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

Pneumococcal Conjugate Vaccine (PCV10) switch to PCV13, Handbook for Health Workers; Ethiopia 2020

MOH Ethiopia
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Foreword

The Ministry of Health recognizes the crucial role of immunization contribution in reducing child morbidity and mortality and affirms its responsibility to ensure that every child is immunized and protected from vaccine preventable diseases. Expanded program for immunization (EPI) is one of the most cost-effective health interventions, with proven strategies to reach the most hard-to-reach and vulnerable populations, builds on the direction and planning of the Government's Health Sector Transformation Plan (HSTP). Measurable achievements in terms of reducing morbidity and mortality associated with vaccine preventable diseases (VPDs) have been documented since 1980, the national immunization program was commenced in Ethiopia. Today, the immunization program is managing more than 13 antigens and new vaccines such as the birth dose of Hepatitis B, Yellow Fever and Meningitis A are on pipeline.

Ethiopia introduced Pneumococcal conjugate vaccine (PCV10) of 2 dose vial into routine immunization in 2011 as a 3 dose primary schedule targeting infants under the age of 12 months with GlaxoSmithKline's (GSK's) called Synflorix. However, this 2 dose PCV10 vaccine will no longer be available in the market currently, the country is obliged to switch to the presently available WHO prequalified PCV vaccine. Among these WHO pre-qualified vaccines, the country preferred to switch to PCV13 of Pfizer product by taking in to consideration of various reasons and because it contains 3 more serotypes, namely 3, 6A, and 19A.

This switch hand book from 2 dose of PCV 10 to 4 dose of PCVB 13 is, therefore, prepared with the aim of giving clear understanding why Ethiopia switched PCV10 to PCV 13, to show differences between in PCV10 and PCV13, to provide clear guidance to health workers on how to implement PCV13 properly and to serve as a reference and training guide for program managers and Health workers.

The ministry of Health appreciates the role of partners and organizations and individuals for their technical contribution in the development of this hand book. The Ministry would also like to express its appreciation for the unreserved efforts of the EPI case team and other closely working partners for their inputs and constructive comments.

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Acknowledgement

The Federal Ministry of Health extends its sincere appreciation to all partners and stakeholders for their technical contributions during the development of this hand book.

This hand book was jointly developed by the involvement of staff from National EPI case team in MCH directorate and partner organizations.

Finally, we wish to express our appreciation to all immunization stakeholders for their willingness to support the planned switch of PCV10 into PCV13 in Ethiopia's EPI program.

Abbreviations /Acronyms

AEFI	Adverse Event Following Immunization
BCG	Bacillus, Calmette and Gu'erin
CSF	Cerebrospinal Fluid
DTP	Diphtheria, Tetanus oxoid, & Pertussis
DTP-HepB-Hib	DPT, Hepatitis B and Haemophilus
EDHS	Ethiopia Demographic and Health Survey
EPI	Expanded Program of Immunization
FAQ	Frequently Asked questions
GSK	Glaxo Smith Kline
HPV	Human Papilloma Virus
ICC	Inter agency coordination committee
IM	Intramuscular
IPD	Invasive Pneumococcal Disease
IPV	Inactivated polio vaccine
LB	Live Birth
MAC	Multi Age Cohort
MCV	Measles Containing Vaccine
MDVP	Multi-Dose Vial Policy
NITAG	National Immunization Technical Advisory Group
OPV	Oral Polio Vaccine
PCV	Pneumococcal Conjugate Vaccine
Td	Tetanus-diphtheria toxoid vaccine
UNICEF	United Nations Children's Fund
VVM	Vaccine Vial Monitor
WHO	World Health Organization

1. Introduction

Pneumococcal disease is the name given to a group of diseases caused by a bacterium called Streptococcus pneumonia, (also known as pneumococcus). Pneumococcal infection and disease can affect a variety of organ systems resulting in several diseases. Diseases caused by pneumococcus include 1) severe diseases such as pneumonia, meningitis and bacteraemia (presence of bacteria in the blood), and milder diseases such as middle ear infection (otitis media), sinusitis and bronchitis. Pneumonia is a very important health problem in children causing about 15-20% of deaths among young children. Meningitis is also among children can lead to life-long disability in 15-20% children—hearing loss, learning disability, and other physical disabilities. In 2000, about 14.5 million episodes of serious pneumococcal disease were estimated to occur globally. Of the estimated 8.8 million global annual deaths amongst children <5 years of age in 2008, WHO estimated that 541,000 (uncertainty range: 376,000-594,000) global child deaths due to pneumococcal (Streptococcus pneumoniae) infections among those under 5 years, of which 476,000 (uncertainty range: 333,000 – 529,000) occurred among HIV-negative children. Out of the estimated 5.83 million deaths among children < 5 years of age globally in 2015, a total of 294,000 were estimated to be caused by pneumococcal infections, of which >90% of these deaths occur in developing countries.

On average, globally about 75% of Invasive Pneumococcal Disease (IPD) cases and 83% of pneumococcal meningitis occur in children aged <2 years. Before widespread immunization with 7-valent pneumococcal conjugate vaccine, the mean annual incidence of IPD in children aged <2 years was 44.4/100 000 per year in Europe and 167/100 000 in the United States. In comparison, the annual incidence of IPD in children <2 years in Africa ranged from 60/100, 000 in South Africa prior to the HIV epidemic to 797/100 000 in Mozambique.

In developing countries, deaths from pneumococcal disease are common in children under 5 years. In industrialized countries, pneumococcal disease is also a common cause of death in the elderly. In developing countries, the contribution of pneumococcal disease to death in the elderly is not well quantified. Pneumococcus is not the only cause of pneumonia and meningitis. These can also be caused by other bacteria including Staphylococcus, Neisseria meningitidis, Haemophilus influenzae, and several viruses.

Pneumonia is one of the leading causes of morbidity and mortality among children under five years of age. According to the 2011 Ethiopia Demographic and Health Survey (EDHS) the under 5 mortality rate (U5MR) in 2010 was 88 per 1000 live births (LB). Before introduction of pneumococcal vaccine, pneumonia accounted for 28% of total under-five mortality in the country.

The purpose of this handbook is to use as a reference to train heath workers on and use as a guide during implementation of PCV10 2 dose vial to PCV13 4 dose vial switch in Ethiopia. The manual incorporates concepts on pneumococcal diseases and epidemiology, PCV vaccine management and administration, guides on implementation of the switch from PCV10 2 dose vial to PCV13 4 dose vial, and the technical knowledge, skills and practices of health workers require for proper handling and administration of PCV13 4 dose vial.

2. Rationale of the switch

Ethiopia introduced Pneumococcal conjugate vaccine (PCV10) of 2 dose vial into routine immunization in 2011 as a 3 dose primary schedule targeting infants under the age of 12 months with GlaxoSmithKline's (GSK's) called Synflorix. Because this currently available 2 dose PCV10 vaccine will no longer be available in the market, the country is obliged to switch to the presently available WHO prequalified PCV vaccine. Based on that the WHO prequalified PCVs are PCV10 2-dose vial, preservative free (no longer available in the market), PCV10 5-dose vial, with preservative2-PE and PCV13 4-dose vial, Preservative2-PE*. Among these WHO pre-qualified products, PCV10 of 5 dose and PCV13 of 4 dose Vial, the country preferred to switch to PCV13 of Pfizer product by taking in to consideration of various reasons and because it contains 3 more serotypes. Pneumosil (PCV10) Serum Institute of India (SII) product WHO prequalified has 10 serotypes, including 6A and 9A which is not included in previously available PCV10 vaccine, Synflorix), but missing the three serotypes 3, 4 and 18 C. 4 and 18C are present in PCV10/ Synflorix and PCV13, but PCV13 has 3 additional serotypes namely 3, 6A and 19A. PCV13 induces an immune response to serotype 3; Serotype distribution of the top 20 global serotypes causing invasive pneumococcal disease was one of the reasons for switch to 13.

Therefore, after thorough discussion with EPI partners and taking advice from National Immunization Technical Advisory group (NITAG), the Inter agency coordination committee (ICC) members has endorsed the switch to PCV13 4 dose vial.

3. Objective of the hand book

1. To give clear understanding why Ethiopia switched PCV10 to PCV 13
2. To show differences between in PCV10 and PCV13
3. To provide clear guidance to health workers on how to implement PCV13 properly;
4. To serve as a reference and training guide for program managers and Health workers

4. Pneumococcal disease

4.1. What are the common forms of pneumococcal disease?

Pneumococcus causes both severe and non-severe disease. Pneumococci frequently colonize the nose and throat asymptomatically; a high proportion of children carry these bacteria in their nose or throat at any given time. Sometimes, within an individual pneumococcus can spread from the nose and throat to the blood stream causing bacteraemia and then infect sites such as the meninges (lining of the brain). There are more than 90 known serotypes of S. pneumonia. Before the introduction of pneumococcal conjugate vaccines (PCVs), 6–11 serotypes accounted for ≥ 70% of all Invasive Pneumococcal Disease (IPD). Serotypes 1 and 5 are common causes of pneumococcal disease outbreaks and are particularly common in Africa and Asian settings. Serotype 14 was found to be the most common in all regions.

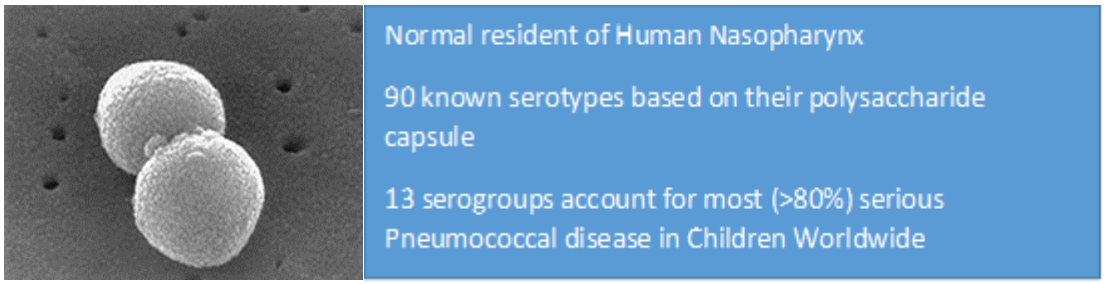

***Figure 1*: Known pneumococcal serotypes**

Most pneumococcal infections are mild. However, some can result in severe diseases with high fatality and long-term problems, such as brain damage or hearing loss. The most common severe form of pneumococcal disease is pneumonia. Less commonly, pneumococcus causes meningitis, which can be fatal or leave survivors with permanent disabilities. The less severe infections such as otitis media, sinusitis, and bronchitis all are much more common than pneumonia or meningitis, but not usually fatal.

Pneumococcus is classified in to sero-groups, there are over 90 known serotypes and the prevalence of the different serotypes varies by the regions of the world. The different serotypes also have differing potential to cause disease. The 13 most common serotypes of Pneumococcus cause over 80% of serious Pneumococcal disease in Children.

4.2. Transmission

Pneumococcus is transmitted by contact with respiratory secretions/droplets by coughing, sneezing, or close contact of people carrying pneumococcus in their nose or throat or by respiratory droplets spread or contact with surfaces contaminated with secretions. The noses and throats of up to 70 percent of healthy people contain pneumococcus at any given time.

The major sign and symptoms of pneumococcal diseases depend on the body organ affected. People who pneumococcal pneumonia develop fever with or without chills, cough, Rapid breathing, and chest wall in drawing. People with meningitis develop fever, headaches, sensitivity to light, neck stiffness, convulsions, and sometimes confusion or change in consciousness. People with septicaemia can develop fever, chills, change in consciousness, and septic shock. On the other people with mild disseises, like otitis media and sinusitis can have fever, pain and discharge from ears, pain at sinuses and/or discharge from nose.

4.3. Epidemiology

Children under 5 years of age and especially those under 2 years of age are most at risk of developing and dying from pneumococcal disease. Case fatality rates may be up to 20% for pneumonia, and as high as 50% for meningitis in developing countries. Lack of exclusive breastfeeding, nutritional deficiencies, and indoor air pollution are risk factors for pneumonia, including pneumococcal pneumonia, in infants and young children. Apart from the high

incidence in children <2 years of age, the risk for pneumococcal disease is increased in the elderly (>65 years of age), and in people who use tobacco or alcohol excessively. This risk is also increased in individuals who suffer from chronic medical conditions, such as heart disease, lung disease, diabetes, asplenia, chronic kidney disease or from other conditions that suppress the immune system, such as advanced HIV infection. Preceding infection with influenza virus is also a risk factor for pneumococcal pneumonia

4.4. How is pneumococcal disease diagnosed?

It can be difficult to diagnose pneumococcal diseases, particularly pneumococcal pneumonia. Pneumococcal infections are normally diagnosed through laboratory testing of the blood (for bacteraemia and bacteraemic pneumonias) or by performing a lumbar puncture, which involves inserting a needle into the spine to obtain a sample of cerebrospinal fluid or CSF (in the case of meningitis). However, pneumococcus is a difficult bacterium to detect and frequently goes undiagnosed even when blood or CSF samples are tested. Health workers diagnose Pneumococcal Pneumonia Clinically based on medical history, physical examination and radiological tests. A definitive diagnosis of Pneumococcal infection is made by isolating the bacterium from blood or other normally sterile body sites, such as CSF.

4.5. Treatment of Pneumococcal Disease

Pneumococcal disease, including pneumococcal pneumonia and pneumococcal meningitis, can be treated with antibiotics. The choice of antimicrobials and the duration of treatment depends on site of infection and pattern of susceptibility to antimicrobials. However, in many countries strains of pneumococcus are becoming resistant to some of the commonly used antibiotics. Pneumococcal infections which are resistant to these antibiotics require treatment using more expensive antibiotics such as cephalosporin and vancomycin, particularly when the resistant pneumococcal infection is meningitis

4.6. Prevention of Pneumococcal Disease

The risk of serious pneumococcal disease remains high throughout the first 24 months of life. Pneumococcal disease is associated with high mortality, especially when timely antibiotic treatment is not available. The risk of Pneumococcal disease can be reduced through Exclusive breast feeding for the first 6 months of age, improved nutrition, reduced indoor air pollution, Hand hygiene, early diagnosis and Treatment. Vaccination can prevent substantial mortality and morbidity, especially in the underserved populations of the poorer countries. Therefore, Vaccination is the most effective method of preventing Pneumococcal disease.

5. Pneumococcal Conjugate Vaccine

Pneumococcus has an outer polysaccharide (sugar) capsule. Many serotypes of pneumococcus exist and are based on the different types of capsule. Two types of pneumococcal vaccines available:

- Pneumococcal polysaccharide vaccines: which contain purified capsule of up to 23 serotypes of pneumococcus, but with short-term protection, and not very effective in infants and young children.
- Pneumococcal conjugate vaccines (PCV): Polysaccharide is bound to carrier protein. It provides Longer-lasting protection, more effective in children, and results in reduction in nasopharyngeal carriage, reduced pneumococcal transmission and better indirect protection.

5.1. What is Pneumococcal Conjugate Vaccine (PCV)?

Pneumococcal conjugate vaccine consists of polysaccharides from the capsule of the bacterium Streptococcus pneumoniae that are conjugated to a carrier protein. Unlike the pneumococcal polysaccharide vaccine, the pneumococcal conjugate vaccine protects children younger than 2 years of age. It protects against severe forms of pneumococcal disease, such as pneumonia, meningitis and bacteraemia. It will not protect against these conditions if they are caused by agents other than pneumococcus or by pneumococcal serotypes that are not present in the vaccine.

Two PCV products are currently licensed, pre-qualified by WHO, globally marketed and available with Gavi support: PCV10 manufactured by, GlaxoSmithKline (GSK) Marketed as Synflorix, and PCV13 manufactured by Pfizer Inc. Marketed as Prevenar-13.

5.2. Serotypes included in PCV13 products

Pneumococcal vaccine is highly effective. Pneumococcal vaccine protects against severe forms of pneumococcal disease, such as meningitis, pneumonia and bacteraemia. PCV10 2 covers 10 serotypes, plus two cross protection (serotypes 6A and 19).
PCV13 covers 13 serotypes, it contains all the serotypes included in PCV10 (1, 4, 5, 6B, 7F, 9V, 14, 18C, 19F, and 23F) are also included in the PCV13 product. The three additional serotypes found in PCV13 are types 3, 6A, and 19A. There is some evidence of cross-protection by 6B for 6A and by 19F for 19A of PCV10. PCV will not protect against infections caused by other agents than pneumococcus. Therefore, even after full immunization, a child may still get pneumonia or meningitis caused by other bacteria or viral infections.

Serotypes	1	3	4	5	6A	6B	7F	9V	14	18C	19A	19F	23F
Pneumosil (PCV10)	X			X	X	X	X	X	X		X	X	X
Prevenar 13 (PCV13)	X	X	X	X	X	X	X	X	X	X	X	X	X
Synflorix (PCV10)	X		X	X		X	X	X	X	X		X	X

Figure 2: Sero-protection of PCV vaccines

In summary, PCV13 has 3 additional serotypes, 3, 6A and 19A. PCV13 induces an immune response to serotype 3; PCV10 contains neither serotype 3 nor any cross-reactive serotype; and immunogenicity against serotype 3 is not measured in studies of this vaccine. Both PCV10 and PCV13 induce an antibody response to serotype 6A, which is included in PCV13 but not in PCV10.

Table 1: PCV13 vaccine product characteristics

Manufacturer	Pfizer
Trade name	Prevenar-13
Vaccine	13(PCV10 types plus types 3, 6A and 19A)
PCV13-dosevial, Preservative 2-PE*	Pfizer
Number of Serotype	1, 3, 4,5, 6A, 6B,7F,9V,14,18C,19A, 19F and 23F
Doses per vial /presentation	4 dose vial
Pharmaceutical form	Liquid
Administration	Intramuscular
Schedule	3
Available secondary carton	25 vials, 50 vials
Storage temperature	2-8°C, don't freeze
Shelf life at 2 - 8°C	24 months
volume per dose	3.5 cm^3 **per dose**
Vaccine vial monitor	VVM 30
Open vial handle guide line	Up to 28 days
Carrier protein	CRM 197 protein
Year Prequalified by WHO	2016
Wastage rate	8-10%
Current price per dose	$2.90

5.3. Immunogenicity Summary

Serotypes (STs) 3, 6A and 19A

Both PCV10 and PCV13 have been shown to be safe and effective and to have both direct (in Vaccinated individuals) and indirect (in unvaccinated individuals living in communities with Vaccinated Children) effects against Pneumococcal diseases caused by Vaccine serotypes when used in a three-dose schedule. According to WHO, both PCV10 and PCV13 have substantial impacts against Pneumonia, Vaccine-Type Invasive Pneumococcal Diseases and Nasopharyngeal carriage.

PCV13 is immunogenic (i.e. induces high concentrations of functional antibody) against Serotypes (STs) 3, 6A and 19A, the 3 additional serotypes in PCV13 but not in PCV10.

PCV10 induces increases in functional antibody against Serotypes 6A and 19A following the primary series, although the proportion of children achieving the correlate of efficacy is lower than that observed in infants receiving PCV13.

After booster dose >70% of PCV10 vaccinated infants have antibody concentrations above the efficacy correlate for both serotypes but the absolute concentrations remain lower than in PCV13-vaccinated infants.

6. What is the vaccination schedule for PCV13?

In Ethiopia the schedule for PCV1O is similar to that of Pentavalent (DTP-HepB-Hib) which is given at 6, 10 and 14 weeks, and the PCV13 schedule will be the same as that of PCV10 schedule.

When PCV10 is out of stock: Continue with PCV13 for remaining doses for those children who have already started with PCV10 to complete doses. Restarting a series with PCV13 is not recommended. For new arriving children start with PCV13 whole series

Table 2: National Immunization Schedule for Children under 2 Years of age and Women of Child Bearing Age

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
MCV1	At 9 months	0.5 ml	Sub-continuous	Left Upper Arm
MCV2	At 15-23 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	Oral	
IPV	14 weeks	0.5 ml	Intra-muscular	Right (outer) mid-thigh 2.5 cm apart from PCV injection site.

PCV	At 6 weeks, 10 weeks & 14 weeks	0.5 ml	Intra- muscular	Antero-lateral side of right mid-thigh
Rota	At 6 weeks and 10 weeks	1.5 ml	Oral	
Td	At first contact, 4 weeks after Td1, 6 months after Td2, one year after Td3 and one year after Td4	0.5 ml	Intra- muscular	Left Upper Arm
HPV	14-year-old girls until the MAC is completed. Then for 9 year old girls routinely	0.5ml	Intra- muscular	Left upper arm

6.1. What if a child is late for the dose?

Previously unvaccinated or incompletely vaccinated children should be vaccinated according to the recommended age-appropriate schedules. Interrupted schedules should be resumed without repeating the previous dose. Give the remaining dose at least one-month interval between doses.

6.2. Can a premature child be vaccinated?

Yes, prematurely born infants (i.e.<37 weeks gestation) should receive PCV at the recommended chronologic age concurrent with other routine vaccinations, unless there are contraindications as described in section 3.6.

6.3. What is recommended for children who are immune-deficient?

Regardless of the presence of underlying medical conditions (e.g., children with HIV infection, sickle cell disease or who are otherwise immune-compromised), the national schedule for administering PCV should be followed. In-fact these children are in particular need of PCV because their risk of invasive pneumococcal disease is high. PCV has been proven safe and well tolerated even among children infected with HIV.

6.4. How safe is PCV?

PCV is relatively safe and well tolerated; severe adverse reactions attributable to the vaccine are extremely rare. Mild side effects such as soreness at the injection site, and transient fever of ≥ 39^{o}C has been reported in less than 5% of vaccines. It is important to note that, as DTP-HepB-Hib vaccine may be given at the same visit as PCV, reactions following immunization cannot usually be ascribed to one product or another. It will be important to emphasize to parents that although this vaccine has an excellent safety profile, the side effects as stated below may occur.

6.5. What are common PCV side effects?

Local reactions have been reported in 10% - 20% of children receiving the vaccine. Of these, only about 3% were considered severe (for example, tenderness that interferes with arm or

leg movement). Some children also have transient fever. More severe reactions than these are extremely uncommon.

6.6. What are the contraindications to PCV?

Pneumococcal vaccine should not be given to anyone who has had anaphylactic reactions or severe allergic reactions to a prior dose or to any component of the vaccine, including diphtheria toxoid, which is also contained in pentavalent vaccine. Infants with a moderate or severe illness (high temperature ≥39°C) should not be vaccinated until they improve. Mild illness such as an upper respiratory tract infection is not a contraindication and children should be vaccinated.

6.7. How to give pneumococcal injection

Pneumococcal vaccines for infant is given by intramuscular (IM) injection in a dose of 0.5 ml. The PCV can be co-administered with other EPI vaccines. The vaccine cannot be mixed with other vaccines in the same syringe. If two injections are being given at the same immunization session, they should be administered at different injection sites - for example, as Pentavalent vaccine is given in the left upper outer thigh, then 0.5ml PCV13 injection should be given IM on the right upper outer thigh 2.5 cm apart from IPV Injection site.

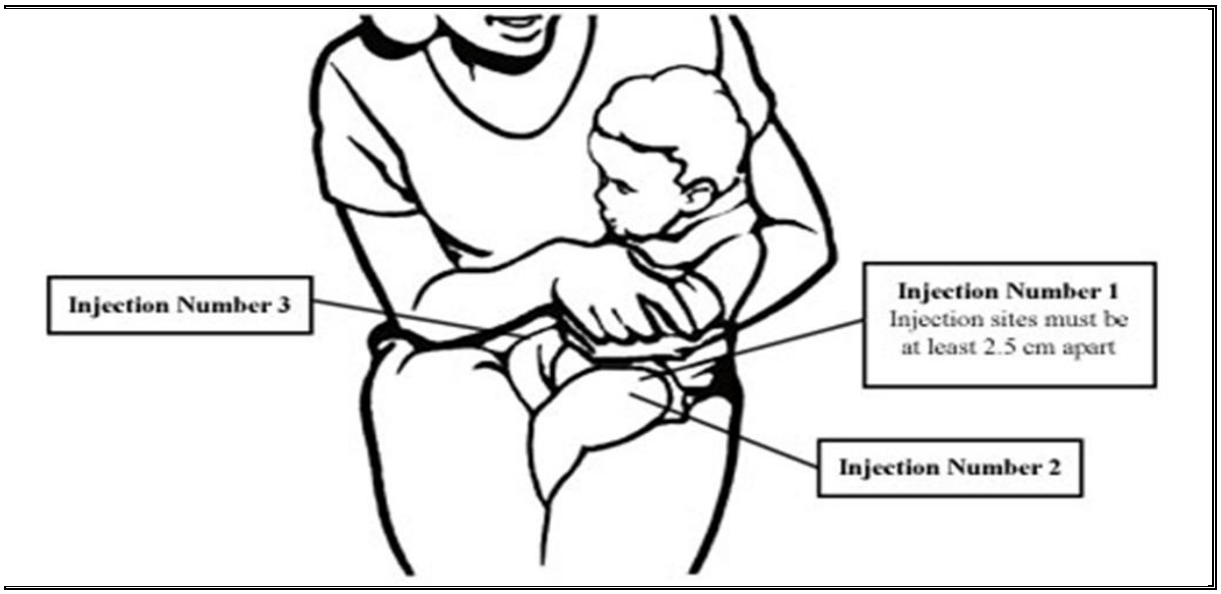

Figure 3: Technique for giving 2 or more intramuscular injections in the thigh of a child under 12 months of age

6.8. Attributed and storage requirements of PCV13

The new 4-dose presentation contains a preservative and is subject to the guidance provided in WHO's MDVP (vaccine is currently prequalified by WHO, have not expired, have not been contaminated (aseptic rules observed when removing doses), have not been exposed to excessive cold or heat, have not been immersed in water and VVM has not reached the discard point and the date and month of the vial opened is clearly labeled). Opened vials of PCV13 fulfilled these criteria, it can be used up to 28 days from the date of opening. Open vials of vaccine need to be carefully managed, including recording month and date of vial opened so as to minimize risk of contamination with a pathogenic organism and wastage and must be discarded after 28 days. In addition, the policies about opening of vials for small-size Immunization sessions should be carefully articulated to as to avoid inadvertent missed opportunities to vaccinate.

6.8.1. Storage and Transportation

Storage and Transportation: PCV should be stored and transported between 2^0c and 8^0c degrees Celsius. Liquid vaccines, including the pneumococcal vaccine, must not be frozen. Liquid vaccines lose their potency and provide no protection against the disease, if frozen. Previously frozen vaccines may also cause "aseptic abscesses".

- Put PCV in the middle compartment of standing front opening refrigerator with other freeze-sensitive vaccines and in top-opening refrigerators, store PCV13 and other freeze-sensitive vaccines on top**.**
- Transported using passive cold chain equipment (cold boxes or vaccine carriers) with cool water packs or properly conditioned ice packs.

  Vaccine forecast and calculating the supply chain needed for the required period will follows the same principle as of other routine immunization and is no different from how PCV10 has been forecasted.

Shake Test: If there is Freeze exposure or doubt, the "shake test" can be performed to check whether any of these vaccines have been frozen.

***Table 3*: The difference between PCV10 and PCV13**

Vaccine	PCV10 (Synflorix)	PCV13 (Prevenar 13)
Presentation	2-dose vial	4-dose vial
Form	Liquid	Liquid
Preservative	None	Yes
Administration	IM	IM
Number of serotypes covered	10 serotypes: 1, 4, 5, 6B, 7F, 9V, 14, 18C, 19F,23F.	13 serotypes: 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F,23F.

	+ Cross protective against sero types 6A and 19A.	Direct protective against sero types 3, 6A and 19A.
Primary packaging	1ml vaccine / vial capacity 3ml	2ml vaccine /vial capacity 3ml
Shelf life	36 months at 2-8°C	24 months at 2-8°C
Cold chain volume per dose	4.8 cm3	3.5 cm3
Vaccine Vial Monitor	VVM 30	VVM 30
Handling of open vials	Opened vials to be kept 6 hours	28 days (in accordance with WHO multi-dose vial policy)
Wastage rate	5%	8-10%

***Figure 4*: Differences between PCV10 and PCV13 presentations**

6.8.2. Vaccine Forecast

Vaccine Forecast: Vaccine forecast and calculating the supply chain needed for the required period will follows the same principle as of other routine immunization

- Annual target population X number of doses (3) X desired immunization coverage X wastage factor (1.11) + 25% buffer stock/supply period

6.8.3. Storage volume

The cold chain volume per dose of PCV13 is 3.5 cm3. Net volume for vaccine storage requirement per fully immunized percent is 11.7 cm3 which is less than PCV10 of 2 doses by 5.994 cm3.

***Table 4*: PCV13 storage volume**

Vaccines	Presentation (doses/vial)	Number of doses per target	Packed volume (cm3/dose)	Wastage		Storage volume (cm3)	Storage volume (lit)
				Rate (%)	factor		
A	B	C	E	F	G	H	I
PCV-13	4	3	3.5	10	1.11	11.7	0.01170

Stock management: will be similar to other vaccine recording the exact description of the vaccine (manufacturer, batch number, Expiry date, VVM status etc.) at each and every transactions (receiving an issuing) will be very important.

6.8.4. Wastage

Like other vaccines poor stock management (oversupply, Vaccine reaches expiry before use Lost, broken, stolen vials), Cold chain failure (high temperatures and Freezing) and Poor vaccination technique are factors associated with vaccine wastage.

7. Vaccine safety and safe waste management

Immunization safety is the process of ensuring and monitoring the safety of all aspects of immunization, including the detection and investigation of adverse events, vaccine quality, vaccine storage and handling, vaccine administration, and disposal of sharps and management of waste. Any injection is considered safe when it is not a health threat to recipient, vaccinator/Health workers, community and environment.

Sharps waste can cause serious health and environmental problems. Unsafe disposal can spread some of the very same diseases that we are trying to prevent. Leaving used syringes and needles in the open puts the community at risk. Most frequently, the unfortunate victims of needle-stick injuries from haphazard disposal of needles are children and health workers. Safety boxes are puncture resistant, impermeable containers for the safe disposal of used syringes and needles and other contaminated sharps. Vaccinators should place all used needles and syringes in a safety box immediately after administering the vaccine, without recapping them, tape the nearly (i.e. not more than 3/4) full box securely shut and store the box in a safe place until it can be properly disposed according to national guidelines.

8. Adverse events following immunization (AEFI)

Definition

An adverse event following immunization (AEFI) is medical incident that takes place after an immunization, causes concern, and is believed to be caused by immunization (but not necessarily caused by immunization).

The adverse event may be any unfavourable or unintended sign, abnormal laboratory finding, symptom or disease. As a rule, any AEFI that is of concern to the healthcare worker or to the caregiver, should be reported. Common adverse events are minor and transient. Serious AEFIs

are life threatening or result in hospitalization, disability or death. Always advise caregivers to bring the child to the nearest health facility in case they experience any serious adverse effect. Serious AEFIs after PCV vaccination are extremely rare. AEFIs should be detected, managed, investigated and reported as appropriate as per the national recommended procedures.

Although vaccines used in the Ethiopian Immunization Programmes are safe and effective, however, no vaccine is perfectly safe and AEFI can occur following any immunization. AEFIs are usually classified into five categories as described in below.

***Table 5*: Five categories of AEFI**

Causes of AEFI	Description
Vaccine product-related reaction	An AEFI that is caused or precipitated by a vaccine due to one or more of the inherent properties of the vaccine product.
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.
Immunization error-related reaction	An AEFI that is caused by inappropriate vaccine handling, prescribing or administration and thus by its nature is preventable.
Immunization anxiety-related reaction	An AEFI arising from anxiety about the immunization.
Coincidental	An AEFI that is caused by something other than the vaccine product, immunization error or immunization anxiety.

8.1. PCV13 reaction

Pneumococcal Vaccine rarely cause severe reactions such as allergic/anaphylactic reactions. Mild self-limiting reactions such as transient fever < 390C, pain, swelling, redness and hotness at the injection sites can be commonly seen after PCV13.

8.2. AEFI Surveillance

The major goal of immunization safety surveillance is early detection, appropriate and quick response to adverse events in order to lessen the negative impact on the health of the individuals and on the immunization programme. It is a key indicator of programme quality and enhances programme credibility by providing actual country data on vaccine risks. Refer to the AEFI guidelines for further information

9. Advocacy, social mobilization and program communication about pneumococcal vaccine

Advocacy is needed at subnational level for prioritizing the immunization service at large and during the PCV10 to PCV13 switch in particular in order to mobilize decision makers. Social mobilization and community awareness creation are important to get participation and support of important stakeholders for the immunization program and increasing demand for vaccination.

9.1. Communication with parents about pneumococcal vaccine

When communicating with care givers, remember the following.

- Be Respectful
- Use simple words
- Listen to caretaker's concerns
- Make sure caretaker understood your key messages
- Follow the triple A communication with parents (3 As: Advice, Alert, Arrange)
    - Advice on what is given
    - Alert on side effects and how to respond
    - Arrange for when to return

A. Advice: what diseases prevented

- PCV helps to prevent pneumonia and meningitis, which are major causes of death and disability in children.
- Answer any questions they may have.
- Praise the caretakers for important practices they are doing well
- Children who have received vaccines may still get pneumonia or meningitis from causes not protected against by these vaccines, however both these diseases will occur less frequently in immunized children.
- Early treatment of pneumonia can prevent serious complications and death, even in children who have received all their vaccines. Take your child immediately for assessment by a qualified health professional and possible treatment, if he/she has high fever, stiff neck, difficult or fast breathing.
- In addition to vaccination, additional measures to protect children from getting pneumonia should be implemented. These additional measures include: exclusive breastfeeding, adequate nutrition, reducing indoor pollution (keep children away from smoke from cooking fires), and assuring receipt of other vaccines especially DTP / Pentavalent and measles vaccine

B. Advice: about vaccine and giving multiple injections

- Millions of children have received the pneumococcal conjugate vaccine and the vaccine is very safe
- Some children will experience mild side effects such as pain or swelling at the injection site and mild fever, but these generally get better quickly.

- PCV 13 will be given at the same time as pentavalent vaccine (DTP-HepB-Hib) therefore no extra visit is required for this vaccine.
- It is safe for the child to receive more than one injection on the same day.
- Advantages of giving multiple injections on the same visit: caretakers do not have to return shortly for another injection, child will be well protected.
- Ensure that all target children receive all three doses of PCV13 vaccines before the age of one year at 6, 10, 14 weeks.

C. Alert: how to respond to side effects

- Inform the caregiver that common mild reactions might occur but are of short duration and will go away in two to three days. The common mild reactions are:
    - Irritability, crying
    - Swelling and tenderness at injection site is common but will go away in two to three days
- Inform care giver that transient fever >39˚C is possible
- Instruct the caregiver to give paracetamol if child has pain and fever, and give the appropriate dosage and timing.
- Instruct the caregiver to use a cool, wet cloth at the site of injection to reduce redness, swelling and tenderness.
- Tell the caregiver if there are any unexpected side effects, to return to the nearest health facility for consultation with a health worker.

D. Arrange: When to return

- Give an appointment for the next dose ensuring that the minimum gap of 4 weeks is maintained.
- Ensure that there is a session on the given date - no public holiday, weekend etc.
- Write the date of next visit on the card.

E. Key points on the switch from PCV10 to PCV13

- Since the 2 dose of PCV 10 will not be available in the global market 4 doses of PCV13 will be used in Ethiopia.
- Unlike the PCV10 vaccine, PCV 13 has preservative and this will enable to fulfil the WHO multi dose vial policy (MDVP). Hence PCV13 can be used up to 28 days after opening.
- During Phased in if a child took his/her 1st or 2nd dose of PCV10 he/she should continue his/her 2nd or 3rd dose with PCV13.
- Un like to PCV10 presentation of PCV13 is 4 doses Vial
- The 2 doses of PCV10 vial was discarded 6 hours after opening but the newly introduced 4 doses of PCV13 will stay for 28 days after opening as far as
    - ✓ Expired date has not passed
    - ✓ VVM is within the limited stage
    - ✓ Not damaged by freezing

- ✓ Not contaminated

- PCV 13 vaccine will be given in the same route(intramuscular) like that of PCV10

9.2. Frequently Asked Questions.

A) What is the presentation of pneumococcal vaccine and how is it stored?

- The PCV-13 vaccine is a liquid vaccine in a 4 dose per vial (4 dose vial). The vaccine should be stored between 2-8 degrees Celsius and must not be frozen.

B) What is the vaccination schedule for the pneumococcal vaccine?

- This vaccine should be given in 3 doses. The minimum age to receive the first dose is 6 weeks, with a minimum interval of four weeks between the three doses - e.g., 6, 10 and 14 weeks. Ideally, PCV-13 should be given at the same time/age as DTP, Hepatitis B, Hib, and OPV administration.
- The vaccination of infants and children who have partially completed their immunization schedule with other EPI vaccines should be decided in accordance with the national policy of the country. However, if the child is under one year of age, they need to be given three doses of the vaccine, with a minimum interval of four weeks between the doses.

C) Can the pneumococcal vaccine be administered at the same time as other vaccines?

- The pneumococcal conjugate vaccine can be co-administered with other EPI vaccines.
- When co-administered with other vaccines, the PCV-13 injection should be given in a different injection site - for example, the opposite thigh.
- The vaccine **cannot** be mixed with other vaccines in the same syringe.

10. Coordination, Monitoring, Evaluation and Supervision of PCV13 vaccine switch

Ethiopia introduced PCV10 two dose vial vaccine in to routine immunization program in 2011 as a 3 doses primary schedule. Currently, Ethiopia has planned to switch from PCV10, 2 doses vial to PCV13, 4 doses vial. The reason for the switch is that PCV10, 2 doses will no longer be available in market in the near future. The options available to switch is PCV10, 4 doses or PCV13, 4 doses. Ethiopia decided to switch to PCV13 4 dose, as it has advantage in covering more sero-types.

10.1. Coordination

The PCV switch is not considered as new vaccine as PCV has been introduced in 2011. Hence there will not be a need for establishment new coordinating structure and mechanisms. Existing coordination mechanisms can be used to coordinate and organize the switch process at all levels.

The existing National, Regional/Zonal, Woreda and catchment areas coordination committees will be used to coordinate and lead the PCV switch implementation at respective places the overall leadership of the MOH/RHBs. The three major EPI working groups, such as, planning and monitoring and evaluation, Logistics, and Communication, with technical experts from the different agencies and partners, will be responsible for the detail planning and

implementation of the specific components of the switch from PCV10, 2 doses vial to PCV1, 4 doses vial.

The following activities should be undertaken to ensure smooth switch from PCV10-2 dose vial to PCV13-4 dose vial.

- Planning for switch (target children, training, supplies, cold chain capacity, communication, monitoring and evaluation).
- Training of health workers, with emphasis on vaccine handling, storage, administration, MDPV, and vaccine requirement estimation.
- Assessing the cold chain storage capacity and filling gaps.
- Collection and distribution of vaccine
- Community awareness creation to increase coverage and reduce defaulters.
- Monitoring switch process

10.2. How to switch from PCV10 to PCV13

- During the switch process, first use available PCV10, 2 doses vial until it is finished. When PCV10 is out of stock, continue with PCV13 for remaining doses for those children who have already started with PCV10 to complete doses. Restarting a series with PCV13 is not recommended, even for the primary series.
- For new arriving children start with PCV13 whole series (3 doses).
- Record and report PCV13 vaccination
- Record PCV13 in vaccine ledger book
- Apply MDVP when started PCV13 4 dose vial when WHO MDVP criteria is fulfilled.

Introduction efficiency: performance, effectiveness and efficiencies, in order to improve the current and future switch/new vaccine introduction processes.

10.3. Monitoring

Monitoring is required to assess data, procedures and practices in order to identify problems, develop solutions and guide interventions and document the overall PCV13 vaccine switch process.

Monitoring the switch process of PCV13 vaccine, may be done through:

- Regular (weekly) coordination meetings by the EPI focal persons and Coordinating Task Force members regular monitoring of immunization data, specifically PCV13 doses administered and vaccine stock to.

10.3.1. Basic Recording Tools

Documentation and recording tools are necessary to ensure that each child receives the appropriate number of doses of vaccine, and to track progress. However, in the switch of PCV13 vaccine recording tools not require revision, because in all existing HMIS tools it is not mentioned the serotype (PCV10) it says only PCV, so we can use the existing tools as it is.

Mother and child card: For children who have already started immunization with PCV10 and have old card, continue with PCV13 for the remaining doses and record on the card. Do not

start as new for PCV 13 doses, just continue with remaining doses. No need to issue a new card to a child who already received a card earlier.

Recording forms: Use the existing recording tools and record the immunized children on tally sheet and register. The PCV13 should also be recorded in the vaccine ledger book.
Reporting: RI including PCV13 should be reported to the next higher level as per then national HMIS reporting schedule and procedures. Data should be analysed and used for action at all levels as appropriate.

10.3.2. Vaccine Supply

Monitoring of wastage and vaccine supply will be important during the switch period, as well as in the future. Monitoring vaccine stock and wastage of the newly switched PCV13 vaccine is important because:

- Wastage rate of PCV13 vaccine is estimated, and may require re-evaluation; therefore, recording the number of doses used will be important.
- To calculate the vaccine wastage first one need to calculate the vaccine usage and then the

Vaccine Usage Rate = Doses administered/ {(Beg. Balance + Received during the month) – Ending balance} *100
Vaccine wastage can be obtained by deducting the vaccine usage rate from 100%.
Vaccine wastage rate = 100% - vaccine usage rate

10.4. Supervision

Supervision increases quality of implementation of activities by guiding, supporting and assisting service providers to carry out their duties to achieve the programme objectives.
Evaluation activities provide an opportunity to assess the overall program status and PCV13 switch.
The training provided to health workers and supervisors during the switch as well the supportive documentation should provide adequate guidance for all staff to safely provide PCV13 vaccine to infants in Ethiopia; however, the best trainings still benefit from supportive supervision to reinforce the messages provided. Supervision requires all supervisors be fully acquainted with the training material and monitor appropriately including:

- Woreda EPI focal points providing supervision for each Primary Health Care Unit (PHCU and HEW supervisors.
- HEW supervisors provide extra emphasis to immunization activities.
- All supervisors should place special emphasis on immunizations during the first 3 months following switch.
- Supervision checklist should be used for all supportive supervision activities

The supervisory visit should include a review of the monitoring data, injection practices, social mobilization, logistics, stock management and vaccine handling practices at the health post.

10.5. Evaluation

The switch process will require periodic evaluation so as to address challenges and gaps, as well as to share successes, all challenges should be listed.

Review meetings have been budgeted to occur at the zonal and woreda level initially. The review meeting should follow the same format as the monthly reports. The participants should include government and partners. This will be coordinated from the central level and is expected to supplement the woreda and regional evaluations. At the end of switch, a national level review meeting will be held.

10.6. Training

Before implementing PCV13 switch, health staff will need to receive training – even though they were familiar with PCV10 vaccine from administering as part of the infant immunization schedule. In the cascaded training, it is feasible to cover all the necessary pneumococcal diseases and epidemiology, PCV vaccine management and administration, guides on implementation of the switch from PCV10 2 dose vial to PCV13 4 dose vial, and knowledge, skills and practices of health workers require for proper handling and administration of PCV13 4 dose vial.

- Regional level training for RHB staffs for 1 day
- Zonal level training for woreda health office staffs for 1 day
- Woreda level training for health hospitals and PHCU staffs for 1 day.
- Health facility level training for Health Extension Workers for 1 day.

This training aims to strengthen the capacity of managers and health workers to ensure PCV13 deployment and use, including handling of PCV13 multi-dose vials in accordance with WHO Multi-Dose Vial Policy (MDVP).

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