. It lists each child on a separate line and is important for several reasons.It is the health facility's primary source of information on a child's immunization status and needed vaccinations. This information is particularly helpful if an infant attends for a follow-up visit without her/his immunization card.

It helps identify infants who miss scheduled vaccinations and who need to be added to the defaulter tracking list. It is a source of data for monthly and other reports.

Health facilities may keep separate registers for each community that they serve; theymay also use specific registers for outreach activities and/or children who present from outside their catchment area.

When a child arrives at a health facility or outreach site, the health care provider should screen the child for eligibility. If the child is eligible, it's important to register/fill in all the necessary information in the registration form. Vaccination should be marked after they have been administered.

Assign a unique identification number to each infant and write the same number on their immunization card. This will make it easier to locate the corresponding entry in the register if the immunization card is availableduring follow-up appointments. If the card is not available, gather the child's name, age, and details of their first immunization, and locate their line in the register. If there is no documented evidence of vaccination for an eligible child ask the mother/caregiver about the child immunization status by history probing the site of vaccination and if the HCW confirmed the child vaccination status register and provide vaccination. If the information about child vaccination status is not adequate, restart the immunization schedule.

Note:

If the date of birth is not known, the health worker should estimate it based on age in months and date of registration as follows.

Step 1: Ask the mother/caretaker age of the infant in months (m0)

Step 2: subtract the number of months (m0) from the month of registration (m1)

Step 3: Add the date of registration (d1) to the calculated month (m2)

Example: the date of birth a 4 months old infant who was registered for vaccination on Meskerem 16/2015 EFY can be estimated as follows: Age in months= 4, Subtract 4 months (m0) from Meskerem which will be May 2014 Add 16 days on May, and then the date of birth is 16 May 2014 EFY

How to complete an immunization register

Kebele	If Health Post, write the name of the kebele where the Health Post is located.
Region	Write the region where the facility is located
Woreda / Sub-City	Write the woreda/sub-city where the facility is located.
Name of Health Facility	Write the name of the health facility where the EPI and GM services are provided.
Register begin date	Enter the date of the first entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)
Register end date	Enter the date of the last entry in the register, written as (EC) Day / Month / Year (DD/MM/YY)

Datum	**Comments**
Identification: personal information	
S. N	Write sequential serial number in registration book;
Infant's MRN	Write infants Medical Record Number Unique individual identifier used on medical information folder
Name of infant	Write the name of the infant
Date of birth	Write Infant's date of birth, written as (EC) Day/Month/Year (DD/MM/YY)
Sex(M/F)	Write Child's sex: M = Male; F=Female
Name of Mother	Write the name of the mother
Mother's MRN	Write Medical Record Number Unique individual identifier used on mother's medical information folder Mothers should be informed to come with their Td immunization card when they come for child immunization.

Identification: Address	
Woreda /Kebele	Write Woreda in upper row and Kebele in the lower row
Gote/House number	Write got in the upper row and house number in the lower row
Registration	
Reg. Date (DD/MM/YY)	Date registered, written as (EC) Day/Month/Year (DD/MM/YY)
Immunization Services: Antigens Received	
Dose number	Indicates specific dose number of antigens
BCG	Write Date BCG antigen received, written as (EC) Day/Month/Year (DD/MM/YY)
OPV (0-3)	Write Date OPV antigens received in each row, written as (EC) Day/Month/Year (DD/MM/YY)
HepB birth dose: within 24 hrs (DD/MM/YY)	Write Date HePB BD antigen received within 24 hrs (DD/MM/YY)
HepB birth dose: after24 and below 14 days (DD/MM/YY)	Write Date HePB BD antigen received after24 and below 14 days (DD/MM/YY)
DTP-HebB-Hib (1-3)	Write Date DTP-HebB-Hib antigen received in each row, written as (EC) Day/Month/Year (DD/MM/YY)
PCV (1-3)	Write Date PCV antigens received in each row, written as (EC) Day/Month/Year (DD/MM/YY)
Rota(1-2)	Write Date Rota antigens received in each row, written as (EC) Day/Month/Year (DD/MM/YY)

IPV (1-2)	Write Date IPV antigen received, written as (EC) Day/Month/Year (DD/MM/YY) for both IPV1 and IPV2
MCV (1-2)	Write Date MCV/Measles antigens received in each row, written as (EC) Day/Month/Year (DD/MM/YY)
Fully immunized (√)	Tick if child completes full series of immunizations by first Birthday
Immunization Service: Neonatal tetanus protection	
No. of Td doses Mother received in last Pregnancy	Write number of Td doses mother received in last pregnancy (Quality check for PAB in column 22: either column 23 or 24, but nor both, should be ticked if PAB (column 22) is ticked.) Infant is considered if mother received a total of 3 or more doses in column 24 or if mother has received 2 doses in her last pregnancy
Total No. of Td doses Mother received	Write total number of Td doses mother received any time (See note on column 23 for purpose of this column.)
Protected from neonatal tetanus at birth (PAB) (√)	Tick if mother received 2 doses of Td in last pregnancy or a total of 3 doses at any time (Quality check for PAB : either 2 doses in column 23 or 3 or more doses in column 24)
Associated Services	
Nutritional screening date (DD/MM/YY)	Write the Date of child growth was monitored, written as (EC) Day / Month / Year (DD/MM/YY)
Screened & linked to CINuS (√)	Tick (√) if child screened for nutritional status and linked to CINuS
Developmental milestone assessment	Screen and write the Developmental milestone status, write code: "NDD"- No Developmental Delay; "SDD" -Suspected developmental delay; or "DD": -Developmental delay
Remarks	Appointment / other comments

NB: The Human papillomavirus vaccination (HPV) and COVID-19 vaccination have their own immunization register to be used at the service delivery point.

Activity 8.1: Group Exercise

Instructions: Read the case, discuss and present your group discussion points to the large group

Mother X and mother Y brought their children aged 6 weeks and 3 months respectively to health center M to get their children vaccinated. The 2nd child had had two visits before while the 1st child came for the 1st time. The health professional B has prepared to provide vaccination for the children based on the available information. Fill the required information in the immunization register. Based on the above information fill the required

information in the immunization register

Time allowed: 20 minutes

Key points

- Fill in all information on the register linefor each child
- Mark vaccinations in the register only after they are given to the Child
- When the child returns for a follow up visit, find the register line for the child using the immunization card (or the child's name and age/ or month of first vaccination if the card is not available)

The immunization card/ Passport

This is the child's/ individual vaccination record/certificate. It is kept by the parents/ caregivers/ individuals and therefore is the only immunization record that is found in the community. This card should be broughtto the vaccination sites during each visit.The vaccination card is important for many reasons:

1. It serves as a reminder for the Child/ individual to return to the health facility/ vaccination site for the next visit/ appointment
2. It helps the health worker determine an individual's vaccination status.
3. Allows continuity of service when the person moves to another area
4. During coverage surveys, the card is used to verify vaccination status of the individual
5. It has key messages on child and maternal health care Serves as a document for international travel
6. Serves for growth monitoring follow up
7. parents/ caregivers/ Individuals should be reminded to keep the vaccination card in a safe place and to carry it to all vaccination schedules

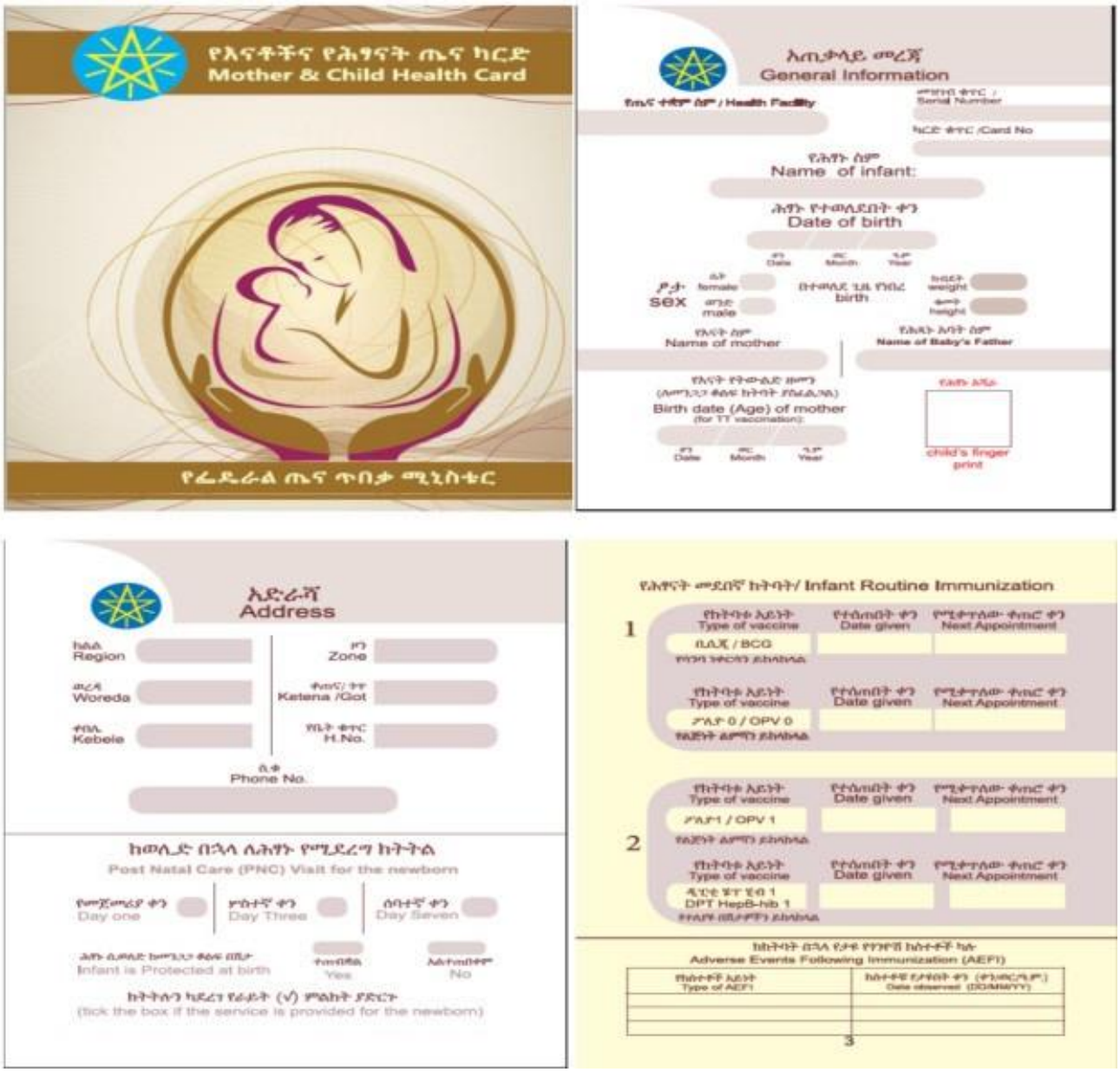


Fig 8.1. Immunization card/passport

Information commonly included on an immunization card/ Passport

An immunization card usually includes the following information:

- Unique identification number (Serial number the same as indicated in the register)
- General information (Name of child, dateof birth, sex, name of mother and father, birth date of mother for Td vaccination, child's fingerprint)
- Address (Region, zone, woreda, got, kebele, house number)
- Postnatal care (PNC) visit for the newborn

- Child routine immunization (Type of vaccine, date given, next appointment)
- Adverse events following immunization
- Date and dose of vitamin A supplementation given,
- Td for pregnant women
- Supplementary immunization
- Growth monitoring chart

How to use an immunization card

Complete the card by writing down the date for each vaccine administered or vitamin A supplement given. Include doses of Td given to the mother if she is eligible and the card has space to enter it. Mark the next appointment date on the card and tell the caregiver when and where to return for the next vaccination.

Key points

- Remember to mark the next appointment date on the immunization card. Make sure that the appointment corresponds to a planned immunization session.
- Inform the caregiver of the next appointment verbally as well as in writing on the card.
- Always return the immunization card to the caregiver. Remind the caregiver to keep the immunization card in a safe place and to take it to all health care and immunization visits.

Tally Sheet

Tally sheets are forms that are marked every time a health worker administers a dose of vaccine. They are used to monitor performance and complete monthly reporting. A new tally sheet should be used for each session, and tally sheets should be kept for at least three years.

How to use a tally sheet

Mark the tally sheet next to the dose received (there are various ways of making tally marks, for example: ||||). Tally sheets with preprinted symbols that can be marked through may help to ensure more accurate counting of totals for reports.

If preprinted sheets are not used, all vaccinators in a health facility should use the same type of tally marks to make it easier to count the totals.

After vaccinating an infant (who is by definition less than one year of age), place the mark in the column headed “Age <1 year”. After vaccinating an older child, place the mark under “Age >1 year”.

If a dose of vitamin A is given, mark it on the tally sheet.

Use a tally sheet for each session and at the end of each reporting month, add upthe number of marks recorded during the sessions. This gives the total number of immunizations given in the month with each antigen and each dose in its series and makes sure to archive the information in a proper way.

Table 8.2. Common mistakes in tallying

Mistake in tallying	Possible problem that may occur	Correct practice
Tallying before the vaccination is given	The child may not receive the vaccination	Give the dose first then mark it on the tally sheet
Tallying at the end of a session according to number of doses contained in the used vials	Wasted doses may be counted	Tally each dose given (as above)
Tallying all vaccines under one age group (to include those outside the targeted age)	Will result in inaccurate coverage data	Separate tally for under 1 and over 1 year old

Monitoring chart

A coverage/drop-out monitoring chart is a simple and effective tool for visually monitoring the progress toward immunization coverage targets across a region or area. The following information is presented on a graph.

- The number of vaccines administered on month -a by-month basis compared with the number of children who should have received them (target population)
- If the coverage of the two vaccines is plotted on the same graph, then it is possible to monitor the dropout rates between the two vaccines. i.e., the number of infants that started receiving immunizations compared to the number of infants that received all doses of vaccines.
- Each level, from the health facility to the national level, should display a current coverage/drop-out monitoring chart on the wall, so it is important that health workers are familiar with producing these.

Steps to make a monitoring chart

Step 1. Calculate the annual and monthly target population who should receive immunization services

Annual target population = total population × % infants in population Aim to vaccinate every infant in the catchment area, including those who are hard to reach.

Use existing population data for infants obtained from national statistics offices, ministry of health planning sections or community censuses. If data are not available, estimate the number of infants by multiplying the total population by 3% (or the percentage of infants in the population suggested by national/central authorities, if applicable). Always use the most precise percentage available: a measured, specific percentage for calculating the number of infants is preferred. Data for peripheral health facility calculations are often difficult to find and more accurate targets can be set by:

a. **immunization staff and district supervisors, who may need to discuss and agree on target population adjustments based on local knowledge and past experience; and**

b. **drawing the past year's results on the current year's chart in order to follow progress from year to year.**

Monthly target = Annual target population/12 (annual target population number of infants calculated above divided by 12.)

Example calculation: If the total population is 3900, then the annual target population of infants is 3900 × 3/100 = 117; and the monthly target is 117/12 = 10.

Step 2. Label the chart and draw the ideal monthly target line

- Complete the information on the top of the chart by adding the area and year.
- Label the left (and/or right) side of the chart with the monthly target numbers.
- Label the boxes at the bottom with the selected vaccine.
- Draw a diagonal line from zero to the top right-hand corner to show the ideal rate of progress from month to month using the cumulative monthly target Numbers.

Step 3. Plot immunization data on the chart

- Locate the space for the month being recorded in the row of boxes underneath the graph and enter the monthly total of vaccine given.
- Calculate the cumulative total for the current month as shown:
- Current cumulative total = current month's total doses + previous month's cumulative total doses

Note that: cumulative means the total number of doses of vaccines given in the current month plus the monthly totals for the current calendar year; for example, the cumulative number of penta3 doses givenby the end of March is the total number of doses given in January plus the total numbergiven in February plus the total number given in March.

Step 4. Enter the current cumulative total on the right side of the month being recorded

- Make a dot on the graph corresponding to the cumulative total recorded on the right side of the month being recorded; the dot should line up with the correct monthly number on the left side of the chart.
- Connect the new dot to the previous month's dot with a straight line.
- Repeat every month until the end of the year.
- Plot other immunizations given on the same chart, as needed.

Step 5. Calculate the total number of dropouts between the first and last dose of the same vaccine series.

Number of dropouts = (cumulative total for the first dose) – (cumulative total for the last dose of the vaccine series) Dropout rate (%) = (number of dropouts/cumulative total for the first dose) × 100

The dropout rate can be seen easily in the doses administered chart: it is the gap between the lines for the first and last dose of a vaccine. Example calculation: If all 117 infants in the annual target population received penta1, but only 100 finished all three doses during the year, then: Number of dropouts = (117) – (100) = 17 Dropout rate = [17/117] × 100 = 14.5%

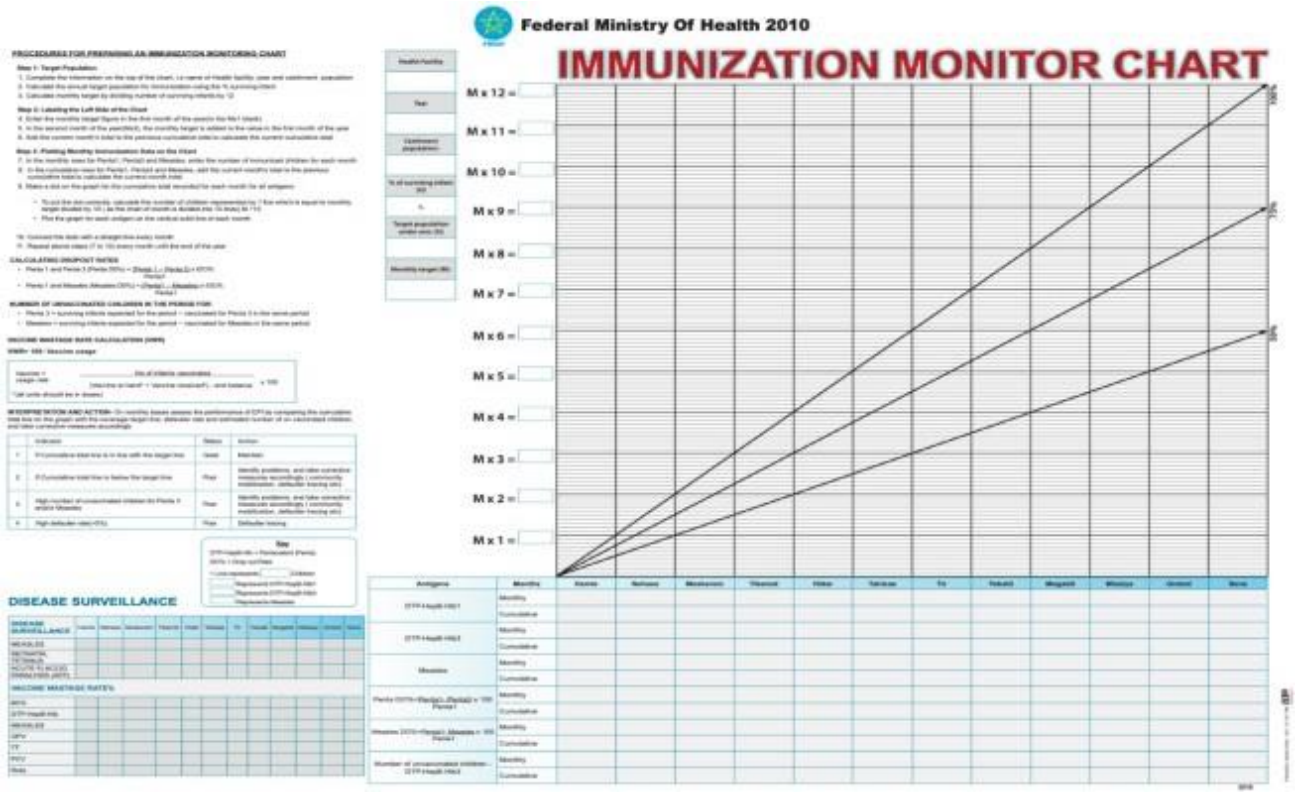


Fig 8.3. Immunization Monitoring Chart

Group Exercise on the EPI monitoring chart (Time 30 minutes)

HP "W" has a total population of 12,000, where surviving infants constitute 3.25%. The number of under one-year children vaccinated monthly for DPT-HepB+Hib1, DPT-HepB+Hib3, and measles for the 2015 EFY is indicated in the table below. Based on the above information fill the information in the monitoring chart and plot the line.

	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June
Penta 1	30	29	31	25	22	20	35	32	29	28	29	27
Penta 3	32	27	29	21	17	15	30	29	29	27	30	26
MCV 1	26	24	25	17	17	14	26	24	25	23	27	23

Based on the above information fill the information in the monitoring chart and plot the line

Defaulter tracking list and tickler box

The term "defaulter" refers to individuals who miss scheduled vaccinations for any reason, including health facility problems, such as canceled sessions or vaccine stock outs. Defaulters need to be followed up and mobilized to attend the earliest available session, since the goal is to complete any missed vaccinations.

Finding defaulters and vaccinating them using reminder cards and tickler box

Reminder cards are copies of infants' immunization cards that can be filed in a box by the month when the next vaccination is due (see Figure 5). For example, when an infant receives pentavalent1 in January, mark it on the reminder card and place the card behind the February divider in the ticklerbox, since this is when pentavalent 2 is due.

In February, if the infant receives pentavalent2, update the reminder card and place it in the March section when pentavalent 3 is due. If the infant does not come for pentavalent2 in February, or does come but does notget vaccinated (due to stock-outs or other reasons), the card will remain in February. At the end of each month, review all the reminder cards remaining and add the names of the infants who have missed vaccinations to the defaulter tracking list.

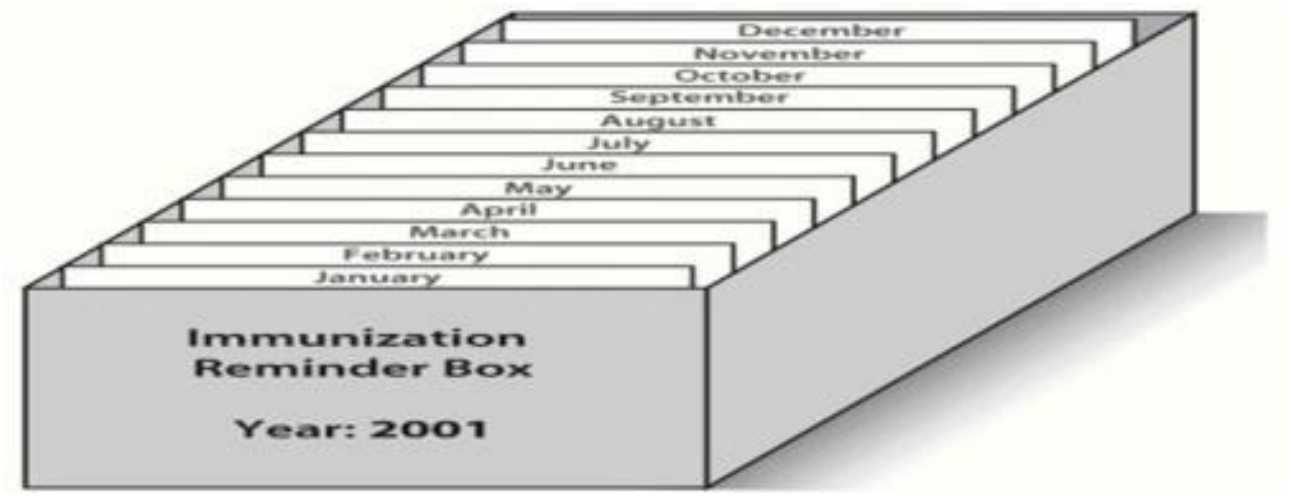


Figure 8.4: Box for filing reminder cards

Preparing defaulter tracking list

Defaulters can be listed by reviewing different immunization records.

Two suggested methods are:

A tracking list, such as the one shown in Table 8.5, should be filled in after each immunization session or at least monthly as described below. It should be given to the person(s) tasked with finding defaulters.

Table 8.5 Registration of infants who have missed vaccination appointments

Date: _____

Health center/health post name: _____

Catchment community name: _____

S/No	Date of Registration	Child's name	Age in Months	Care giver's name	Name of Kebele/ Gote	Household code/ phone number	Missed Antigen	Outcome[4]
1								
2								
3								
4								
5								
6								
7								

[4] Outcome: child vaccinated, transferred to other area, refused, died

Listing defaulters from the immunization register

At the end of each month, review the immunization register to identify infants who may have failed to receive vaccinations when due. For example, in March check to see that any infant who received a pentavalent1 dose in February returned for pentavalent2 (in March) when it was due.

Add the names of any infants who missed vaccinations to the defaulter tracking list. Names should be listed for tracking and follow up as soon as possible after a missed appointment.

How to use the defaulter tracking list

The defaulter tracking list will be effective only if every infant receives vaccinations that are overdue. Listing defaulters regularly every month makes it easier to find them and follow them up. To follow up defaulters, caregivers may be contacted directly (for example by phone or text messaging) or with the help of other community members.

Zero dose and under-immunized child identification and linkage to vaccination service

Zero-dose children are those that have not received any routine vaccines. For operational purposes, GAVI defines "Zero Dose children" as children who have not received a first dose of diphtheria-tetanus-pertussis-containing vaccine (DPT1).

Under-immunized are those who have not received a full course of routine vaccines. For operational purposes, GAVI defines "under-immune" as those who have not received the third dose of diphtheria-tetanus-pertussis-containing vaccine (DTP3).

Healthcare workers are expected to regularly identify zero dose children and under-immunized children using locally available recording and reporting tools for the next appropriate action to identify, register and link them to the vaccination service. The analysis of the identified zero dose and under-immunized children distribution/ settlement in the area, the reason why they are not getting vaccinated/ defaulted, identification of barriers would help for future planning to include all populations in the catchment area.

Family folder

Family folder is one of the community health information systems (CHIS) tools issuedto each family/household and is used to record data on household and householdmembers. The front-side is used to capture data related to household identification, household members' description, household's possession of long-lasting insecticides treated bed net (LLITN), women development army (WDA) and community-based health insurance (CBHI) membership status. The backside is used to capture data related to HEP package practices, model household status and competency-based training program status (for WDA leaders). It also serves as a file for cards of members of a family.

Temperature monitoring chart

As a monitoring tool, temperature monitoring charts should be available in all areas where cold chain storages are available. Twice a day (including weekends and holidays) the temperature of every refrigerator and freezer that stores vaccines should be recorded on a refrigerator temperature chart. Stringent temperature monitoring is very crucial for the proper management of vaccines and maintaining their potency. For the details refer chapter 2 (Supply chain management section)

Vaccine control book (Ledger book)

It is essential to keep the EPI vaccine and injection materials stock record up to date; this will help to avoid stock shortages and stock wastage. It is important to ensure that vaccine stocks do not fall below the recommended minimum level, or rise above the recommended maximum level, and that you order new supplies when the stock falls to the critical level. This stock record should be kept up to date at all times to ensure that stock shortages and stock excesses are avoided. As a monitoring tool, there should be available ledger books at woreda and health center level. For the details, refer chapter 2 (Supply chain management section)

AEFI line listing, reporting and investigation formats

Strict monitoring (identification, notification, reporting, investigation, causality assessment and classification) of adverse events following immunization during routine immunization, catch-up vaccination and Supplementary immunization activities is crucial for the management of AEFI cases and for the crisis communication activities. There are AEFI line listing forms for the registration of each AEFI case reported, reporting forms and investigation forms. For the details refer chapter 7 (vaccine preventable disease and AEFI surveillance section))

Vaccination Session monitoring checklist

Help to ensure safety before, during and after immunization. This checklist is a reminder of key points in preparation, vaccination and closure of sessions and is meant to reinforce positive actions. Health workers should be familiar with national immunization schedules, vaccine administration, waste disposal, data collection and other details of standard operating procedure from relevant national programme documents and beable to quickly recognize and complete the checklist items. A printed copy of this checklist can be posted on a wall in the immunization area for easy viewing throughout sessions. You can refer to the vaccination session monitoring checklist in chapter six (Service Delivery).

Health facilities should monitor their session plan which developed during annual Micro planning regularly to ensure whether sessions are held or not. based on monitoring finding the health facility or health workers reschedule the canceled or postponed session (Refer the session monitoring tool in chapter six: service delivery)

Vaccine wastage monitoring

Open vial wastage should be monitored on a monthly basis using immunization monitoring charts and DHIS2 especially for vaccines of multi dose vial policy. For the details refer section 2 (supply chain management section)

Supportive Supervision

Checklists based supportive supervision should be arranged for health facilities and vaccine storage facilities for regular monitoring and corrective actions. Health care workers need to get hands-on coaching by experienced officers from higher administrative levels, colleagues, and partner organizations such as RHB, ZHD, WHO, PHCU and partners at service delivery points. This is the best monitoring tool whereby the feedback is immediate and used for immunization service improvement.

PHCU level catchment review meeting

On monthly basis the PHCU should coordinate and brings HEWs and community representatives, PMT/PRT, supervisors at PHCU level to discuss on performance, challenges and develop action plan.

8.3. Immunization data quality Assurance

Individual Reflection	■ Explain the importance of good quality data ■ Roles and Responsibilities of each level of the health system **Time allowed: 5 minutes**

EPI data are widely used for a variety of purposes – including program reviews, planning, program monitoring, quality improvement and reporting. For this reason, it is critical to have high-quality data on performance in the health sector available routinely.

Data: refers to a collection of facts, statistics, or information that is represented in various formats, such as numbers, text, or images. Data can include immunization records, vaccination coverage rates, demographic information, disease surveillance data, and other relevant information related to immunization activities.

Data Elements: are the individual units of information that make up a dataset. Data elements can include specific details such as the Child name, age, vaccination dates, vaccine types, lot numbers, adverse events, and other relevant variables that are captured and recorded as part of the immunization process.

Data Quality: Data quality refers to the accuracy, completeness, consistency, reliability, and timeliness of the data. It encompasses the overall reliability and usability of the data for decision-making, research, and program evaluation purposes within the EPI.

Data Quality Assurance: is the processes and activities undertaken to ensure that data meets predefined quality standards which include data validation, data cleaning, data verification, and adherence to data quality protocols and guidelines.

Data Triangulation: Data triangulation is a methodological approach that involves comparing and cross-referencing data from multiple sources or methods to validate and strengthen the reliability of findings. e.g. administrative reporting vs logistics/supply.

Data Verification: Data verification is the process of confirming the accuracy and reliability of data by checking its consistency, completeness, and adherence to predefined criteria or standards. For example, data verification may involve cross-checking immunization records with source documents, such as vaccination cards or registries, to ensure the data is correct and valid.

All data are subject to quality limitationssuch as missing values, bias, measurement error, and human errors in data entry and computation. Data quality assessments should be undertaken to understand how much confidence can be placed in the health data that are used to assess health sector performance and to understand the relative strengths and weaknesses of the data sources. In particular, it is important to know the reliability of national coverage estimates and other results derived from health-facility data.

Data Quality Dimensions

1. Accuracy: Ensuring that the data is correct, precise, and free from errors.
2. Completeness: Confirming that all required data elements are present and available.
3. Consistency: Maintaining uniformity and coherence of data across different sources or systems.
4. Timeliness: Ensuring that data is collected, processed, and made available in a timely manner.
5. Validity: Verifying that the data conforms to defined rules, standards, or criteria.
6. Reliability: Establishing the trustworthiness and dependability of the data.

Importance of data quality

Quality health service is dependent on the access to and use of good quality data. The importance of good quality data includes:

- It helps for immunization program management and evidence-based decision-making process to achieve the country vaccine coverage and disease elimination goals.
- It will support the quality of the program by indicating the actual performance of the service and to identify the strengths and weaknesses of the implementation.

- It will also help to identify the actual need of the vaccine and supplies forecast
- It will also help the researcher to improve outcomes by providing evidence to support particular care processes and beyond.
- Reliable and precise data enables EPI focal to assess the extent to which target populations are being reached with immunization services. This information helps identify gaps and implement targeted interventions to improve coverage and to prevent and respond the VPD outbreaks
- Quality data will help for efficient resource allocation and utilization.

Techniques for immunization data quality assurance

The following methodology shall be applied to assure data quality at service delivery and intermediate health administration units (Woreda, Zone and regional health offices)

Data Quality assurance techniques: Facility Assessment

- Lots quality assurance sampling (LQAS),
- Visual Scanning (Eyeballing)
- Immunization Data quality self-assessment (DQS)
- Data triangulation

Lot Quality Assurance Sampling (LQAS)

It is a technique useful for assessing whether the desired level of reporting accuracy has been achieved by comparing data in relevant record forms (i.e. registers or tallies) and HMIS reports. The data that is compiled in databases and reporting forms is accurate and reflects no inconsistency between what is in registers and what is in databases/ reporting forms at facility level. Similarly, when data entered in the computers, there is no inconsistency between reporting forms and computer files.

The LQAS method will be used to check reporting accuracy at Health Facility level. The health facilities will maintain a registry to record the data consistency check results and to look at the trend of the data quality improvement.

This is a method for testing hypotheses related to the level of HMIS data quality whether it is achieved or not. It uses a sample size of 12 data elements and tries to check the reporting accuracy.

If the number of sampled data elements not meeting the standard exceeds a predetermined criterion (decision rule), then the lot is rejected or considered not achieving the desired level of pre-set standard. Decision rule table is used for determining whether the pre-set criterion is met or not. Comparison of LQAS results over time can indicate the level of change.

Who can exercise: Health facilities (Hospital, health center and health posts)

Frequency: Monthly

Data quality dimension addressed: Internal consistency of reported data; (Consistency of reported data and original records)

Steps to carryout LQAS:

Step 1: Decide the month for which you want to do the data accuracy check.

Step 2: Pre-fix the level of data accuracy that you are expecting, e.g. 85% or 90% etc.

Step 3: Put serial numbers against the data elements (not disaggregation) in the Service Delivery or Disease Report that you want to include in the data accuracy check

Step 4: Generate twelve random numbers using the Excel program. These random numbers represent the serial numbers of the data elements included in the data accuracy check. Note them in the Column of the Data Accuracy Check Sheet. This is to ensure representation of all data elements by giving equal chance to all data elements.

Step 5: List down the selected data elements from the report on to the Data Accuracy Check Sheet in Column 2 and Column 3

Step 6: Write down the reported figures from the Monthly HMIS Report for the selected data elements in the Column 4 of the Data Accuracy Check Sheet.

Note: In case of Health Post, figures for the selected data elements from the Tally sheet will be compared with recounted figures from the Family Folders. Therefore, record the figures for the selected data elements from the Tally sheet in Column 5.

Step 7: Recount the figure from the corresponding registers and note the figures on Column 5 of the LQAS check-sheet

Step 8: If the figures for a particular data element match or do not match, put "yes" or "no" accordingly in Column 6 or Column 7 respectively.

Step 9: Count the total number of "yes" and "no" at the end of the table

Step 10: Match the total number of "yes" with the LQAS Decision Rule table and determine the level of data accuracy achieving the expected target or not.

The health workers should do a LQAS check by repeating the same procedure after having the revised report. However, the first LQAS score should be reported in the monthly report format and the health facility should keep the record of both LQAS accuracy sheets on the PMT minute book (Data quality Log book). The health facilities should monitor the trend of LQAS across months to see the changes over time.

Using LQAS Data Accuracy Check sheet and decision rules in the table below

Questions

- How many data elements on the table (annexed) show that they match?
- What is the data accuracy level achieved?
- Does that level meet the desired data accuracy level?
- Based on the data accuracy level, what will you do as the next step?

Exercise:

Random No.	Reporting Element	Figures from			Does the figure from the source documents match?	
		Report	Tally	Register	Yes	No
(1)	(3)	(4)	(5)	(6)	(7)	(8)
1	Repeat Acceptors	14		14		
2	Deliveries attended by skilled health personnel	52		32		
10	Fully Immunized infants <1 yrs. of age	12	15	15		
18	2-5 years age group who de-wormed	26		26		
8	Measles doses given < 1 year of age	8	8	8		
20	Live birth	32		28		
5	Number of newborns weighed	28		28		

35	Number of weights recorded with severe malnutrition	78	80	80		
40	Pregnant mothers linked based on option B+ for the first time	0		0		
65	Early PNC within 0-48 hours	4		4		
5	Vitamin-A supplementation for 6-59 months of age	2		2		
12	Early neonatal death in the first 24hr	11		14		
Total number of "Yes" or "No"						

Decision Rules for sample Sizes of 12 and Coverage Targets /Average of 20-95%																
Sample size	Average Coverage (baselines)/Annual Coverage Targets (monitoring and Evaluations)															
	<20%	20%	25%	30%	35%	40%	45%	55%	60%	65%	70%	75%	80%	85%	90%	95%
12	N/A	1	1	2	2	3	4	5	6	7	7	8	8	9	10	11

Decision Rules

Please note that Health Facilities will maintain a registry to record the data accuracy check results. The HMIS focal persons will also use it for recording the data accuracy check during their supportive supervision visits.

Visual Scanning (Eyeballing)

It is a simple method used at health facilities to check for consistency of reports before/ after conducting data entry. The PMT members sit together and look across each line and then from top to bottom to identify missing data values, unexpected fluctuations beyond maximum/minimum values, inconsistencies between linked data elements, and for mathematical errors.

Examples:

- Number of children who have been vaccinated vs the number of antigens that has been taken

Frequency: Whenever the report is generated, the health care provider should have to review the documents.

Data quality dimensions addressed by visual scanning:

- Presence of outlier
- Data completeness
- Internal consistency between indicators

8.3.1. Data Verifications at the primary health care unit level

Data Verifications at the primary health care unit level basically focus on verifying coverage data sent by the health unit level. Primary health care unit coverage data on the number of immunizations provided tothe community is sent to the district on the PHCU monthly or quarterly reports. The data is potentially verifiable from the following sources:

- immunizations recorded in an immunization register;
- immunizations tallied on a form;
- monitoring charts describing the progress of the coverage of the PHCU throughout the year;
- meeting reports, feedback or feed-forward forms describing achievements.

Accuracy of the PHCU sources can also be checked and bring useful information on the correct use of one or the other tool.For example, the verification of tally sheets against registers could lead to the finding that a higher number of tallied vaccinations are due to the poor recording in the registers.

8.3.2. Verifying in the community the accuracy of the recorded information available in a health unit

The only verifiable recorded information on individual vaccinations is the coverage information recorded on an immunization register. The principle is to check for discrepancies between infants or mothers vaccinated according to the register and those according to the child vaccination card (or mother vaccination card).

The exercise is not only useful in detecting overreporting or underreporting but also allows examination of the correct recording of immunization cards. It can also assess the proper use of the immunization register and allow an estimation of valid doses (i.e. doses given at the right time and with a proper interval).

In situations where the child was indeed vaccinated but the date put on the register was systematically wrong (for example because the health worker puts the date of planned vaccination instead of the actual date of vaccination), the exercise can provide an estimation of timely doses, i.e. given in the recommended time schedule, according to the information retrieved from the card.

The two following options can be proposed:

a) If the suspected problem is **overreporting** in the register, a sample of infants or mothers should be taken from the immunization register in the PHCUs. Then the assessor can search for the children/ mothers in the community to verify the information recorded (antigen, date of vaccination, etc).

b) If the suspected problem is **underreporting** in the register, a sample of children or mothers should be taken from the community. The assessor takes the available information (antigen and date of vaccination) from the immunization cards of the children or mother and verifies it later in the PHCU register.

Card retention in the community may be a problem and the assessors need to agree on what to do in case of missing cards. It is recommended that the history of vaccination by parents' recall is used if a card is not available.

Similarly, the assessors need to think about which strategy to adopt if a child in the community cannot be retrieved – option a. Reasons may indeed include overreporting but also family move, temporary absence,etc. It is recommended to make every attempt (including contacting neighbors, administrative entities, etc.) to verify whether children recorded on a register exist.

In option b, the assessors should make sure that the vaccinations that are verified from immunization cards in the community have been provided by the selected PHCU(s) and not by other units so that they can potentially be retrieved in the registers.

Experience has shown that verification at the community level is a time-consuming exercise and a cheaper alternative can be to take infants coming to the PHCU. With this method, a balance is found between the number of children/mothers to be verified and the logistic and time constraints.

Selection of children/mothers in a register (option a)

A minimum of 5–10 children/mothers should be selected per PHCU. According to time and logistics, they can be selected from the register:

- from the same locality (to limit transportation costs) if the address is mentioned in the register;
- by retrieving x of the most recently immunized infants/mothers in the register (the most recent will be less likely to have moved from the area);
- by choosing randomly within a time period;
- or a combination of the above options.

Selection of children in the community (option b)

A minimum of 5–10 children/mothers should be selected per PHCU. According to time and logistics, they can be taken from the same locality (to limit transportation costs) or from different areas among the population covered by an PHCU. Once a village/area has been selected, it is recommended that the strategy developed in the immunization coverage cluster survey reference manual: Immunization coverage cluster survey reference manual (in print) is used to randomly retrieve the defined number of children/mothers. The age of the childrento be retrieved should be in the range of the children recorded in the register. For example, if the PHCU registers from the last three years are available, children 0–36 months could be

retrieved in the community. However, it is recommended that children 0–12 months are assessed (although taking one birth cohort only will take more time than several birth cohorts) in order to determine the current recording practice.

84. The measure (accuracy ratio/ verification factor)

Definition

The main quantitative measure of data accuracy is the ratio between the number of vaccinations verified or re-counted from a source at one level (numerator), compared to the number of vaccinations reported by that level to more central levels (denominator). This ratio gives the proportion of reported numbers that could be verified. It is expressed as a percentage. The antigen, the source of information and the time period will need to be defined.

Examples of accuracy ratios/ *verification factor (VF)*:

- ***Verifying coverage data sent by the PHCU level:***

=No. of re-counted DTP3 (0–11 months) in the HU register during given time period x 100

No. of DTP3 (0–11 months) reported in the HU reports found at the district level during same time period

- ***Verifying in the community the recorded information available in an HU:***

=No. of DTP3 doses recorded on immunization cards of children in the community x 100

No. of DTP3 doses recorded on the registers for the same children in the HU

Each time, the verified information (from the "lower" level in the data flow) is on the numerator and the reported information (retrieved from the "higher" level in the data flow) is on the denominator, so that:

- **a percentage < 100%** shows that not all reported information could be verified;
- **a percentage > 100%** shows that more information was retrieved than was reported.
- For over reporting + or – 10% is acceptable margin
- For under reporting use this decision rules

It is theoretically possible to develop several accuracy ratios, basically for each level and source assessed against another one. The assessment should focus on accuracy ratios that are most relevant in order to avoid confusion with a high number of different accuracy ratios.

0%	-75%	-85%	5%
Catastrophic level of under-reporting	evere under-reporting	oderate level of under-reporting	Acceptable

Interpretation

Possible reasons for low verification: accuracy ratio < 100%

Overreporting

- Intentional
  - Often linked with pressure from a higher level
- Non intentional
  - Inclusion of vaccination conducted outside target group
  - Reporting of doses used instead of immunizations
  - No use of standard tools to adequately report the daily number of immunizations performed
  - Transcription or calculation error

Loss of verifiable information

Possible reasons for very high verification: accuracy ratio > 100%

Underreporting

- Reports not complete at the time of forwarding
- No use of standard tools to adequately report the daily number of immunizations performed
- Transcription or calculation error

Loss of information

Exercise 8.6 data verifications at the Service Delivery Sites: - Verify reported data against recounted from registers

Indicators	Description	HF1	HF 2	HF3	HF4	HF5	HF6	HF7	ΣA / ΣB	VF= A/B
Penta 3	Recounted=A	25	45	30	12	20	10	0	142	
	Reported=B	38	59	30	16	15	13	0	171	
Measles	Recounted=A	20	55	34	54	45	25	92	325	
	Reported=B	12	42	23	22	95	36	47	277	

Data triangulation

- **Data triangulation** has been used with increasing frequency in the EPI field, used to compare coverage figures according to various data sources.
    - e.g., administrative reporting vs. survey, logistic, surveillance).
- **Data triangulation** also encourages deeper insight into the phenomena of interest through making sense of complementary information and integrating knowledge of the broader context and underlying process.
- Health care workers can perform data triangulation at their level computing immunization performance with logistics

Key Steps for data triangulation at service delivery point

- **Step 1:** Extract routine immunization DHIS 2/ COVAX data, Logistics(vaccine stock monitoring book,) and surveillance(weekly/monthly VPD report, case based report, lin list data)
- **Step 2:** Cleanup the raw data for data triangulation Exercise
- **Step 3.** Analyze the data by comparing Admin, Logistics and surveillance data
- **Step 4.** Interpretation
- **Step 5**: Develop action plan

The overall goal of **data quality improvement** is to improve data quality at all levels in the health system, by upgrading knowledge, skills, and attitude of health care workers, health information managers, and administrators at all levels on techniques of improving quality of healthcare data in all its dimensions.

Common data quality problems

- •Different people supply different answers to the same question.
- •Data are not collected in a standardized way or objectively measured.
- •Staff suspects that the information is unreliable, but they have no way of proving it.
- •There are parallel data systems to collect the same indicator.
- •Data management operational processes are not documented.
- •Data collection and reporting tools are not standardized; different groups have their own formats.
- •Too many resources (money, time, and effort) are allocated to investigate and correct faults after the fact.
- •Mistakes are spotted by external stakeholders (during audits).

8.5. Immunization program data analysis and use

Data collected and summarized in reports are useful only when analyzed and interpreted regularly and used to improve service delivery. This section describes the initial analysis of monitoring data that begins at the health facility level.

Compiling coverage data

To analyze data, it is necessary to compile data properly by area. The following steps provide a simple way of compiling data for analysis. Table xx provides a simple way of compiling and analyzing data.

1. List each geographic area or community that you serve (column a).
2. List the target population numbers for infants <1 year (column b).
3. Enter the number of doses of vaccine administered to the target age group during the preceding 12-month period, for example for DTP1, DTP3, and Measles (columns c to e)

Table 8.7Compilation and analyses of health facility data

	Compile population immunization coverage data in the previous 12 months							Analyse problem							prioritize area
	Target population	Dose of vaccine administered			Immunization coverage			Unimmunized(No.)		Dropout rate		Identifay problem		Catagorize problem according to table 7.4	
Area Name	<1year	DTP1	DTP3	Measles	DTP1	DTP3	Measles	DTP3	Measles	DTP 1-DTP3	DTP1-Measles	Access	utilization	category 1234	priority 123
a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p

Immunization coverage calculation

To calculate immunization coverage, divide the total number of immunizations given over the preceding 12-month period by the target population.

Use the formula below:

Annual coverage for childhood immunizations =Number of infants under one year of age receiving all required doses for selected Vaccine/ Target population of infants under one year of age or live births X 100

Number of unvaccinated children calculation

For Penta1 = target population MINUS number of children vaccinated with Penta1

For Penta3 = target population MINUS number of children vaccinated with Penta3

For Measles 1 = target population MINUS number of children vaccinated with MCV1

For Measles 2 = target population MINUS number of children vaccinated with MCV2

Penta1-Penta3 Dropout Rate = # of doses of Penta1 minus # of doses of Penta3 for the same period divided by # doses of Penta1 in the same period multiplied by 100.

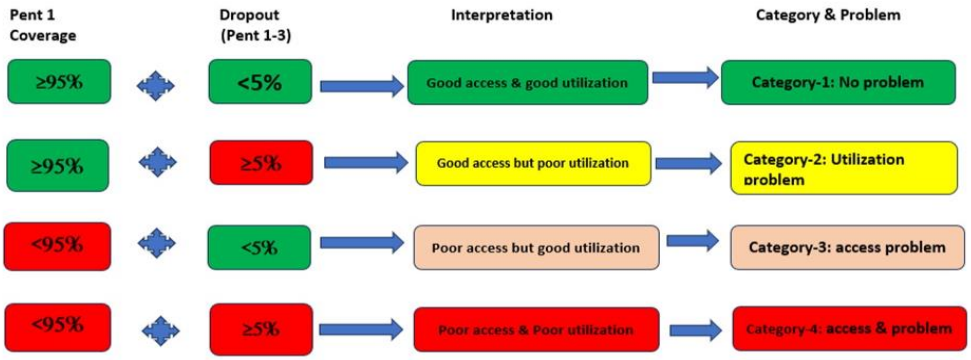
Penta1-MCV1 Dropout Rate = number of doses of Penta1 minus number of doses of MCV1 for the same period divided by number of doses of Penta1 in the same period multiplied by 100.

MCV1-MCV2 Dropout Rate = number of doses of MCV1 minus number of doses of MCV2 for the same period divided by number of doses of MCV1 in the same period multiplied by 100.

Immunization data use

It is important to understand whether communities are accessing and utilizing immunization services. Analyze access to and utilization of services by using the RED Categorization tool (see Table below). Use Penta1 for coverage and Penta1 to Penta 3 to estimate dropout rates. By cross-tabulating coverage and dropout rates (DOR), access to and utilization of services can be assessed as demonstrated in the algorithm below.

Table 8.8: RED Categorization Tool



Use of RED categorization to prioritize areas or health facilities.

The institutional/facility performance review team or quality improvement team can use different tools like a fishbone diagram (see Annex) to identify the root causes of poor access to and utilization of immunization services. Work with the Quality Improvement Team (or performance improvement team) to identify solutions and people to implement the solution.

Exercise (20 Minutes)

Comprehensive immunization data analysis on four health facilities was conducted. The findings were as follows:

Health Facility name	Penta 1 coverage	Penta 1- 3 dropout
X	63%	5%
Y	83%	20%
Z	95%	2%
W	21%	30%

Based on the above data, what would be the category and problem of each facility? Which health facility is the best performing and which one is the least performing?

Fishbone Diagram to Identify Root Causes and Effective Solutions

What it is: A fishbone diagram is a way to map out a problem's root causes. This enables teams to address the root cause rather than focusing on symptoms.

Why do it: To identify the sources (root causes) of a problem, which helps teams to develop lasting solutions.

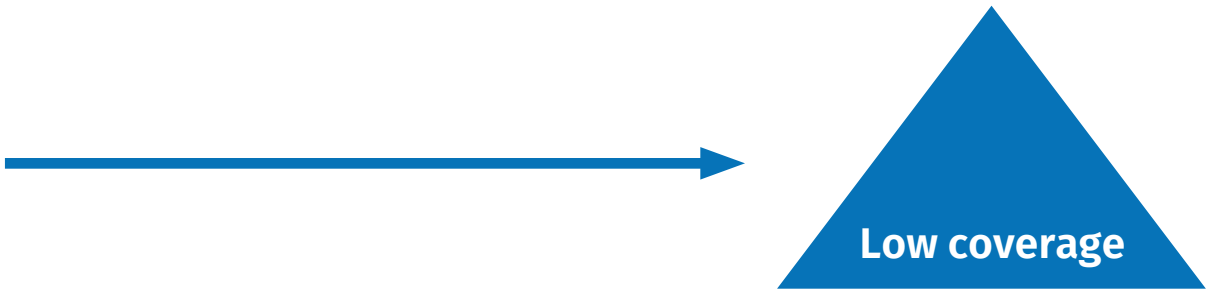
Who should do it: A small, focused team (e.g., HEWs, nurses, EPI focal persons, and others who experience or are affected by the problem). Other possible team members:

- QIT/PRT members, including community leaders and members.
- Managers who have insight into the problem, a role in solving the problem, or facilitation skills to help move the process along.

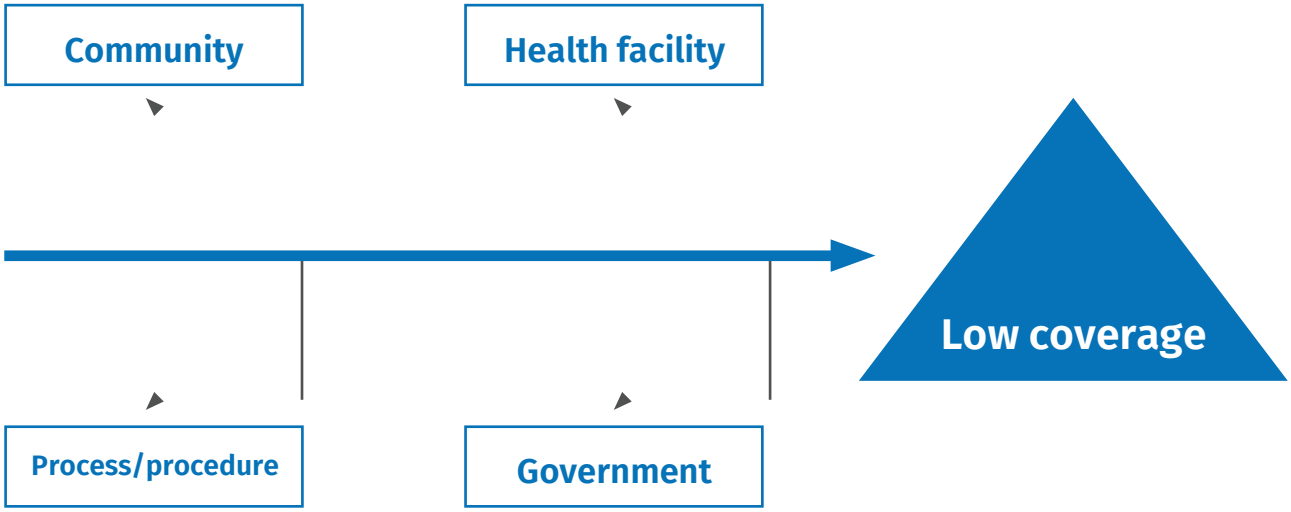
How to do it:

A) Draft a clear **problem statement** that all team members agree to.

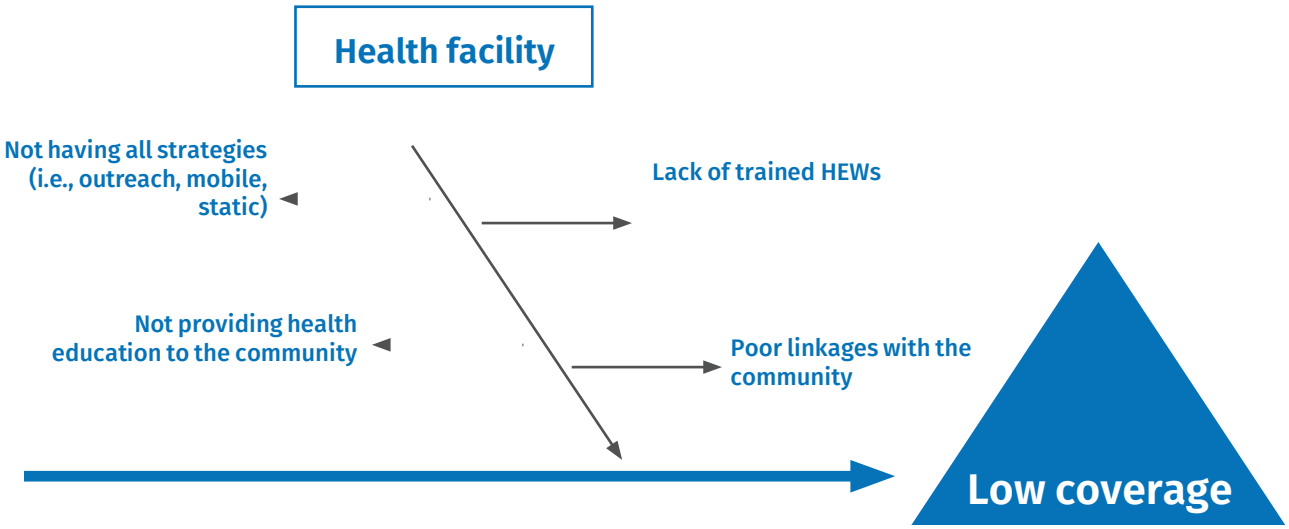
Write the problem statement in the head of the "fish." Draw a line with an arrow toward the head—this is the fish's "backbone." Inthe example shown here, the problem is **low coverage.**



B) Brainstorm **major categories** of issues that might be part of the problem. Connect them to the backbone as "ribs." Common categories include the health system, geography, materials, policies, environment, culture/tradition, methods, and information.



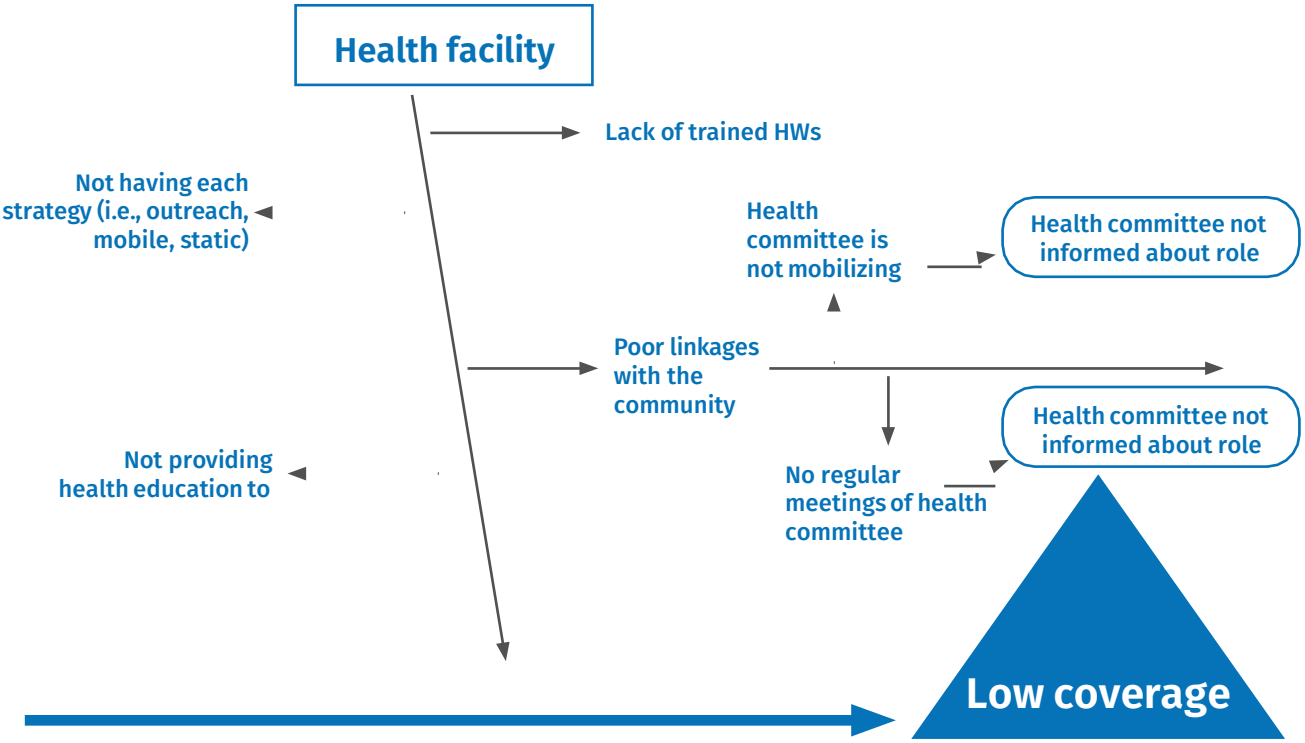
C) For each category, brainstorm contributing factors (i.e., possible causes of the problem). (Or choose one category where you know the group can act.) Attach each contributing factor to the appropriate rib (category). Some contributing factors may fit into multiple categories.



D) Push to identify deeper causes. You may end up with several branches on each successively smaller rib. Continue to go deeper for a clear understanding. Ask "why" two to five times, as in the example below.

E) Identify the main reasons/root causes by looking for causes that appear more than once. Addressing the root cause can affect many contributing factors and have far-reaching effects.

- In the example below, "Health committee not informed about their role" seems to be a good root cause to address.
- Factors to consider regarding which main reason/root cause to address include:
- The likely impact of addressing that root cause (the greater the likely impact, the more important it is to address).
- How difficult it will be to address the root cause.
- The available resource to address the root cause.
- Whether there is a logical order in which to address the root causes.
- Finding an appropriate root cause to address may involve trial and error, as there may be multiple root causes to address.
- If the team decides to address a given root cause and the problem continues to occur, you have probably not identified the actual root cause.
- ask another look at the root causes and keep asking "Why?"



F) aDevelop and implement local solutions or try a different solution based on the identified root cause.

Select local solutions that are within your control and could make the situation better. Try to implement and test local solutions

Example:

The QIT / PRT identifies that in the past month, there was a high number of defaulters in xy village. The team discusses why this is happening and determines that the problem is that no one was assigned as social mobilizer for the village, so parents do not know when and where to go for vaccination services. Mr. Awol, from the QIT, volunteers to serve as a community mobilizer. He will work with the HEW to mobilize the community prior to the next outreach session

8.6. Lesson learned and best practice documentation

Case study:

High Penta dropout rate was the main problem in facility XY. The health care providers have analyzed the data and identified the root cause of the problem. They suggested a strategy to enhance their reach by working more closely with local non-health actorsand they reached the unreached communityand increased the performance.

What lesson can be learned from the XY facility?

What is a lessons learned document

Lessons learned is the knowledge gained from the process of conducting immunization service. Every important event, challenge, constraint, risk, and uncertainty faced during the immunization service delivery are documented in a lesson learned report along with the healthy and timely solutions used.

Why is it important to write a lesson learned report in PHCUs?

It is important to write a lesson learned report to record the desired outcomes and solutions to reference for all future Immunization service. In this regard, it helps in avoiding making the same mistakes again and to share experiences for future immunization activities.

Steps involved in documenting lessons learned

These following steps will help the health care providers to ensure whether they are accurately capturing, documenting, and sharing the immunization information in a way that everyone can access.

1. Identify

Organize and host an internal live brainstorming session with the PHCU director, MCH lead, EPI team and externally with all relevant stakeholders such as community members, partners. This is a chance for team members to expand upon their lessons learned. In particular, there are three main questions to ask during the lessons learned brainstorming session with regards to **KPIs, service quality, data quality assurance and implementing improvement plans**

- What went right?
- What went wrong?
- What could be improved?

2. Document

Create a detailed lessons learned report with all of the information and discussion notes for relevant stakeholders to review. The main points to consider here are ***what was happening before, the change encountered and its impact based on the available evidence.***

3. Analyze, organize and store the lesson learned document

Analyze and organize the document in a simple and descriptive way then store the lessons learned in the right place so they can be applied as well as shared with other health care providers.

4. Experience sharing among facilities both internally and externally

Knowledge management and experience sharing practices can help health professionals develop themselves and deliver quality health care services

8.7. Evidence based accountability

Case study: In XY facility, there are three vaccinators that reported three KPIs

Time allowed: 10 minutes

	Vaccinator A	Vaccinator B	Vaccinator C
Completeness	85%	90%	95%
Accuracy of data	50%	70%	95%
Timeliness of report	Not in time	In time	In time
Reliability	Not reliable	Not reliable	Reliable

Based on your judgment, which vaccinator would you award for their performance and who would you hold accountable?

Accountability entails the procedures and processes by which a health care provider justifies and takes responsibility for service provision. Immunization service providers should understand that accountability is not about blaming, getting angry or making others feel guilty. It's about finding solutions and working together to accomplish goals.

The basic steps to ensure the accountability,

8.7.1.1. Define who and how the health care provider is accountable for.

Immunization service providers need to clearly understand their expectations to achieve goals in terms of the KPIs and quality service provision. All HCP are accountable for the services they provide

8.7.1.2. Organizing data driven and Evidence based open discussions with supervisors and relevant stakeholders

After analyzing the data based on theKPIs and data quality parameters in terms completeness, timeliness, discrepancy, reliability and accuracy. The health care providers will identify the challenge, strength, lesson learned and set an improvement plan.

8.7.1.3. Creating a sense of accountability among the community

How to make the community accountable? Organizing community forums with community leaders, religious leaders, WDA, HDA and involving them in the activities to increase their sense of accountability.

8.7.14. Recognize and celebrate progress.

Identify, celebrate and learn from successes. It motivates health care providers to stretch and creates responsibility role models for others to follow.

88. Chapter Summary

- Monitoring and evaluation is key in improving the quality of the immunization program.
- There are various M&E recording and reporting tools which include immunization register, immunization card/passport, tally sheet, monitoring chart, defaulter tracking and tickler box, family folder, temperature monitoring chart, ledger book, AEFI listing, recording and investigating formats, vaccine session monitoring checklist, vaccine wastage monitoring etc..
- Data quality assurance is an important component of monitoring and evaluation. Ensuring data quality is necessary to bring about good quality service.
- There are various data quality assurance tools which include Data Quality self assessment, LQAS, data triangulation
- Data that is collected needs to be analyzed and interpreted regularly to improve the quality of immunization service. eg calculation of coverage rates, calculating the number of unvaccinated children, calculating dropout rate.
- There are some techniques for analysis, for example, RED categorization and prioritization and root cause analysis.
- It is important to write a lesson learned report to record the desired outcomes and solutions to use as a reference for all future Immunization service
- Accountability entails the procedures and processes by which a health care provider justifies and takes responsibility for service provision.
- Accountability is not only about blaming, or making others feel guilt; it is about finding solutions and working together to accomplish goals.

List of Annexes

Annex 1: Sub Kebele Level Inventory Form K1

Kebele Inventory Form																														Name of hard to reach area
Region:									Zone:							Woreda:		Kebele:								Date of Compilation:				
Sub-Kebele Name	Target Population									Sub-Kebele contact person	Distance from Kebele	Type		# Health Facility				# Functional EPI Sites			Ttransportation Access? (yes=1, No=0)	# Functional Cold chain Equipment				# staff trained				
	Total Population	Live birth	Surviving infant	12-23 months	24-59 months	Girls (9 Yrs)	Preg. Women	Non Pregnant	Target (12 years and			Rural	Urban	Hos	HC	HP	Total	Fixed	OR	Mobile	Car	Motor bike	Refrigerator (Functional)	Refrigerator (Non functional)	Cold box	V. Carrier	IIP	IRT	Cold Chain	
Total																														
Name of coordinator:																														

Annex 2: Sub Kebele Session Plan Form K2

	Sub-Kebele Session planning													
Date filled in:_____Region:_____Woreda:_____Health Facility:_____ Form K2														

Name of the site (fixed, outreach mobile) for service delivery			Target Population per year						Distance or time to vaccination post (km or minutes)	# injections per year	Other key MNCH activities for integration (e.g. Vit, de-worming, screening)	Session type	Sessions		
	Live birth	SI	12-23 months	24-59 months	HPV target	PW	NPW	Target(12 years and above)				F, OR & M	#per year	#per month	Day of Session
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P

Annex 3: Sub Kebele Level Data Analysis Form K3

		Sub Kebele Data Analysis Summary form																Data of_____										Form K3
Region:					**Zone:**						**Woreda:**							**Kebele**										
Sub Kebele Name	**Total Pop**	**Surviving Infant**	**12-23 Months**	**HPV target**	**Doses of vaccine administered**						**Immunization Coverage (%)**						**Analyse problem**												
																	Unimmunized (No.)					**Drop-out rates**		**Identify & categorize Problems**			**Are there significant # VPDs?**	**Are there significant # of high irsk pop?**	**Are there significant # of unimmunized ?**	**Priority/rank (1,,2,3,4)**
					Penta1	**Penta3**	**MCV1**	**MCV2**	**HPV**	**Td2+**	**Penta1**	**Penta3**	**MCV1**	**MCV2**	**HPV**	**Td2+**	**Penta3**	**MCV1**	**MCV2**	**HPV**	**Td2+**	**P1-P3**		**Access**	**Utilization**	**Category; 1,2,3,4**				
	a	b	c	d	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	ab	ac	ad	ae	af	ag	ah
Total																														
Category																														
1 = No problem,; drop-out rates low(<5%) , coverage (access) high (DPT1 > 95%) based on regional context																														
2 = Utilization Problem; drop-out rates high, coverage (access) high.																														
3 = Access Problem; drop-out rates low, coverage (access) low.																														
4 = Both Access and Utilization Problem; drop-out rates high, coverage (access) low.																														
Priority																														
Category 4=Priority 1																														
Category 3=Priority 2																														
Category 2=Priority 3																														
Category 1=Priority 4																														

Annex 4: Kebele Level Session Monitoring Form K4

Annual RI workplan

Region/Zone:_____**Woreda:**_____**Health Facility:** _____ **Form K4**

Name of service delivery site	Session plan (F, OR, M)		July	August	Septembe	October	Novembe	Decembe	January	February	March	April	May	June
	Static	*# of Session* scheduled												
		# of Session held												
	Outreach 1	Date scheduled												
		Date held												
	Outreach 2	Date scheduled												
		Date held												
	Outreach 3	Date scheduled												
		Date held												
	Mobie 1	Date scheduled												
		Date held												
	Mobile 2	Date scheduled												
		Date held												
	Mobile 3	Date scheduled												
		Date held												
Grand Total		Total planned in the month												
Total held in the month														

Date:	Kebele Name_____village Name_____
Distance from health center/HP (in km):	Health center/ HP name:

Annex 5: Micro-planning budget and other resource Form HFs

PHCU/HC Inventory summary Form

Form Cluster 1

Name of hard to reach area

Region: | Zone: | Woreda: | Cluster/HC: | Date of Compilation:_____

Kebele Name	Target Population									Kebele contact person	Distance from PHCU	Type		# Health Facility				# Functional EPI Sites			Ttransportation Access? (yes=1, No=0)		# Functional Cold chain Equipment				# staff trained			
	Total Population	Live birth	Surviving infant	12-23 months	24-59 months	Girls (9 Yrs)	Preg. Women	Non Pregnant W…	Target (12 years and …			Rural	Urban	Hos	HC	HP	Total	Fixed	OR	Mobile	Car	Motor bike	Refrigerator (Functional)	Refrigerator (Non functional)	Cold box	V. Carrier	IIP	IRT	Cold Chain	
Total																														

Name of coordinator:

Annex 6: Household immunization status questionnaire assessing children aged 12–23 months.

	Tally	Total
Number of visited households with children 12–23 months of age		
Total number of children 12–23 months of age		

Number of children with immunization cards				
Immunization status of child	From card – tally		By recall – tally	Total
Fully immunized for age				
Partially immunized				
Never Immunized				

For each child who is partially or never immunized, ask only one question – "Why was the child not fully immunized?" Then mark an "x" next to the reason that best matches the answer given

Lack of information	unaware of need for immunization																
	unaware of need to return for 2nd or 3rd dose																
	place &/or time of immunization unknown																
	fear of adverse reactions																
	incorrect ideas about contraindications																
	Other																
Obstacles	place of immunization too far																
	time of immunization inconvenient																
	vaccinator absent																
	vaccine not available																
	caregiver too busy																
	family problem, including illness of caregiver																
	child ill – not taken for immunization																
	child ill – taken for immunization but not vaccinated																
	long waiting time																
	Other																

Annex 7: Community Discussion Guide

Community Description	
Distance From Health center -km and time	
Total population from health center data	
Total population from community leaders' information	
Results Of Household Immunization Status Questionnaire*	
Number of children 12-23 months of age partially or never immunized	
Discussion With Caregivers (done after completing the household survey)– suggested questions:	
Where Do You Get Immunizations? (Outreach/fixed/ mobile /other)	
Where Was Your Last Child delivered?	
If at home, what was your main reason for not using a health facility?	
Where do you take sick children? (Traditional healer/HC/HP/private/other)	
How Much Does It Cost to Travel the HC/PHCU catchment area?	
Do you have to pay any fees at the HC/PHCU catchment area facilities for immunization?	
When was the last outreach visit from the health facility to your community?	
What do you think the health facility can do to get children fully immunized?	
When was your home last visited by the health extension workers?	
Are you informed in advance of outreach sessions?	
Discussion With Health Extension Worker(s)–suggested questions:	
What Supplies challenge do you have in the HP? (Vaccine, ORS, antibiotics, paracetamol, antimalarials, etc.)	
Do You Have Mobile phones?	
Do you provide immunization outreach service in your catchment? If no way?	
How are the communities you work with informed about an outreach session before and on the day the session?	
When Did You Last Receive Any training?	
Do you conduct identification of zero dose/never vaccinated children in your locality and link to the nearby health facility?	
Do you do defaulter tracing and follow up for the immunization program?	
Do you conduct identification of pregnant mothers and linkage with the nearby health facility?	
Discussions With Community Leader(s)–suggested questions:	
What do you see as the main health problems in your community?	
How Can the Health facility improve services for the community?	

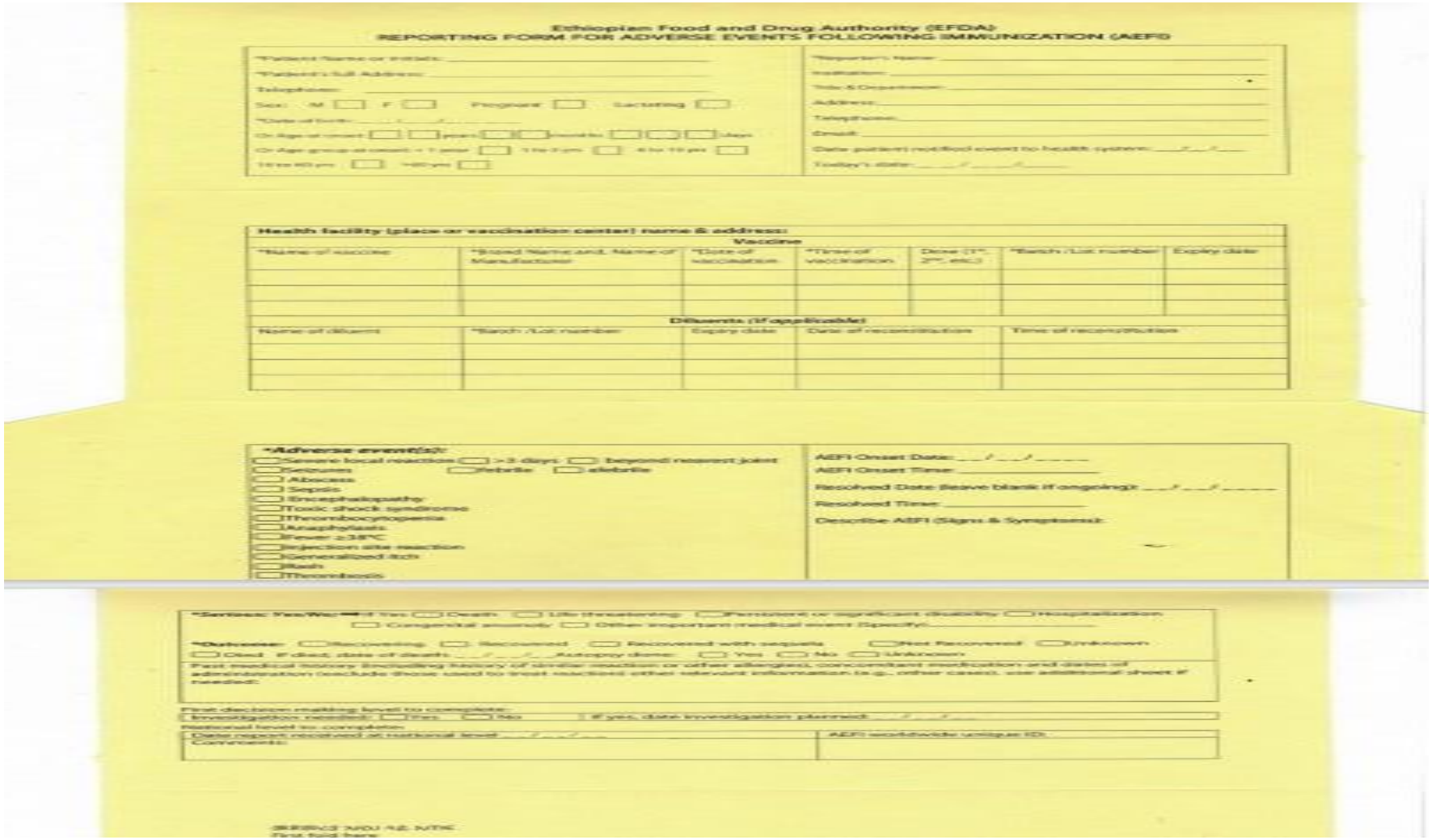
Annex 8: Work Plan Template

S.no	Activities	Where	Who is responsible?	When									
				J	A	S	O	N	D	J	F	M	Ap
1	Community Mobilization for vaccination	OR	HC staff	X	x	x	X	X	x	X	x	x	X
2	Defaulter tracing	OR	HC staff	X		X		X		X		X	
3	Refresher training of HF staff	HC	HC head			X			x				X
4	Supervision of HPs	HPs	HC	x	x	x	x	X	x	x	x	x	X
5	Review meeting with HC and HP staff	HC	HF staff	x	x	x	x	X	x	x	x	x	X
6	Supply collection & distribution			X	X	X	X	X	X	X	X	X	X
7	Submission of monthly report		HC			x			x			x	
8	Collection of vaccine and injection materials		HC	x	x	x	x	X	x	x	x	x	X

Annex 9: Root Cause Analysis form

	PHCU/HC EPI Micro-Planning: Root Cause Analysis					Form Cluster 2
Region: _____		Zone: _____		Woreda: _____	HC:____	Date of compilation:
Major Problems:						
System components/ link to social barriersManagement	Problems identified	Root Causes of problems (Fishbone analysis)	SOLUTIONS with available resources	SOLUTIONS with extra resources	Possible time line	Respopnsible person
Reaching target population (sessions, reaching the unreached) 2nd yr of life, girls (HPV), women (TT), etc						
Supportive Supervision						
Engaging communities						
Monitoring & use of data for action						
Planning and management of resources						
Cold chain & vaccine management						
Are Key interventions integrated with immunization & planned carefully to optimize the services?						
Surveillance						

Annex 10: Yellow AEFI Standard Reporting Format



Ethiopian Food and Drug Authority (EFDA)
REPORTING FORM FOR ADVERSE EVENTS FOLLOWING IMMUNIZATION (AEFI)

Health facility (place or vaccination center) name & address:

Vaccine						
*Name of vaccine	*Brand Name and Name of Manufacturer	*Date of vaccination	*Time of vaccination	Dose (1st, 2nd, etc.)	*Batch /Lot number	Expiry date

Diluents (if applicable)				
Name of diluent	*Batch /Lot number	Expiry date	Date of reconstitution	Time of reconstitution

*Adverse event(s):
- Severe local reaction (>3 days; beyond nearest joint)
- Seizures; Febrile; Afebrile
- Abscess
- Sepsis
- Encephalopathy
- Toxic shock syndrome
- Thrombocytopenia
- Anaphylaxis
- Fever ≥39°C
- Injection site reaction
- Generalized itch
- Rash
- Thrombosis

AEFI Onset Date: ___/___/_____
AEFI Onset Time: _____
Resolved Date (leave blank if ongoing): ___/___/_____
Resolved Time: _____
Describe AEFI (Signs & Symptoms):

*Serious: Yes/No? Yes; Death; Life threatening; Persistent or significant disability; Hospitalization; Congenital anomaly; Other important medical event (Specify): _____

*Outcome: Recovering; Recovered; Recovered with sequela; Not Recovered; Unknown; Died; If died, date of death: ___/___/___; Autopsy done: Yes; No; Unknown

Past medical history (including history of similar reaction or other allergies), concomitant medication and dates of administration (exclude those used to treat reaction) other relevant information (e.g., other cases), use additional sheet if needed:

First decision making level to complete:
Investigation needed: Yes; No; If yes, date investigation planned: ___/___/_____
National level to complete:

Date report received at national level: ___/___/___	AEFI worldwide unique ID:
Comments:	

Annex 11: AEFI Line list

S.No	Patent name	AEFI Reporting ID Number	Patient Location (Village /Town	Patient Location (District)	sex (m/F)	Pregnant (y/N)	Lactatng (Y/N)	Age (date of Birth or	Vaccine/s Brand	Manufacture Nam	Dose	Vaccine Batch No	Diluent Batch No	Adverse Event	Place of Vaccination	Date of Vaccination (DOV)	Date of onset	Date of Notification(DON)	Date of Reporting (DOR)	*Serious (y/N)	Reasone for Serious	outcome	Autopsy Conuctd in Case	Reported by	Reporter Location 1	Reporter Location 2	Investigation Planned	Date Reported at National

Annex 12: - Weekly Disease Reporting Form (Outpatient and Inpatient Cases and Deaths) for HCs, Hospitals, WoHOs, ZHDs and RHBs (WRF)

Health Facility Name and Type		Woreda	
Zone		Region	
Start of week from Monday _____/_____/_____to Sunday_____/_____/_____ (day)(month)(Year in Gregorian Calendar)(day) (month)		WHO EPI-Week	_____

1. Record below the total number of cases and deaths for each disease/condition for the current week

Indicator		Out - Patient	In - Patient	
		Cases	Cases	Deaths
Total malaria cases				
Total malaria suspected fever cases tested by RDT or Microscopy				
Number of cases positive for malaria parasites (either by RDT or Microscopy)	P. falciparum			
	P. vivax			
Meningitis				
Dysentery				
Scabies				
Relapsing fever				
Severe Acute Malnutrition /MUAC < 11.5cm and/or Bilateral Edema in under 5 years children (new cases only)				
Moderate Acute Malnutrition: U5C				
Moderate Acute Malnutrition: PLW				
Diarrhea with dehydration in children less than 5 years of age				
Acute jaundice syndrome within 14 days of illness				
Severe pneumonia in children under 5 years age				
Diabetic Mellitus new cases				
HIV new cases				
Tuberculosis new cases				
Hypertension new cases				

RDT = Rapid Diagnostic Test; MUAC = mid upper arm circumference; PLW = Pregnant and lactating woman ; U5C = Under 5 years child

2. Summary for Immediately Notifiable Disease / Conditions: (Total cases and deaths reported on case-based forms or line lists during the reporting week)

Indicator	Out - Patient	In - Patient	
	Cases	Cases	Deaths
AFP/Polio			
Anthrax			
Cholera			
Dracunculiasis (Guinea worm)			
Chikungunya			
Adverse events following immunization (AEFI)			
Measles			
Neonatal Tetanus			
Human influenza caused by new subtype			
Suspected rabies exposure			
(Human) Rabies			
Dengue fever			
SARS			
Small pox			
Viral hemorrhagic fever			
Yellow fever			
COVID-19			
Monkeypox virus			
Rift Valley Fever			
Brucellosis			
Maternal death			
Perinatal death			
Obstetric fistula			
Other (specify)			

RDT = Rapid Diagnostic Test; MUAC = mid upper arm circumference; PLW = Pregnant and lactating woman ; U5C = Under 5 years child

3. Report timeliness and completeness (to be filled only by Woreda Health Office and Zone/Regional Health Bureaus/regional public health institutes)

Indicator	Government			NGO Health Facility	Private Health Facility	Others
	Health Post	Health Center	Hospital (Primary/ Secondary/Tertiary)			
Number of sites that are supposed to report weekly						
Number of sites that reported on time						

4. Any events notification from community members

Indicator	Number
Total number of notifications from community	
Total number of notifications fulfilling case definition utilized by HEWs	
Total number of notifications done within 30 minutes of detection	

Look at the trends, abnormal increase in cases, deaths, or case fatality ratios? Improving trends? Actions taken and Recommendations:

_____

_____

_____

Date sent by HF/Woreda/Zone/Region: _____ Date received at Woreda/Zone/Region: _____

Sent by: _____ Received by: _____

Annex 13: Case based Reporting Form (CRF)

Reporting Health Facility:_____					Reporting Woreda_____Zone _____			REGION: _____	
Disease type (put tick mark)	Anthrax	Cholera	Measles	Meningitis	Neonatal Telanus	Yellow Fever	Dengue Fever	Chikungunya	Others/Specify
Name of Patient:									
Date of Birth (DOB): / / (Day/Month/Year)					**Age (If DOB unknown):**		Month (if <12)		
Sex:		Write M for Male F for Female							
Patient's Address:	**Kebele:**				**House number:**				
Woreda:		**Zone:**			**Region:**				
Locating Information	Location when symptom started				Current location				
	If applicable or if the patient is neonate or child, please write full name of mother and father of the patient								
Date seen at Health Facility: / /	**Date Health Facility notified Woredalzone:** / /				**Date of Onset:** / /				
Number of vaccine/TT doses received:	**For cases of NNT*, Measles, Yellow Fever, and Meningitis (For NNT, Measles, Yellow Fever – refer immunization card & for Meningitis - ask history)** ***For NNT cases please complete the additional case investigation form***								
Date of last vaccination:	/ / (NNT, Measles, cholera Yellow Fever and Meningitis only)								
Associated with epidemics?	1=YES 2= NO								
In/Out Patient	1=Inpatient				2=outpatient				
Treatment given	1=YES (specify)				2= NO				
Outcome of the patient at the time of report	1=Alive				2=Dead		3=Unknown		

Complete the following information and send a copy of this form to the corresponding Surveillance team						
ID Number:						
Date of specimen received:/Receiving laboratory:						
Type of specimen:	Stool	Blood	Serum	CSF	Throat swab	Other/specify
Specimen Condition:		Adequate		Not adequate		
Disease / Condition:						
Result:		+ = Positive		- = Negative		P = pending
Cholera direct exam, Culture; RDT, specify the method used:						
Meningitis: N meningitides	Culture					
	Latex					
	Gram stain					
Meningitis: S. pneumoniae	Culture					
	Latex					
	Gram stain					
Meningitis: H. influenzae	Culture					
	Latex					
	Gram stain					
Typhoid Fever	Widal ("O" > 1:160)					
	Blood culture					
	Stool culture					
Anthrax	Gram stain or culture					
Epidemic Typhus: Serum test(OX19)						
Result:		+ = Positive	- = Negative	I=Indeterminate		P=Pending
Viral Detection	Yellow fever (IgM)					
	Measles (IgM)					
	Rubella (IgM)					
	VHF (Ebola, lassa fever, Marburg, CCHF, RFV etc) (IgM)					
	Small pox (virus isolation)					

Annex 14: Case-based Laboratory Reporting Format (CLRF)

	Denque fever(RT-PCR)				
	Chikungunya(RT-PCR)				
	Others				
Other lab test (specify)	Results:				
Date lab results sent to corresponding surveillance team:			//		
Name of lab sending results:					
Name of lab technician sending the results:			Signature:		

Feedback: To be filled by result receiving entity

Date woreda/zone receive lab results://	Woreda/zone:
Date lab results sent to health facility by woreda/zone://	
Date lab results received at the health facility://	

Annex 15: Rumor logbook to register community notifications for health post level only

Record verbal/phone call, in person, written/SMS, social media and other source notifications of any public health risk rumors

Region_____ Zone_____ Woreda_____ Health center_____ Health post_____

Serial number	Date of Registration	Date condition began/onset	Date condition was seen by notifying person	Time of condition seen by the notifying person	Date of notification	Time of notification	Type of notified condition	Specific location/village of condition seen	Number of suspected cases notified	Date a condition was first seen at health facility	Tentative diagnosis given at health facility	Date the HEW verified the condition	Time of the HEW verified the condition	Date health facility was requested to investigate the condition by the HP	Date health facility investigated the condition	Result of investigation (verified, ruled out)	Date of intervention began by Health post	Date of intervention began by health center	Type of intervention begun by HP and HC	Comments/remark	Name and signature

Annex 16: Child Routine immunization Register

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MINISTRY OF HEALTH-ETHIOPIA

ROUTINE IMMUNIZATION REGISTER

Identification: Personal information: S.N	Infant's MRN	Name of infant	Date of Birth (DD/MM/YY)	Sex (M/F)	Name of mother	Mother's MRN	Address: Woreda: Kebele	Address: Gott: House Number	Registration: Reg. Date (DD/MM/YY)	Routine Immunization Register: Antigens received: Dose number	BCG (DD/MM/YY)	OPV (DD/MM/YY)	Hep Birth dose: within 24 hrs (DD/MM/YY)	Hep Birth dose: after24 and below 14 days (DD/MM/YY)	DPT-Hep-Hib (Pentavalent) (DD/MM/YY)	PCV (DD/MM/YY)	Rota (DD/MM/YY)	IPV (DD/MM/YY)	Measles (DD/MM/YY)	Fully immunized (√)	Neonatal tetanus protection: No. of Td doses Mother received in last pregnancy	Total No. of Td doses Mother received	Protected at birth (PAB) (√)	Associated services: Nutritional screening date (DD/MM/YY): Screened & linked to CMuS (√)	Development milestones assessment Write code	Remark/Appointment
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)
										0																
										1																
										2																
										3																
										0																
										1																
										2																
										3																
										0																
										1																
										2																
										3																

Development milestones assessment classification code (Col. 26)
NDD- No Developmental Delay
SDD -Suspected developmental delay
DD: -Developmental delay

Count # of children with	
NDD	
SDD	
DD	

Annex 17: Infant immunization tally sheet

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Infant Immunization Tally Sheet

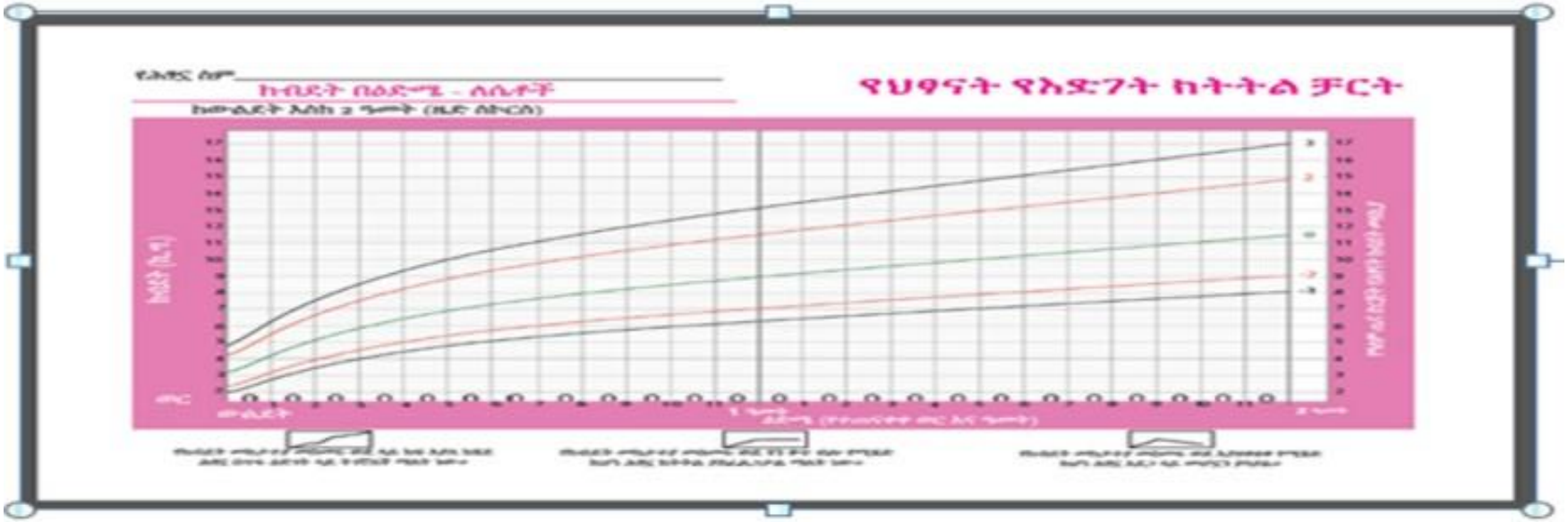
Woreda:_____ Facility: _____
Year:_____ Month:_____
Type of session: ☐ static ☐ Outreach ☐ Mobile

S.N	ANTIGEN	Under 1 year Childrens'		One year and older Childrens'		Total
		Tally	Count	Tally	Count	
1	BCG					
	HepB BD within 24 Hrs					
2	HepB BD after 24 Hrs-14 days					
2.1	Pentavalent 1					
2.2	Pentavalent 2					
2.3	Pentavalent 3					
3.1	OPV 1					
3.2	OPV 2					
3.3	OPV 3					
3.4	IPV 1					
3.5	IPV 2					
4.1	PCV 1					
4.2	PCV 2					
4.3	PCV 3					
5.1	Rota 1					
5.2	Rota 2					
6.1	Measles 1 (MCV1)					
6.2	Meseals 2 (MCV2)					
7	Fully immunized					
8	Protected at Birth from NNT (PAB)					
9	Td all doses given (Td1-Td5)					

	Doses	Tally	Count
1	Td1		
2	Td 2		
3	Td 3		
4	Td 4		
5	Td 5		

Annex 18: Child immunization card and Growth monitoring sheet

Annex 19: Weight for Age chart



Annex 20 Immunization Monitoring Chart

HF Name	M x 12=												
	M x 11=												10 %
Year	M x 10=												
	M x 9=												7 %
Total Population	M x 8=												
	M x 7=												
Conversion factor	M x 6=												5 %
	M x 5=												
<1 surviving infant	M x 4=												
	M x 3=												
Monthly Target	M x 2=												
	M x 1=												
		Hamle	Nehasie	Meskerem	Tikmit	Hidar	Tahisas	Tir	Yakatit	Magabit	Mayazia	Ginbot	Sane
Penta 1 coverage	Monthly												
	Cum. total												
Penta 3 coverage	Monthly												
	Cum. total												
Measles coverage	Monthly												
	Cum. total												
$P1\ to\ P3\ DOR = \frac{P1 - P3}{P1} x\ 100$	Monthly												
	Cum. total												
$P1\ to\ measles\ DOR = \frac{P1 - measles}{P1} x\ 100$	Monthly												
	Cum. total												
Unimmunized for P3= <1 surviving infant- immunized for P3	Monthly												
	Cum. total												

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Immunization In Practice

Participant Manual

September 2023