Fundamentals of Immunization

Health Managers Modules for Immunization
FUNDAMENTALS OF IMMUNIZATION

Health Managers Modules for Immunization
The Universal Immunization Program, launched in 1985 for reducing deaths and disabilities due to vaccine preventable diseases in the country, has received a special impetus through the National Rural Health Mission (NRHM). The strengthening support provided by NRHM includes funds, resources, strategic guidelines and contractual manpower for program management. Since 2005, when the NRHM came into effect, there has been an increasing trend in Immunization coverage and quality.

Child Health managers introduced to manage and oversee child health and immunization in select districts of low performing states, as well as other health managers from non-medical background introduced through the NRHM, was found to have an increasing role in the Immunization Program. However they often came with no prior knowledge, experience or skills related to management of the Immunization program. Their roles and therefore their requirement in the program were identified as being a mixture of technical, supervisory and managerial. This set of modules covers many of these aspects, and have been developed for self as well as collective learning by program managers and supervisors.

The modules have been compiled from existing literature related to the Immunization program and health management available in India with the Ministry of Health and Family Welfare as well as with UNICEF, WHO, USAID and PATH. The materials have been adapted to meet the requirements at the primary levels of health program management in the country, particularly at the sector, block and district levels.

The National Child Health Resource Center (NCHRC) at the National institute of Health and Family Welfare (NIHFW) has worked closely with national trainers in Immunization at the NIHFW and the Immunization officer of United Nations Office for Project Services, Norway India Partnership Initiative (UNOPS-NIPI) in developing these modules. The pilot testing of these modules has been conducted in Orissa, Bihar and Rajasthan involving the district, block and sub block level managers and supervisors along with select state level trainers, and their feedback has been incorporated. UNOPS-NIPI has been instrumental in identifying the need for improving program management at implementation levels as an important step to achieve enhanced program coverage and quality, and have also provided the required support for the development of these modules.

We hope that this set of module will prove to be useful in enhancing the capacity of managers and supervisors at implementation levels for improving quality and coverage of Immunization.

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<tr>
<td>ADS</td>
<td>Auto Disable Syringes</td>
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<tr>
<td>ANM</td>
<td>Auxiliary Nurse Midwife</td>
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<td>ARI</td>
<td>Acute Respiratory Infections</td>
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<td>ASHA</td>
<td>Accredited Social Health Activist</td>
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<td>BCG</td>
<td>Bacillus Calmette-Guérin</td>
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<td>BPM</td>
<td>Block Program Manager</td>
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<td>DPT</td>
<td>Diphtheria Pertussis Tetanus Vaccine</td>
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<td>DT</td>
<td>Diphtheria Tetanus Vaccine</td>
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<tr>
<td>DTaP</td>
<td>Diphtheria Tetanus acellular Pertussis Vaccine</td>
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<td>Hep B</td>
<td>Hepatitis B Vaccine</td>
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<tr>
<td>Hib</td>
<td>Haemophilus influenzae type b Vaccine</td>
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<td>ICDS</td>
<td>Integrated Childhood Development Services</td>
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<td>IFA</td>
<td>Iron and Folic Acid Tablet</td>
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<td>IPV</td>
<td>Inactivated Polio Vaccine/ Injectable Polio Vaccine</td>
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<td>JEV</td>
<td>Japanese Encephalitis Vaccine</td>
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<td>MOIC</td>
<td>Medical Officer in Charge</td>
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<td>NIS</td>
<td>National Immunization Schedule</td>
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<td>NRHM</td>
<td>National Rural Health Mission</td>
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<td>OPV</td>
<td>Oral Polio Vaccine</td>
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<td>PIP</td>
<td>Program Implementation Plan</td>
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<td>Polio NID</td>
<td>Polio National Immunization Days</td>
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<td>PRI</td>
<td>Panchayati Raj Institutions</td>
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<td>RI</td>
<td>Routine Immunization</td>
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<td>SIA</td>
<td>Supplementary Immunization Activities</td>
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<td>SNID</td>
<td>Sub National Immunization Days</td>
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<td>TB</td>
<td>Tuberculosis</td>
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<td>TT</td>
<td>Tetanus Toxoid Vaccine</td>
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<tr>
<td>UIP</td>
<td>Universal Immunization Programme</td>
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<td>VAD</td>
<td>Vitamin A deficiency</td>
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<tr>
<td>VHND</td>
<td>Village Health and Nutrition Days</td>
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<tr>
<td>VPD</td>
<td>Vaccine Preventable Disease</td>
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Introduction to the series

The Health managers’ modules for immunization were conceived as a set of capacity building material for the front line managers of health programs. Traditionally, health program managers have been clinical personnel with knowledge of medical terms and processes. However, of late, especially with the onset of the National Rural Health Mission, managers from non-clinical backgrounds are being involved in the management and oversight of health programs.

The requirement for these managers is a mixture of technical and operational knowledge and skills. As Immunization is one of the key health programs a field based operations manager gets exposed to, it becomes important to build his capacity in the proper and effective management of the Immunization program. This will put him at an advantage to grasp both the specifics of the immunization program and the general understanding of health systems and programs at large. These modules have been prepared keeping these challenges and objectives in view.

There are two ways in which this set of modules can be used. Firstly in a phase-wise manner, wherein a group of managers are exposed to one module at a time, usually through half day sessions, and then are encouraged to use their learning through activities in the field. A good example is using training on the module on Immunization micro planning (Module 2) followed by the preparation of actual micro plans in the areas where the managers work. This dual exposure to classroom and actual field experience on the subject matters helps in better learning and gaining confidence. The second way to use the modules is through a four day learning package which includes one day of field exposure and plenty of learning exercises. Both ways have been tested and been found effective.

The 7 modules are as follows:

Module 1: Fundamentals of Immunization
Module 2: Developing Micro plans for Immunization Program
Module 3: Vaccines and Logistics management
Module 4: Supervision and Monitoring
Module 5: Addressing demand-side issues in Immunization
Module 6: Information management in Immunization
Module 7: Review and action plan preparation for Immunization Program
Objectives of this module

- To explain to the managers the basics of vaccination, immunization and the immunization program.
- To give them basic understanding of how vaccines work and the different types of vaccines in use.
- To give them a comprehensive understanding of the immunization program and their roles as managers in it.
- To brief them about vaccine preventable diseases, vaccine dosages, routes of administration and packaging.
- To inform them about the national Immunization schedule and special situations where the schedule is not strictly followed.

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1A. BASICS OF IMMUNIZATION
1B. THE IMMUNIZATION PROGRAM
1C. VACCINE PREVENTABLE DISEASES
1D. THE IMMUNIZATION SCHEDULE
1E. FREQUENTLY ASKED QUESTIONS ON THE NATIONAL IMMUNIZATION SCHEDULE
1. A. Basics of Immunization

Why Immunization?
1. Immunization saves lives
   • Immunization saves the lives of children all over the world.
2. Strong immunization systems can protect our children
   • All children deserve to get full access to all the vaccines they need.
   • Immunization is the foundation of the public health system—without it, other health programs would fail.
3. Vaccines are safe
   • Immunization is among the safest of modern medical interventions.
   • Vaccines are easier and safer to administer than ever before.
   • Being immunized is much safer than risking infection and disease.
4. Vaccines are always improving
   • Vaccine prices are lower than ever before.
   • New vaccines protect against more diseases.
   • New technologies make immunization cheaper and safer.
5. Immunization can save money
   • Immunization is one of the most cost-effective health interventions.
   • Investing in vaccines SAVES more money than it costs.
6. Immunization can protect the unprotected
   • When immunization coverage is high, it can prevent viruses and bacteria from circulating.
   • More the children are fully immunized, more safer a community is.

How vaccines work?
Vaccines contain weakened or killed versions of viruses and bacteria. These are also called “antigens”

Once introduced in a body they prepare the body to fight off the disease caused by the particular virus or bacteria. The body produces “antibodies” to fight against the disease causing organisms.

When the body is prepared to fight against a particular disease it is called immunity. The “immune system” of the body takes care of this protective response to foreign organisms (antigens). If the body encounters the real disease-causing organism, the immune system will “remember” it and can respond quickly to launch an immune response to prevent severe illness.

Each vaccine provides immunity against a particular disease; therefore, a series of vaccinations is administered to children and women to protect them from many vaccine-preventable diseases.
What is the difference between vaccination, immunity and immunization?

Vaccination is the process of giving a vaccine.

Immunity is the body's ability to protect itself from diseases. This could be natural, following infection of a disease or induced following vaccination. Since the body prepares its own antibodies through these processes it is called active immunity. Sometimes readymade antibodies can also be given to fight diseases e.g. to a fetus by the mother during pregnancy. This is called passive immunity.

Immunization is the entire process beginning from giving vaccines to the development of body's protective response.

What are the various types of vaccines?

There are three main types of vaccines:

Live attenuated vaccines are derived from disease-causing viruses or bacteria that have been weakened under laboratory conditions. They will grow in a vaccinated individual, but because they are weak, they will cause no disease or only a mild form. They usually require only one dose to provide life-long immunity, with the exception of oral polio vaccine which requires multiple doses. Examples include:

- **Virus** (e.g., oral polio vaccine [OPV], measles, yellow fever)
- **Bacteria** (e.g., Bacillus Calmette-Guérin (BCG) vaccine, which prevents complications of childhood TB)

Inactivated vaccines are produced by inactivating disease causing viruses and bacteria by heat or chemicals. They may be whole-cell (made of an entire bacterial or viral cell) or fractional (composed of only part of a cell). Fractional vaccines are either protein- or polysaccharide-based.

- **Whole**
  - **Virus** (e.g., inactivated polio vaccine [IPV])
  - **Bacteria** (e.g., whole-cell pertussis)

- **Fractional**
  - **Protein-based**
    - Subunit (e.g., acellular pertussis)
    - Toxoid (e.g., diphtheria and tetanus)
  - **Polysaccharide-based**
    - Pure (e.g., meningococcal)
    - Conjugate (e.g., *Haemophilus influenzae* type b [Hib])

Recombinant vaccines are produced by inserting genetic material from a disease-causing organism into a harmless cell, which replicates the proteins of the disease-causing organism. The proteins are then purified and used as vaccine. An example of this is:

- Hepatitis B vaccine
What is the impact of immunization on disease transmission?

Individual immunization protects only the person vaccinated from the disease. However, if a large number of susceptible individuals are immunized against a disease in the community it is possible to control the spread of the disease. Persons who have been immunized serve as a protective barrier for other individuals who have not been immunized. To achieve this, the percentage of immunized persons in the community has to reach a certain level, usually 80% or higher. Reaching and maintaining that level, provides “herd immunity” to unimmunized individuals: this can also be called “community immunity”.

Sometimes if the entire susceptible populations have enough immunity to keep off an infective organism, and that organism has no other place to live and multiply, it is possible to eradicate the disease (e.g. smallpox vaccination). Few more vaccine preventable diseases are being targeted for eradication (poliomyelitis), elimination (Maternal and Neonatal tetanus) or reduction in deaths (measles).

What is the history of vaccination?

The first systematic effort to control a disease through immunization occurred over 200 years ago.

Edward Jenner, a British physician, made the observation that dairy workers rarely became ill with smallpox, although they often got cowpox, a related but less serious disease. On May 14, 1776, he performed an experiment that would revolutionize public health. He made two small cuts on the arm of a healthy eight-year-old boy and inserted drops of fluid from a skin sore of a woman infected with cowpox, a mild disease common to dairy workers. Six weeks later, Jenner injected the boy with fluid from a smallpox lesion, and the boy did not contract smallpox.

With this experiment, Jenner discovered that inoculation of a person with a relatively harmless disease material could protect the person from a more dangerous disease. He called the process “vaccination,” derived from the Latin name for cowpox, vaccinia.

Jenner’s work set the stage for a tremendous amount of scientific advancement in the development of vaccines. As the timeline below shows, numerous vaccines were developed for diseases of great public health concern in the years that followed, including yellow fever, measles, polio, and others. In fact, vaccination has become one of the most important preventive health care interventions of all time.

Since 1990, many additional developments have taken place and new vaccines hold the potential to save many thousands more lives per year.
**Knowledge Test**

1. The human body fights off the disease causing organisms by producing
   a) Immunity
   b) Antigen
   c) Antibody
   d) All of the above

2. What is the difference between Vaccination and Immunization?
   a) Immunization is the process of giving a vaccine while vaccination is the entire process beginning from giving vaccines to the development of body’s protective response
   b) The entire process of giving immunity to the development of body’s protective response is called vaccination while the process of giving a vaccine is called Immunization
   c) The process of giving a vaccine is called Vaccination while the entire process beginning from giving vaccines to the development of body’s protective response is called Immunization
   d) None of the above

3. Ability of the body to protect itself from diseases following an infection or vaccination is known as
   a) Active Immunity
   b) Passive Immunity
   c) Artificial Immunity
   d) Positive Immunity
4. A pregnant woman passes antibodies to her unborn baby through the placenta to protect against certain diseases. This immunity is called
   a) Active Immunity
   b) Passive Immunity
   c) Artificial Immunity
   d) None of the above

5. Which of the following vaccine usually provides life-long immunity?
   a) Recombinant vaccines
   b) Live Attenuated vaccines
   c) Whole cell Inactivated vaccines
   d) Fractional Inactivated vaccines

6. Which type of vaccines are BCG & DPT?
   a) BCG Inactivated/Killed vaccine, DPT Live attenuated vaccine
   b) BCG Live Attenuated, DPT Inactivated vaccine
   c) DPT Inactivated, BCG Recombinant
   d) BCG Live Attenuated, DPT Recombinant

7. Measles is a type of
   a) Live Attenuated
   b) Inactivated / killed
   c) Recombinant
   d) All of the above

8. What is “Herd” immunity?
   a) The process whereby each immunized individual produces antibodies
   b) The process whereby number of immunized persons in the community (usually 80% or more) serve as protective barrier for other people who are not immunized
   c) The process of community-based planning for immunization
   d) None of the above
1.B. The Immunization program

Why an Immunization program?

While a health worker giving a vaccine in a clinic to one child may seem a simple procedure, a well organized public health program is needed to ensure vaccines are given to several thousands of children. The Immunization program is an important public health program of most government health departments and other health agencies.

Features of the program:

- It is based on scientific evidence and rationale.
- It needs an effective management system to ensure vaccine quality and consistent delivery.
- It requires well trained and motivated personnel to provide regular dependable services.
- It requires reach and continued acceptance among beneficiaries
- With adequate coverage and quality it results in prevention of the diseases in the community.

Effective management systems for the immunization program need to consider aspects of
- resource management including human, infrastructure and financial resources
- supply chain management,
- personnel management including capacity building,
- social mobilization including effective community participation and
- data review mechanisms such as authentic reporting and surveillance.

Health programs such as the Immunization program also needs to be linked to other health and development programs that use the same health systems, infrastructure and personnel.

What is the history of the Immunization Program in India?

<table>
<thead>
<tr>
<th>Year</th>
<th>Milestones</th>
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<tbody>
<tr>
<td>1978</td>
<td>Expanded program of Immunization (EPI) introduced after smallpox eradication</td>
</tr>
<tr>
<td>1978</td>
<td>BCG, DPT, OPV, Typhoid</td>
</tr>
<tr>
<td>1978</td>
<td>Limited to mainly urban areas</td>
</tr>
<tr>
<td>1985</td>
<td>Universal Immunization Program (UIP) introduced</td>
</tr>
<tr>
<td>1985</td>
<td>Expanded to entire country</td>
</tr>
<tr>
<td>1985</td>
<td>Measles added</td>
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<tr>
<td>1985</td>
<td>Close monitoring of &lt;1 yr age group</td>
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<tr>
<td>1986</td>
<td>Technology Mission</td>
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<tr>
<td>1990</td>
<td>Vitamin-A supplementation</td>
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<tr>
<td>1992</td>
<td>Child Survival and safe motherhood Program</td>
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<tr>
<td>1995</td>
<td>Polio National Immunization Days</td>
</tr>
<tr>
<td>1997</td>
<td>Reproductive and Child Health Program (RCH I)</td>
</tr>
<tr>
<td>2005</td>
<td>RCH-II and the National Rural Health Mission (NRHM)</td>
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Routine Immunization is one of the most cost effective public health interventions and was first introduced in India in 1978.
What are various immunization related programs in India?

**UIP:** The Universal Immunization Programme (UIP), launched in 1985 to progressively cover the country, aimed to reduce mortality and morbidity from the six vaccine preventable diseases (measles vaccine was added in 1985). Under the program, indigenous vaccine production capacity was enhanced and a national cold chain established. Vitamin A supplementation was included in 1990. Within the Universal Immunization program, newer vaccines such as Hepatitis B are being introduced country-wide from 2011. Japanese Encephalitis vaccine is a part of the routine immunization package in endemic districts while Penta-valent vaccine is being introduced in the states of Kerala and Tamil Nadu.

**NRHM:** Launched in 2005, the National Rural Health Mission has made way for a comprehensive and effective integration of health programs including Immunization. It also provides for resources, mechanisms and flexibility for effective program management. Additional manpower for management and linkages with the villages called ASHA (Accredited Social Health Activist) has helped boost health program implementation and acceptance. As a part of the integrated approach, immunization sessions are being used as a platform to provide other health, nutrition and sanitation related services and these special days are called Village Health and Nutrition Days (VHNDs).

**Polio NIDs and SNIDs:** With Polio eradication as a goal, states in India have few to several rounds of Polio supplementary Immunization activities. These are called National (NID) and sub-national Immunization days (SNID) and consist of booth based and house-to-house vaccination activities lasting several days.

**Measles catch-up and second opportunity:** Measles Mortality reduction is the goal of this activity where a second opportunity for measles vaccination is being given to children either through a catch-up activity or through introduction in the regular immunization schedule.

What are the important components of Immunization program management?

As a manager, one would be responsible for all aspects of program management that would lead to the desired program output, in this case over 80% coverage of vaccines among the targeted beneficiaries leading to cessation of incidence of the vaccine preventable diseases. The different aspects of program management include:

1. Human resource
2. Micro planning
3. Capacity Building
4. Logistics management
5. Supervision and monitoring
6. Data for action
7. Social mobilization
8. Financial resources
9. Coordination and work environment
10. Linkages with other maternal and child health interventions.
All these components will be dealt in separate modules for the managers.

What are the roles and responsibilities of health managers in Immunization?

- **Prepare Immunization action plan**
  - Understand budgetary allowances for immunization activity under NRHM
  - Prepare annual action plan for immunization activity at block level (corresponding to part C of PIP) in consultation with other stakeholders at block level and after taking inputs from field personnel involved in immunization.
  - Link budgetary provision of other aspects of PIP with immunization activity where applicable (parts A, B and E).
  - Identify any special areas in immunization requiring budgetary provision that are not provided through regular NRHM funds and resources.

- **Prepare Immunization micro plan and roster**
  - Ensure proper and equitable distribution of health manpower and help in planning for the approach (fixed, outreach, mobile) of immunization activity required in consultation with the field based health personnel.
  - Ensure no areas are left out and immunization sessions are planned for all areas of human habitation as per injection load recommendations.
  - Build capacity of health staff to prepare health sub center area wise immunization session plans, including equitable planning (using injection load) and logistics planning for each session.
  - Compile health sub center wise session plan and help prepare plan for supervision, alternate vaccine delivery, day-wise logistic distribution and monthly logistics requirement and indent.
  - Collate the immunization micro plan in user friendly roster, and distribute charts and maps for day-to-day use.
  - Ensure immunization sessions are held as per micro plan
  - Update and revise micro plans when necessary
• **Facilitate annual community assessments and surveys, and updation of beneficiary lists**
  - Ensure health workers and link workers undertake community survey annually to identify all immunization beneficiaries, and periodically update this beneficiary list.
  - Validate sample of beneficiary lists to ensure completeness and correctness of data.

• **Maintain beneficiary line-list at block level and use this to ensure tracking of successive vaccine doses.**
  - Support and assist the data assistant/person in compiling and maintaining a comprehensive line list of beneficiaries with the records of their successive vaccinations and other health events (tracking); use and analyze this list for program progress and intervention.

• **Support in management of logistics for the Immunization program**
  - Ensure adequate logistics stocks are maintained in appropriate conditions at the cold chain stores and depots.
  - Ensure proper and systematic distribution of logistics to all sites during immunization activity.
  - Ensure timely and appropriate indent of logistics from higher store on a periodic basis.
  - Ensure cold chain is maintained for all vaccines during transportation and storage.

• **Plan and undertake supervisory visits and field assessments**
  - Prepare plan for periodic field supervisory and assessment visits to immunization session sites and to community.
  - Undertake visits as per plan and ensure visits of other supervisory personnel also. Ensure supervisory visits are supportive and corrective. Build capacity of workers and mobilizers and of supervisors undertaking visits.
  - Compile information about observations during supervisory visits; use information in review meetings for program improvement.

• **Compile and collate immunization data for appropriate action and preparing reports**
  - Understand records and reports used in immunization.
  - Facilitate processes for correct, timely and complete recording and reporting of immunization data.
  - Periodically cross verify immunization records and reports.
  - Collate and compile data for analysis and appropriate action.
  - Maintain data base to ascertain trend and direction in program implementation and management.

• **Facilitate trainings and capacity building of health staff and organize periodic review meetings**
  - Facilitate block level trainings and capacity building of all link workers and staff on immunizations skills and activities.
  - Organize periodic review meetings at sector and block levels to review program performance and decide on future course of action.
Coordinate with MOIC/BPM and other sectors (ICDS/PRI/general administration/education) for responsibility sharing and communication/community mobilization to ensure program success.

- Coordinate with and report to Block Medical Officer and Block Program Manager for program administrative, financial and operational decisions. Coordinate with other stakeholders, particularly the ICDS officers, Block administrative officers and PRI representatives at block level to ensure sharing of responsibility for community mobilization and involvement in immunization program.
- Support in formulation of communication plans and strategies including behavior change communication to improve acceptance and demand of vaccination and other child health services.

**Knowledge Test**

1. In which year was the first Routine Immunization program introduced in India?
   a) 1975
   b) 1978
   c) 1980
   d) 1982

2. What is the name of India’s national immunization program? When was it introduced?
   a) Expanded Program on Immunization in 1978
   b) Expanded Program on Immunization in 1985
   c) Universal Immunization Program in 1978
   d) Universal Immunization Program in 1985

3. What are the Immunization-related programs in India?
   a) Universal Immunization Program (UIP)
   b) National Rural Health Mission (NRHM)
   c) Polio NIDs and SNIDs
   d) All of above

4. What are the roles and responsibilities on Health Managers?
   a) Micro planning
   b) Logistics management
   c) Supervision and Monitoring
   d) Compile and collate data for appropriate action
   e) All of the above
1.C. Vaccine Preventable diseases

What are vaccine preventable diseases?
Vaccines are now available to prevent certain diseases. In most cases if a potent vaccine is given correctly, that is at appropriate time, dosage and technique, it can prevent the disease from occurring in a vaccinated individual despite his exposure to the disease. Diseases for which an effective vaccine has been made and is available for use are known as a Vaccine Preventable Disease (VPDs).

What diseases are prevented through vaccines used in the Universal Immunization Program (UIP)?
Presently, the Universal Immunization Program in India provides vaccines mainly to children below 5 years of age and pregnant women for the following vaccine preventable diseases:

1. Tuberculosis
2. Poliomyelitis
3. Diphtheria
4. Pertussis (whooping cough)
5. Measles
6. Tetanus
7. Hepatitis B
8. Japanese encephalitis (in endemic districts)

Vitamin A is not a vaccine, but a nutritional supplement which prevents many deficiency related conditions. However administration of Vitamin A is also a part of the Universal Immunization Program.

Some other diseases have combined vaccines so as to avoid multiple shots, for example DPT for Diphtheria, Pertussis and Tetanus. This is also called a triple antigen. A penta-valent vaccine (5 vaccines together) is also being considered for introduction in the UIP. This will include DPT+ Hepatitis B vaccine+ vaccine for Haemophilus B.

Vitamin A is not a vaccine, but a nutritional supplement which prevents many deficiency related conditions; however administration of Vitamin A is also a part of the Universal Immunization Program.

A manager would need to have an understanding/knowledge of the:
- The disease: to interact with the health workers, medical officers and general public.
- The vaccine: to physically verify the vials to monitor its potency.
- The schedule for the vaccine: to plan for vaccination sessions and monitor timeliness and completeness of immunization as per schedule.
- The packaging and dosing of the vaccines: for proper logistics management
- The site, route and mode of administration: to supervise the health worker
1. **Tetanus:**

**Vaccine:** *Tetanus toxoid:* packaged as liquid in 10 dose vial. *(The vaccines DT, DPT, DTaP also protect against tetanus but here tetanus toxoid is in combination with other antigens)*

**Disease:**  
Tetanus  
Suck & cry in first 2 days of life, illness between 3-28 days of life, inability to suck followed by stiffness of neck & body &/or jerking of muscles

**Schedule:**  
Early in pregnancy and at least 4 weeks later  
For subsequent pregnancy within 3 years of last where 2 doses of TT were given, here only 1 booster shot required.

**Dose:**  
0.5 ml; Vial: 10 doses

**Site:**  
Deltoid muscle

**Route:**  
90° angle

**Method:**  
Stretch skin flat between finger and thumb on either side of injection site

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Remember: T series vaccines are destroyed if frozen and should be stored and transported in temperatures between 2 and 8 degrees Celsius.
2. Tuberculosis:

Vaccine: BGC (Bacillus Calmette-Guérin) powder in a 10 dose amber vial reconstituted with Normal saline

Disease:

*history of contact with suspected/confirmed case of pulmonary TB
*Weight loss, cough and wheeze not responding to ARI antibiotics

Dose:

Dose: 0.1 ml (0.05ml for less than 1 month);
Diluent: 1 ml sodium chloride; Vial: 10 doses

Route:

15° Angle

Intra-dermal Injection

Schedule:

Give at birth or as early as possible in the first 12 months.

Site:

Left Upper Arm

Method:

Gently pull skin under arm to stretch skin at injection site

Remember: after BCG vaccination, the skin gets raised and later a scar will form.
However, BCG vaccination is not to be repeated even if the scar does not form. BCG if missed earlier can be given till 1yr of age of the child. After reconstitution, BCG should be used within 4 hours.
3. Poliomyelitis:

**Vaccine:** Oral Polio vaccine (Trivalent: Sabin) liquid in a 20 dose vial with dropper

**Disease:**

* Sudden weakness & paralysis of leg(s), &/or arm(s) &/or trunk
* Paralysis not present at birth or due to serious injury/mental retardation

**Dose:**

Put two drops directly in mouth of child

**Route:**

Dose: 2 drops; Vial: 20 doses

**Site:**

Mouth

**Method:**

Oral administration

**Schedule:**

Zero Polio dose at birth till 15 days, 11/2 months…. (14 weeks) and at 16 to 24 months with DPT booster

Remember: During Polio supplementary rounds, other types of Polio vaccines may be used. These may be mono-valent OPV, bivalent OPV or even Injectable Polio Vaccine (IPV). These should be distinguished from the trivalent OPV to be used during UIP sessions.
4. Diphtheria, Pertussis and Tetanus:

**Vaccine:** DPT (Trivalent) liquid in a 10 dose vial for injection

**Disease:**
- **Diphtheria:** Sore throat with gray patch(es) in throat
- **Pertussis (whooping cough):** repeated & violent coughing, with: cough persisting for 2+ weeks, fits of coughing, cough followed by vomiting, typical whoop in older infants.
- **Tetanus:** suck & cry in first 2 days of life, illness between 3-28 days of life, inability to suck followed by stiffness of neck & body &/or muscle jerking

**Schedule:**
- Birth 24 hours of following delivery, 1½ mths (6 wks), 2½ mths (10 wks), 3½ mths (14 wks)
- Booster at 16-24 months and at 5 years

**Dose:** 0.5 ml; Vial: 10 doses

**Route:** Intramuscular Injection

**Site:** Outer Mid-thgh (Antero-lateral side of mid-thigh)

**Method:** Stretch skin flat between finger & thumb on both sides of injection site

Remember: Giving DPT in buttocks may injure the sciatic nerve and cause paralysis. It should never be given there. Instead, it should be given in the outer mid-thigh. Between two doses of DPT there should be a gap of at least 4 weeks. DPT boosters are to be given at 16-24 months and in the 5th year.
5. Hepatitis B vaccine

**Vaccine:** Hepatitis B vaccines: packaged as liquid in 10 dose vial.

**Disease:**
Infection of the liver causing yellow discolouration of skin and mucous membrane, sometimes lead to severe complications like liver failure or chronic disease carrier.

**Schedule:**
at birth within 24 hours of delivery, 1½ mths (6 wks), 2½ mths (10 wks), 3½ mths (14 wks)

**Dose:** 0.5 ml; Vial: 10 doses

**Site:** Outer mid-thigh (Antero-lateral side of mid-thigh)

**Route:** Intramuscular Injection

**Method:** Stretch skin flat between finger & thumb on both sides of injection site

Remember: Hepatitis B vaccines are very cold sensitive and are destroyed if frozen and should be stored and transported in temperatures between 2 and 8 degrees Celsius.
6. Measles:

**Vaccine:** Measles containing vaccine: packaged as powder in 5 dose amber colored vial. Needs reconstitution with a diluent which is: pyrogen free double distilled water.

**Disease:**
Measles: fever with rash with cough or running nose or red eyes.

**Schedule:**
9 months completed - 12 months (39 – 52 weeks).
If a child does not receive Measles before the 12th month, give a dose as soon as possible before 5 years of age.

**Dose:**
Dose: 0.5 ml; Diluent: 2.5 ml double distilled water; Vial: 5 doses

**Site:**
Right Upper Arm

Remember: Following reconstitution the measles vaccine has to be used within 4 hrs.
A second dose of measles is to be given with DPT booster at 16-24 months of age initially in select states of India and soon (following Supplementary Immunization campaigns) throughout the country.
7. Vitamin A:

Vitamin A is not a vaccine but an important micronutrient for maintaining normal growth, regulating cellular proliferation and differentiation, controlling development, and maintaining visual and reproductive functions. However, it is included in the Universal Immunization schedule.

Vitamin A deficiency (VAD) increases the risk of disease and death from severe infections such as measles and diarrhoea. In young children VAD can also cause growth retardation. VAD affects many tissues in the body; however its effect is most apparent on the eye. Children with clinical VAD face difficulty in seeing in the night termed as ‘night blindness’. At a more severe stage, it results in Bitot’s spots, Corneal Xerosis/ ulceration, Keratomalacia and Corneal scar.

Preparation and dose: Vitamin A is usually packaged in amber colored bottles of 100 ml as a solution with oil base. It is also supplied with a 2 ml spoon with a marking in the middle indicating 1 ml. The dose of Vitamin A is 1 ml (half spoon) containing 1,00,000 International units of Vitamin A when administered between 9 -12 months and 2 ml (1 spoon) containing 2,00,000 IU when administered beyond 1 year.

Schedule: The first dose of Vitamin A is administered at 9-12 months along with measles. The second dose is scheduled with DPT booster at 16 months. Thereafter, 1 dose is to be given every six months till the age of 5 years, that is, a total of 9 doses till the age of 5 years. In many states Vitamin A is also given through Bi-annual campaigns, in which case, the same dose need not be repeated in the routine immunization sessions.

Route of administration: Orally, always using the spoon supplied with the Vitamin A bottle.
8. **Japanese Encephalitis:**

**Vaccine:** *live attenuated SA 14-14-2 JE vaccine.*

Multi-dose vials with 5 doses, supplied with the diluent vial of 2.5 ml which contains Phosphate Buffer solution.

The vaccine should be reconstituted with the supplied diluent only. After reconstitution it turns into a transparent orange red or light pink liquid. After reconstituting the time of reconstitution should be noted on the vial. The reconstituted vaccine *should be used within two hours of reconstitution,* beyond which the vaccine should be discarded.

**Disease:** a person of any age, at any time of the year with sudden onset of fever and a change in mental status (drowsy, confusion, inability to talk, disoriented or coma) and/or convulsions. This usually follows infection by the Japanese Encephalitis virus introduced through a mosquito bite.

**Schedule** In UIP schedule, following campaigns in an endemic district, JE vaccine should be introduced to new cohorts (children who were underage/not born during the campaign) at 16 to 24 months along with DPT Booster.

**Dose:** 0.5 ml

**Site:** left upper arm

**Route:** subcutaneous

**Method:** pinch skin of left upper arm between thumb and index finger and give at 45 degrees

**Contraindications (situations when not to give vaccine):** High Fever (Vaccination to be done only after advise from a Medical officer), Severe malnourishment, Acute infectious disease, Ear infection, Tuberculosis, Heart, liver and kidney problems, Pregnancy, Allergy, Convulsions, Person treated with any immunosuppressive therapy, Person with a proven or suspected hypersensitivity to Kanamycin or Gentamicin.

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Japanese Encephalitis vaccination is administered under Universal Immunization Program only in selected endemic districts following large scale vaccination campaigns.
**Knowledge Test**

1. Which of the following diseases are not prevented through vaccines used in the Universal Immunization Program?
   a) Measles
   b) Malaria
   c) Tuberculosis
   d) Tetanus

2. Diluent used for reconstituting BCG vaccine is
   a) Distilled water
   b) Mineral water
   c) Normal saline
   d) Do not need a re-constituent

3. What is the route and site for administering BCG vaccine?
   a) Intramuscular injection on the left upper arm
   b) Intramuscular injection on the right upper thigh
   c) Intra-dermal injection on the left upper arm
   d) Subcutaneous Injection on the left upper arm

4. If a scar does not form after BCG vaccination,
   a) There is no need for re-vaccination
   b) Repeat vaccination after one month
   c) Give Booster dose

5. The type of OPV used in Routine Immunization Program is
   a) Monovalent
   b) Penta-valent
   c) Bi-valent
   d) Tri-valent

6. What is the route & site of administering DPT vaccine?
   a) Intramuscular on the buttock
   b) Intramuscular on Antero-lateral side of mid thigh (Outer mid-thigh)
   c) Intramuscular on Postero-lateral side of mid thigh (Inner mid-thigh)
   d) Intramuscular on Antero-lateral side of upper arm (Outer mid-arm)

7. Measles vaccine is usually given on the right upper arm by
   a) Intra-dermally
   b) Intra-muscularly
   c) Sub-cutaneously
   d) None of the above
8. Tetanus vaccine must be stored
   a) At 0°C
   b) Below 2°C
   c) At 11°C
   d) Between temperatures 2-8 °C

9. Which of the following is not a vaccine but still a component of Universal Immunization Program?
   a) Oral Rehydration Solution
   b) Vitamin A
   c) Polio drops
   d) Antibiotics

10. What is the route of administering Hepatitis B vaccine?
    a) Intramuscular
    b) Subcutaneous
    c) Intravenous
    d) Intradermal
1 D. The Immunization schedule

What is an immunization schedule?

Immunization schedule is a time-table which tells us the different ages when vaccines need to be given to an individual to ensure the best protective response.

Schedules have been carefully devised after taking into consideration many factors, such as the incidence of disease, the body’s protective immune memory and mechanism, feasibility of administration within large public health programs amongst many others. According to changes in disease patterns and availability of newer vaccines, the immunization schedules may change from time to time.

What is the National immunization schedule as per the universal immunization program?

<table>
<thead>
<tr>
<th>Vaccine</th>
<th>When to give</th>
<th>Dose</th>
<th>Route</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>TT-1</td>
<td>Early in pregnancy</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Upper Arm</td>
</tr>
<tr>
<td>TT-2</td>
<td>4 weeks after TT-1*</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Upper Arm</td>
</tr>
<tr>
<td>TT- Booster</td>
<td>If received 2 TT doses in a pregnancy within last 3 yrs*</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Upper Arm</td>
</tr>
<tr>
<td>BCG</td>
<td>At birth or as early as possible till one year of age</td>
<td>0.1 ml (0.05 ml till 1 mth age)</td>
<td>Intra-dermal</td>
<td>Left Upper Arm</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>At birth or as early as possible within 24 hours</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Antero-lateral side of mid-thigh</td>
</tr>
<tr>
<td>OPV-0</td>
<td>At birth or as early as possible within the first 15 days</td>
<td>2 drops</td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td>OPV 1,2 &amp; 3</td>
<td>At 6 weeks, 10 weeks &amp; 14 weeks</td>
<td>2 drops</td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td>DPT 1,2 &amp; 3</td>
<td>At 6 weeks 10 weeks &amp; 14 weeks</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Antero-lateral side of mid-thigh</td>
</tr>
<tr>
<td>Hep B 1, 2 &amp; 3</td>
<td>At 6 weeks 10 weeks &amp; 14 weeks</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Antero-lateral side of mid-thigh</td>
</tr>
<tr>
<td>Measles</td>
<td>9 completed months-12 months.</td>
<td>0.5 ml</td>
<td>Sub-cutaneous</td>
<td>Right upper Arm</td>
</tr>
<tr>
<td>Vitamin-A (1st dose)</td>
<td>At 9 months with measles</td>
<td>1 ml (1 lakh IU)</td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td>DPT booster</td>
<td>16-24 months</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Antero-lateral side of mid-thigh</td>
</tr>
<tr>
<td>Measles 2nd dose</td>
<td>16-24 months</td>
<td>0.5 ml</td>
<td>Sub-cutaneous</td>
<td>Right upper Arm</td>
</tr>
<tr>
<td>OPV Booster</td>
<td>16-24 months</td>
<td>2 drops</td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td>Japanese Encephalitis**</td>
<td>16-24 months</td>
<td>0.5 ml</td>
<td>Sub-cutaneous</td>
<td>Left Upper Arm</td>
</tr>
<tr>
<td>Vitamin-A*** (2nd to 9th dose)</td>
<td>16 months. Then, one dose every 6 months up to the age of 5 years.</td>
<td>2 ml (2 lakh IU)</td>
<td>Oral</td>
<td>Oral</td>
</tr>
<tr>
<td>DPT Booster</td>
<td>5-6 years</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Upper Arm</td>
</tr>
<tr>
<td>TT</td>
<td>10 years &amp; 16 years</td>
<td>0.5 ml</td>
<td>Intra-muscular</td>
<td>Upper Arm</td>
</tr>
</tbody>
</table>

*Give TT-2 or Booster doses before 36 weeks of pregnancy. However, give these even if more than 36 weeks have passed. Give TT to a woman in labour, if she has not previously received TT.
** JE Vaccine, in select endemic districts after the campaign.
*** The 2nd to 9th doses of Vitamin A can be administered to children 1-5 years old during biannual rounds, in collaboration with ICDS.
**1 E. Frequently Asked Questions on the National Immunization Schedule BCG vaccine**

*Why is BCG vaccine given only on the left upper arm?*

BCG is given on the left upper arm to maintain uniformity and for helping surveyors in verifying the receipt of the vaccine.

*Why is the dose of BCG reduced to 0.05ml in newborns (below 1 month of age)?*

This is because the skin of newborns is thin and an intradermal injection of 0.1ml may break the skin or penetrate into the deeper tissue and cause local abscess and enlarged axillary lymph nodes.

*Why is BCG given only up to one year of age?*

Most children acquire natural clinical/ sub-clinical tuberculosis infection by the age of one year. This too protects against severe forms of childhood tuberculosis e.g. TB meningitis and miliary disease.

*If no scar appears after administering BCG, should one re-vaccinate the child?*

There is no need to revaccinate the child even if there is no scar.

**OPV**

*Till what age can a child be given OPV?*

OPV can be given to children till 5 years of age.

*Can OPV and vitamin A be given together with DPT Booster dose?*

Yes.

*Can an infant be breastfed immediately after OPV?*

Yes.

**DPT VACCINE**

*If a child has not received DPT1, 2, 3 and OPV 1, 2, 3 according to the schedule, till what age can the vaccine be given?*

The DPT vaccine can be given until 7 years of age and OPV can be given till 5 years of age. If a child has received previous doses but not completed the schedule, do not restart the schedule and instead administer the remaining doses needed to complete the series.

*If a child comes between the ages of 2 to 5 years without having received any vaccine earlier, what vaccines should be given?*

If the child comes between 2 to 5 years without any vaccination, three doses of DPT can be given with OPV with a minimum gap of 4 weeks (or one month). A single dose of measles vaccine also needs to be given with first dose of DPT. Also remember to give a second dose of measles vaccine four weeks after the first dose.
**Why should there be a minimum gap of 4 weeks between two doses of DPT?**

This is because decreasing the interval between two doses may interfere with the antibody response and protection.

**Why is DPT vaccine given in the antero-lateral mid thigh and not the gluteal region (buttocks)?**

DPT is given in the front-outside mid-thigh and not the buttock region to prevent damage to the sciatic nerve. Moreover, the vaccine deposited in the fat of buttock region does not invoke the appropriate immune response.

**What should one do if the child is found allergic to DPT or develops encephalopathy after DPT?**

A child who is allergic to DPT or develops encephalopathy after DPT should be given the DTaP/DT vaccine instead of DPT for the remaining doses, as it is usually the P (whole cell Pertussis) component of the vaccine which causes the allergy/encephalopathy.

**TT VACCINE**

*If a girl received all doses of DPT, DT and TT as per the NIS till 16 years of age and she gets pregnant at 18 years, should she get one dose of TT during pregnancy?*

Give 2 doses of TT during the pregnancy as per the schedule.

**HEPATITIS B VACCINE**

*Can Hepatitis B vaccine be mixed in the same syringe with DPT and given as one injection?*

No, DPT and Hepatitis B vaccine (if supplied separately) cannot be mixed or administered through the same syringe.

*Until what age can Hepatitis B vaccine be given?*

According to the National Immunization Schedule, Hepatitis B vaccine should be given with the first, second and third doses of DPT till one year of age.

Why is the birth dose of Hepatitis B vaccine given only within the first 24 hours of birth?

The birth dose of Hepatitis B vaccine (within the first 24 hours) is effective in preventing peri-natal transmission of Hepatitis B.

**MEASLES VACCINE**

*Why is Measles vaccine given only on the right upper arm?*

The Measles vaccine is given on the right upper arm to maintain uniformity and to help surveyors in verifying the receipt of the vaccine.

*If a child has received the Measles vaccine before 9 months of age, is it necessary to repeat the vaccine later?*

Yes, according to National Immunization Schedule, the measles vaccine should be administered after the completion of 9 months and before 12 months of age. If not administered in the ideal age for Measles vaccine, it can be administered until 5 years of age.
What is a measles catch-up campaign?

A measles catch-up campaign is a special campaign to vaccinate all children in a target age group in a state or a district with one dose of measles vaccine. The catch-up campaign dose is given to all children, both immunized and un-immunized, who belong to the target age group. The goal of a catch-up campaign is to quickly make the population immune from measles and reduce deaths from measles. A catch-up campaign must immunize nearly 100% of target age group children.

Why 2nd dose of Measles vaccine is introduced in the National Immunization Program?

Measles is highly infectious disease causing illness and death due to complications as diarrhoea, pneumonia or brain infection. One dose of measles vaccine at 9 months of age protects 85% of infants. With 2nd dose we aim to protect all the children who remain unprotected after first dose.

If a child comes late for the first dose, then can it get the second dose?

All efforts should be made to immunize the children at the right age i.e. first dose at completed 9 months to 12 months and second dose at 16 -24 months. However if a child comes late, then give two doses of Measles vaccine at one month interval until 5 years of age.

If a child received one dose of Measles vaccine during an SIA campaign, should it receive the routine dose of Measles vaccine?

Yes, the child should receive routine doses of Measles vaccine according to the Immunization schedule irrespective of the measles SIA dose.

Why the amount of diluent provided by Manufacturers is more than the amount of vaccine doses to be administered?

The manufacturer provides more quantity of diluent than required, e.g. for 5 dose measles vial the diluent is more than 2.5 ml and for 10 dose BCG vial, it is more than 1ml. The reason for this is to take care of the unavoidable vaccine wastage which occurs due to:

- Some dead space in the hub and needle
- Sticking of the vaccine to the inner wall of the vaccine and
- Inefficiency of the HWs to draw entire amount of vaccine from the vial.

Therefore, it is important to draw the entire amount of diluent from the ampoule and use it to reconstitute the vaccine.

JE VACCINE

If a child 16-24 months of age has been immunized with JE vaccine during an SIA, can it receive the JE vaccine again, as part of RI?

No, currently this is a single dose vaccine and should not be repeated.

If a child above 2 years (24 months) of age has not received the JE vaccine through either RI or an SIA, should s/he be given the JE vaccine?

Yes, the child is eligible to receive a dose of the JE vaccine, through RI, till the age of 15 years.

VITAMIN A

How many prophylactic doses of vitamin A should be given and till what age?

A total of 9 prophylactic doses of vitamin A should be given till 5 years of age.
What should be the minimum gap between two doses of Vitamin A?
The minimum gap between any two doses of vitamin A should be 6 months.

How should Vitamin A syrup be administered?
Vitamin A syrup should be administered using only the spoon/dispenser provided with each bottle. The half mark in the spoon indicates 100,000 IU and a level full spoon contains 200,000 IU of Vitamin A.

What is the treatment schedule for children with clinical signs of vitamin A deficiency?
Administer 200,000 IU of Vitamin A immediately after diagnosis, followed by another dose of 200,000 IU, 1-4 weeks later.

What are the storage guidelines for un-opened bottles of Vitamin A solution?
Vitamin A solution must be kept away from direct sunlight and can be used until the expiry date.

How long can a bottle of Vitamin A be used, once opened?
A Vitamin A bottle, once opened, should be used within 6-8 weeks. Write the date of opening on the bottle.

Other than Vitamin A supplementation, what are other policy guidelines to prevent vitamin A deficiency?
These are promotion of:
- Early and exclusive breast feeding, including feeding of colostrum, rich in vitamin A.
- Regular consumption of dark green leafy vegetables or yellow and orange fruits and vegetables like pumpkin, carrots, papaya, mango, oranges along with cereals and pulses to a weaning child
- Consumption of milk, cheese, curd, ghee, eggs, liver etc.

ALL VACCINES

If a child who has never been vaccinated is brought at 9 months of age, can all the due vaccines be given to a child on the same day?
Yes, all the due vaccines can be given during the same session but at different injection sites using separate AD syringes. It is safe and effective to give BCG, DPT, Hepatitis B, OPV and Measles vaccines and Vitamin A at the same time to a 9 months old child who has never been vaccinated.

If the mother/caregiver permits administration of only one injection during an infant’s first visit at 9 months of age, which vaccine should be given?
At 9 months of age, the priority is to give measles vaccine with OPV and Vitamin-A.

Which vaccines can be given to a child between 1-2 years of age, who has never been vaccinated?
The child should be given DPT1, OPV-1, Measles and 2ml of Vitamin A solution. It should then be given the second and third doses of DPT and OPV at one month intervals till 2 years of age. The Booster doses can be given at a minimum of 6 months after administering OPV3/DPT3.

What vaccines should one give to a child who is brought after 6 years of age for the first time?
Give the child only 3 doses of DPT one month apart.
**Why is it not advisable to clean the injection site with a spirit swab before vaccination?**

This is because some of the live components of the vaccine are killed if they come in contact with spirit.

**Community Immunity (“Herd” Immunity)**

We know that vaccines can prevent the occurrence of disease in vaccinated and immunized individuals as well as save lives and prevent disabilities. However, as a health manager of a large area and responsible for the public health in that area (block/district/state), vaccination of children can go well beyond saving individual lives. It can also help in preventing large scale outbreaks of diseases as well as keeping the disease under control (or sometimes even eliminated or eradicated) in the area.

In this respect, apart from understanding individual immunity, it is important to understand community immunity or herd immunity and the subsequent herd effect.

When a critical portion of a community is immunized against an infectious disease, most members of the community are protected against that disease because there is little opportunity for an outbreak. Even those who are not vaccinated for certain vaccines get some protection because the spread of the infectious disease is contained. This is known as “community immunity.”

The term ‘herd effect’ has been defined as: ‘the reduction of infection or disease in the unimmunized segment as a result of immunizing a proportion of the population’ (TJJohn). The induced herd immunity of a given vaccine exhibits geographic variation and it depends upon coverage and efficacy of the vaccine, both of which can vary geographically. Herd effect is determined by herd immunity as well as the force of transmission of the corresponding infection.

Although to arrive at the exact coverage for a particular vaccine to achieve herd immunity in a particular community is beyond the scope of this module. However, for disease control to be effective the health manager should always strive to achieve over 80-90% coverage for all doses of the vaccines available. In this way if a small proportion of the community remains unvaccinated, there will still be a good possibility of interrupting disease transmission.

The principle of community immunity applies to control of a variety of infectious diseases, including influenza, measles, mumps, rotavirus, and pneumococcal disease.

In the illustration following, the top box depicts a community in which no one is immunized and an outbreak occurs. In the middle box, some of the population is immunized but not enough to confer community immunity. In the bottom box, a critical portion of the population is immunized, protecting most community members.
In the top panel, there is no one immunized, and the contagious disease spreads throughout the population.

In the middle panel, some of the population gets immunized, and the contagious disease spreads through some of the population.

In the bottom panel, most of the population gets immunized, and the spread of contagious disease is contained.
**KNOWLEDGE TEST**

1. A woman who has given birth in the last 3 years and had received 2 doses of TT in her last pregnancy is pregnant for the second time. The woman should receive  
   a) 2 doses of TT  
   b) Only one dose of TT  
   c) No need for the vaccination  
   d) None of the above.

2. A pregnant woman should be given Injection TT during labour/delivery if she has not previously received Injection TT – Choose the correct answer  
   a) True  
   b) False  
   c) Don’t know  
   d) True, but only in a District hospital or Medical college

3. Till what age can the 0 dose of OPV be given?  
   a) Till 1 week  
   b) Till 15 days  
   c) Till 1 month  
   d) Till 1 year

4. What vaccines are usually/routinely given at 10 weeks according to the Immunization Schedule?  
   a) OPV 2, DPT 2, Hepatitis B 2  
   b) BCG, DPT, Measles  
   c) OPV, DPT  
   d) DPT, Vitamin A, Hepatitis B

5. As per the National Immunization schedule, at what age would the first dose of Vitamin A be given?  
   a) 6 months  
   b) 10 months  
   c) 9 months  
   d) 12 months

6. At what age should the first dose of measles vaccine be given?  
   a) 6 – 10 months  
   b) 12 – 15 months  
   c) 16 – 24 months  
   d) 9 – 12 months
7. At what age should the first DPT & OPV booster be given?
   a) 9 – 12 months
   b) 15– 20 months
   c) 16 – 24 months
   d) 24- 30 months

8. Infant should not be breastfed after giving OPV – Choose the correct answer
   a) True
   b) False
   c) Don’t know
   d) True, but only after 2 hours

9. What should be the minimum gap between 2 doses of DPT?
   a) 2 weeks
   b) 4 weeks
   c) 6 weeks
   d) 8 weeks

10. An infant developed convulsions after receiving the first dose of OPV & DPT. Next time the infant should be given
    a) DT & OPV
    b) TT & OPV
    c) Only DPT
    d) Only OPV

11. To prevent perinatal transmission of Hepatitis B, from mother to the newborn baby, the baby should be given birth dose of Hepatitis B vaccine
    a) During the labour
    b) Within 24 hrs of birth
    c) Within 48 hrs of birth
    d) Within one week of birth

12. How many doses of Vitamin A should be given till 5 years of age?
    a) 12
    b) 7
    c) 15
    d) 9

13. If a 6 year old child, who has never been vaccinated before, comes for vaccination, what vaccines should be given to him for the first time?
    a) BCG, OPV, Measles & DPT
    b) Vitamin A, Measles & DT booster should be given
    c) OPV, DPT, Measles & TT
    d) 3 doses of DPT one month apart
**Final Assessment**

1. What is the difference between Vaccination and Immunization?
   a) Immunization is the process of giving a vaccine while vaccination is the entire process beginning from giving vaccines to the development of body's protective response
   b) The entire process of giving immunity to the development of body's protective response is called vaccination while the process of giving a vaccine is called Immunization
   c) The process of giving a vaccine is called Vaccination while the entire process beginning from giving vaccines to the development of body's protective response is called Immunization
   d) None of the above

2. Which of the following vaccine usually provides life-long immunity?
   a) Recombinant vaccines
   b) Live Attenuated vaccines
   c) Whole cell Inactivated vaccines
   d) Fractional Inactivated vaccines

3. Which type of vaccines are BCG, DPT & Measles?
   a) BCG & Measles Live Attenuated, DPT Inactivated vaccine
   b) BCG Inactivated/Killed vaccine, DPT & Measles Live attenuated vaccine
   c) DPT Inactivated, BCG & Measles Recombinant
   d) BCG Live Attenuated, DPT & Measles Recombinant

4. What is the name of India's national immunization program? When was it introduced?
   a) Expanded Program on Immunization in 1978
   b) Expanded Program on Immunization in 1985
   c) Universal Immunization Program in 1978
   d) Universal Immunization Program in 1985

5. Which vaccine in Universal Immunization Program is given only in selected endemic districts following large scale vaccination campaigns?
   a) Measles
   b) Chinese Encephalitis
   c) Elephantiasis
   d) Japanese Encephalitis

6. What is "Herd" immunity?
   a) The process whereby each immunized individual produces antibodies
   b) The process whereby number of immunized persons in the community (usually 80% or more) serve as protective barrier for other people who are not immunized
   c) The process of community-based planning for immunization
   d) None of the above
7. Which of the following disease is not prevented through vaccine used in the Universal Immunization Program?
   a) Measles
   b) Tuberculosis
   c) Malaria
   d) Tetanus

8. A woman who has given birth in the last 3 years and had received 2 doses of TT in her last pregnancy is pregnant for the second time. The woman should be given
   a) 2 doses of TT
   b) No vaccination
   c) TT plus Hepatitis B
   d) 1 dose of TT

9. Which vaccine requires reconstitution with a diluent?
   a) BCG & OPV
   b) BCG & DPT
   c) BCG & Measles
   d) BCG & Hepatitis B

10. Which vaccines are light sensitive and come in amber coloured vials?
    a) BCG & Measles
    b) BCG & OPV
    c) BCG & DPT
    d) BCG & Hepatitis B

11. What vaccines are usually/routinely given at 10 weeks according to the Immunization Schedule?
    a) BCG, DPT 3, Measles
    b) OPV 2, DPT 2, Hepatitis B 2
    c) OPV 1, DPT 1
    d) DPT 2, Vitamin A, Hepatitis B 1

12. What is the usual age of giving Measles vaccine?
    a) 6 – 9 months
    b) 12 – 15 months
    c) 16 – 24 months
    d) 9 – 12 months

13. At what age should the DPT & OPV first booster be given?
    a) 9 – 12 months
    b) 15- 20 months
    c) 16 – 24 months
    d) 24- 30 months
14. A 3 year old child comes to you without having received any vaccine. What vaccines should be given to the child?
   a) DPT 1, OPV 1 & Measles on 1st visit followed by DPT2/OPV2 after 4 weeks and DPT 3/OPV 3 after another 4 weeks
   b) DPT 1 & OPV 1 on 1st visit followed by DPT2/OPV2 after 4 weeks and DPT 3/OPV 3 after another 4 weeks
   c) Only 3 doses of DPT at the gap of 4 weeks
   d) BCG, DPT 1 & OPV 1 on 1st visit followed by DPT2/OPV2 after 4 weeks and DPT 3/OPV 3 after another 4 weeks

15. How many doses of Vitamin A should be given till 5 years of age?
   a) 12
   b) 9
   c) 7
   d) 15

16. A manager should be well informed about the different aspects of the country's immunization program. There are different issues and reasons of Vaccine Preventable diseases which are given below. Match each issue with the correct reason.

<table>
<thead>
<tr>
<th>Issue</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Diseases prevented by Vaccination</td>
<td>A) For proper logistic management</td>
</tr>
<tr>
<td>B) The site, route and mode of administration of vaccine</td>
<td>B) To interact with the health workers, medical officers and general public</td>
</tr>
<tr>
<td>C) The Immunization schedule</td>
<td>C) To Supervise the health worker</td>
</tr>
<tr>
<td>D) The packaging and dosing of the vaccines</td>
<td>D) To plan for vaccination sessions and monitor timeliness and completeness of immunization as per schedule</td>
</tr>
</tbody>
</table>

Options:
   a) A – C; B – A; C – D; D – B
   b) A – B; B – D; C – A; D – B
   c) A – B; B – C; C – D; D – A
   d) A – D; B – C; C – A; D – B

17. If a child of 24 months comes to you without having received any dose of measles, what would be your strategy?
   a) Give both the doses of Measles vaccine right away
   b) Give two doses of Measles vaccine at six months interval
   c) Measles vaccine cannot be given after the age of 12 months
   d) Give two doses of Measles vaccine at one month interval until the age of 5 years
18. You come across a woman from another village with a 9 month old child in your health facility who had been visiting her grandparents. On enquiry, about the status of the child’s immunization status, it was found that the child has been vaccinated with only 2 doses of DPT and OPV when the child was 6 months old. What vaccines should be given to the child?

a) DPT 3, OPV 3, Measles, Vitamin A
b) Only Vitamin A
c) DPT 3, Measles, TT
d) MMR, DPT 3, Vitamin A

19. To prevent perinatal transmission of Hepatitis B, from mother to the newborn baby, the baby should be given birth dose of Hepatitis B vaccine

a) During the labour
b) Within 24 hrs of birth
c) Within 48 hrs of birth
d) Within one week of birth

20. Which component of DPT vaccine is not given if the child is found allergic to DPT or develops encephalopathy after DPT?

a) Diphtheria
b) Tetanus
c) All of the above
d) Pertussis
e) None of the above

21. If a child of 16 months comes to you without having received any vaccination, what vaccines should be given?

a) BCG, OPV 1, Measles & DPT 1
b) OPV 1, DPT 1, Measles, Vitamin A
c) Only Vitamin A, Measles & DT Booster
d) OPV 1, DPT 1, Measles & TT

22. What is the usual age of giving 2nd dose of Measles?

a) 9-12 months
b) 15-20 months
c) 16-24 months
d) 25-32 months
**Facilitators’ Guide:**

**Module 1: Fundamentals of Immunization half day (3 ½ hrs)**

**Module 1 A:**
*Basics of Immunization: ½ hr*

<table>
<thead>
<tr>
<th>Section</th>
<th>Method</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Why immunization</td>
<td>Presentation (PPT): 10 mins</td>
<td>Ppt 1 A</td>
</tr>
<tr>
<td>• How vaccines work</td>
<td>Film show followed by short</td>
<td>Films 1 A 1 and 1 A 2</td>
</tr>
<tr>
<td>• Vaccination/Immunity/immunization</td>
<td>Module Reading and interactive discussion: 10 mins</td>
<td>Module 1 A</td>
</tr>
<tr>
<td>• Types of vaccine</td>
<td></td>
<td></td>
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<tr>
<td>• Impact of Immunization</td>
<td></td>
<td></td>
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<tr>
<td>• History of vaccination</td>
<td></td>
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</tbody>
</table>

**Module 1 B:**
*The Immunization program: 1 hr*

<table>
<thead>
<tr>
<th>Section</th>
<th>Method (time)</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Why Immunization program</td>
<td>Modular reading and discussion (15 mins)</td>
<td>Module 1 B</td>
</tr>
<tr>
<td>• History of Immunization program in India</td>
<td></td>
<td></td>
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<tr>
<td>• Immunization related programs</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Roles and responsibilities of health managers in immunization</td>
<td>Film on Immunization  (20 mins) followed by discussion in groups (25 mins)</td>
<td>Film 1 B</td>
</tr>
<tr>
<td>• Group A: what are the preparatory managerial activities for a successful immunization program</td>
<td></td>
<td>Module section 1 B</td>
</tr>
<tr>
<td>• Group B: What are the managerial activities during the immunization session day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Group C: What are the managerial activities following the immunization session day</td>
<td></td>
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<tr>
<td>• OR</td>
<td></td>
<td></td>
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<tr>
<td>• Group A: who are the persons involved in the immunization program and what are their responsibilities</td>
<td></td>
<td></td>
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<tr>
<td>• Group B: What are the logistics and materials needed during the immunization program</td>
<td></td>
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<tr>
<td>• Group C: how is information compiled and used during the immunization program</td>
<td></td>
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</tbody>
</table>
### Module 1 C:
**Vaccine Preventable Diseases: 1 hr**

<table>
<thead>
<tr>
<th>Section</th>
<th>Method (time)</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>• What are VPDs</td>
<td>Ask participants the names of the VPDs and related vaccines they know about, fill in any gaps in knowledge: (15 mins)</td>
<td></td>
</tr>
<tr>
<td>• What vaccines are in Universal Immunization Program</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Details of each vaccine, schedule, dose, site and manner of administration</td>
<td>Quiz using presentation: (45 mins)</td>
<td>Presentation</td>
</tr>
</tbody>
</table>

### Module 1 D and E:
**Immunization schedule: 1 hr**

<table>
<thead>
<tr>
<th>Section</th>
<th>Method (time)</th>
<th>Tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Immunization schedule</td>
<td>Ask participants to write vaccine, schedule, dose, route, site in plain sheet of paper and exchange with each other for correction; discuss during correction time each vaccine with the details: demonstrate vaccines, diluents and syringes (20 mins)</td>
<td>Plain sheet of paper or one with 5 columns, vaccine, schedule, dose, route, site Vaccine, diluents and syringes for demonstration</td>
</tr>
<tr>
<td>• Immunization schedule as per Universal Immunization Program in India</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Frequently asked questions</td>
<td>Modular reading of questions and answers: (40 mins)</td>
<td>Module section 1 D</td>
</tr>
<tr>
<td>• Herd Immunity</td>
<td>Presentation followed by discussion</td>
<td>Presentation</td>
</tr>
</tbody>
</table>
REFERENCES:

- Immunization Essentials: A Practical Field Guide (October 2003), Technical writing group, USAID
Fundamentals of Immunization

Health Managers Modules for Immunization