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CHAPTER 1
YELLOW FEVER DISEASE

PREAMBLE

Yellow fever is an acute viral haemorrhagic disease transmitted by infected mosquitoes. The “yellow” in the name refers to the jaundice that affects some patients. Up to 50% of severely affected persons without treatment will die from yellow fever. The virus is endemic in tropical areas of Africa and Latin America, with a combined population of over 900 million people.

The yellow fever virus is an arbovirus of the flavivirus genus, and the mosquito is the primary vector. It carries the virus from one host to another, primarily between monkeys, from monkeys to humans, and from person to person. Several different species of the Aedes and Haemogogus mosquitoes transmit the virus. The mosquitoes either breed around houses (domestic), in the jungle (wild) or in both habitats (semi-domestic).

The number of yellow fever cases has increased over the past two decades due to declining population immunity to infection, deforestation, urbanization, population movements and climate change. There is no cure for yellow fever. Treatment is symptomatic, aimed at reducing the symptoms for the comfort of the patient. Vaccination is the most important preventive measure against yellow fever. The vaccine is safe, affordable and highly effective, and appears to provide protection for 30–35 years or more. The vaccine provides effective immunity after 10th day for 95% of persons vaccinated.

1.1 MAGNITUDE OF PROBLEM OF YELLOW FEVER ENDEMIC COUNTRIES

Yellow fever, the original viral hemorrhagic fever, was one of the most feared lethal diseases before the development of an effective vaccine. There are an estimated 200 000 cases of yellow fever, causing 30 000 deaths, worldwide each year. Fortunately, the virus has never emerged in Asia. Asia is considered vulnerable for the potential introduction of the virus, due to the presence of a large susceptible human population and presence of the mosquito vector, Aedes aegypti. Possible explanations for absence of the disease in Asia include cross-protection afforded due to by hyperendemicity of dengue fever, low competence of local populations of Aedes aegypti, and occurrence of Yellow fever in remote areas in people who do not travel by air and are unlikely to spread the infection. Regions of the world outside the Yellow fever endemic zone infested with Aedes aegypti and thus receptive to the introduction and spread of the disease include coastal areas of South America, Central America, the Caribbean, the southern USA, South Africa, India, Southeast Asia, Australia (Queensland), Southern China, Taiwan, and the Pacific Islands.

Up to 5000 cases in Africa and 300 in South America are reported annually, but the true incidence is believed to be 10-50 fold higher than the official reports (WEEKLY EPIDEMIOLOGICAL RECORD, NO. 6, 4 FEBRUARY 2005). Between 1990 and 1999, 11297 cases and 2648 deaths were reported in Africa. The largest number of cases was in Nigeria, which suffered a series of epidemics between 1986 and 1994. Epidemics have also occurred in Cameroon (1990), Ghana (1993-1994, 1996), Liberia (1995, 1998), Gabon (1994), Senegal (1995, 1996), Benin (1996), and Kenya (1992). During epidemics in Africa, the incidence of infection may be as high as 20% and the incidence of disease 3%. In South America, Yellow fever occurs principally in the Amazon region and contiguous grasslands. Between 1990 and 1999, 1939 cases and 941 deaths were reported.
In Africa, where the human population is seasonally exposed in and around villages, children without naturally acquired immunity are at highest risk of disease and there is a slight excess of cases in males. In South America, where the virus is transmitted in sparsely populated forested areas, it principally affects men engaged in lumbering or clearing land for agriculture.

Although WHO Member States are required to report YF cases under the International Health Regulations, reported data underestimate the true incidence of the disease. Studies indicate that YF morbidity and mortality are underestimated by a factor of 10-500. Reasons for underreporting include weak surveillance, particularly in rural areas where there is a higher probability of transmission, and generally less capacity and infrastructure for epidemiological surveillance and laboratory confirmation. Since the late 1980s, there has been a re-emergence of YF; more than 80 % of all YF cases reported to WHO were from Africa. Of the 33 “at-risk” countries in Africa, 16 reported at least 1 outbreak from 1980 to 1999. During the period 2000-2004 alone, 16 countries reported 1 or more outbreaks, with a total of 1927 cases and 425 deaths reported. The largest outbreak recorded during this period was in Guinea in 2000-2001, where 17 out of the 38 districts reported 833 cases and 246 deaths. Two of the outbreaks reported to WHO since 2000 were urban outbreaks in Abidjan, Côte d'Ivoire, in 2001 and Touba, Senegal, in 2002. Outbreaks may occur after long intervals of silence, as in the case of the outbreaks in Kenya in 1993 and Guinea in 2000, which occurred after 20 and 50 years of silence, respectively.

In 2004, out of the total number of cases of yellow fever declared in South America, 111 cases (47%) and 52 deaths (80%) were notified by 5 countries (Bolivia, Brazil, Colombia, Peru and Venezuela). The global case-fatality rate in South America was 47% - far higher than in Africa (11%).

### Outbreaks of Yellow fever disease in various endemic countries during 2000-2012

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<td>Yellow fever in Senegal</td>
<td>23 August 2001</td>
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1.2 PROBLEM OF YELLOW FEVER OUTSIDE THE ENDEMIC COUNTRIES

Travelers may wrongly consider yellow fever an "extinct" disease, and may not obtain accurate information about the risk of infection. In part this is because the indigenous population in Africa and South America is immune and virus transmission occurs in the virtual absence of reported cases. During the rainy season and early dry season all rural areas present a danger. In such areas, the risk of infection during a non-epidemic period approximates 1/1000 per month of exposure, but may increase to 1/15 per month during an epidemic. Immunization for travel is imperative.

Between 1996 and 1999, four fatal cases occurred in unvaccinated travelers from the USA and Europe to Brazil (two cases), Venezuela, and Cote d'Ivoire. These unfortunate events were completely avoidable by preventative vaccination. In one case (a US citizen infected in Brazil), the patient had not been immunized because the nearest vaccinating centre was inconveniently located, 25 miles from his home in Tennessee. A geographic analysis of vaccinating centers in the USA showed that they were indeed sparsely distributed in rural regions. By international regulation, yellow fever vaccine can only be distributed by centers approved by the World Health Organization or by designated national health authorities.

1.3 YELLOW FEVER AND INDIA

Yellow Fever does not occur in India. The conditions for transmission of yellow fever are very conducive in India - presence of mosquito vectors in abundance and susceptible population. Government of India has been following a strict yellow fever vaccination programme to prevent the entry of yellow fever in India. All passengers coming to India or passengers going from India to countries endemic for Yellow Fever should have a valid International Vaccination Card for Yellow Fever or they will be quarantined for a period of 6 days or till the YF vaccination become valid (whichever is earlier).
Strategy of Government of India for prevention of entry of yellow fever disease into India has been screening of all international passengers for vaccination against yellow fever disease at all points of entry in compliance of the International Health Regulations 1969 & 2005 and Aircraft Health Rules 1954 and Port Health Rules 1955. Over the years, Dte. GHS and MOH have set up 27 YFV Centers across the country. The vaccinations in these centers have increased and the demand for YFV has increased from 90,000 to nearly 132,000 in 2008.

IHR-2005.
The purpose and scope of these Regulations are to prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.

INDIA’s RESERVATIONS AND UNDERSTANDINGS TO IHR 2005

Proposed Reservation to IHR 2005:-
1. The Government of India reserves the right to consider the whole territory of a country as infected with yellow fever whenever yellow fever has been notified under Article 6 and other relevant articles in this regard of IHR (2005). The Government of India reserves the right to continue to regard an area as infected with yellow fever until there is definite evidence that yellow-fever infection has been completely eradicated from that area.
2. Yellow Fever disease will be treated as disease of Public health emergency of international concern and all health measures being applied presently like disinsection of conveyance, vaccination requirements and quarantine of passengers and crew (as may be required) (as per Article 7, 9.2(b), 42 and relevant annexures) will be continued as has been stipulated under Annex-II of IHR-1969

In the recent years there has been increase in the international travel including to and fro from yellow fever endemic countries. There has been an increase of 26.7 percent passenger load at all airports in India. In actual numbers, the passengers increased from 1492134 to 1842784 in 2007-08 over 2006-07. No specific figures are available from the YFV endemic countries. However, with the increased India’s aid to African Continent the traffic from YF endemic countries is likely to increase.

1.4 CAUSATIVE AGENT OF YELLOW FEVER
The disease is caused by the yellow fever virus, which belongs to the flavivirus group.

1.5 TRANSMISSION OF YELLOW FEVER
There are two modes of transmission of the yellow fever virus, the sylvatic or forest cycle and the urban cycle. Transmission begins when vector mosquitoes (Aedes africanus in Africa, and several species of the genus Haemagogus in South America) feed on non-human primates infected with the virus. The infected mosquitoes then feed on humans travelling through the forest. The greatest risk of an epidemic occurs when viraemic humans return to urban areas and are fed on by the domestic vector mosquito Aedes aegypti, which then transmits the virus to other humans.

1.6 DISEASE PRESENTATION
Despite intense study, relatively little is known about the disease beyond purely descriptive accounts. In part, this is due to the occurrence of the disease in remote
areas without access to sophisticated medical care. Although the human disease can be modeled quite precisely in nonhuman primates, virtually no research on its pathogenesis has been conducted in the past 20 years.

The clinical disease varies from non-specific, abortive illness to fatal hemorrhagic fever. The incubation period after the bite of an infected mosquito is 3-6 days. Disease onset is typically abrupt, with fever, chills, malaise, headache, lower back pain, generalized myalgia, nausea, and dizziness. On physical examination the patient is febrile and appears acutely ill, with congestion of the conjunctivae and face and a relative bradycardia with respect to the height of fever (Faget's sign). Virus is present in blood and the patient may thus serve as a source of infection for mosquitoes. The average fever is 39°C and lasts 3-3 days. Young children may experience febrile convulsions. Laboratory abnormalities include leukopenia with a relative neutropenia. Between 48 and 72 h after onset and before the appearance of jaundice, serum transaminase levels may rise. This so-called "period of infection" lasts several days and may be followed by a "period of remission", with the disappearance of fever and symptoms lasting up to 24 h. During the period of remission, virus is cleared by antibodies and the cellular immune response. The blood may contain non-infectious immune complexes detectable by immunoassays or PCR. Patients with abortive infections may recover at this stage, without further signs.

In approximately 15-25% of people affected, the illness reappears in a more severe form (the so-called IrpeHod of intoxication") with fever, vomiting, epigastric pain, jaundice, renal failure, and a hemorrhagic diathesis. Hemorrhagic manifestations include petechiae, ecchymoses, epistaxis, and oozing of blood from the gums and at needle puncture sites. In many cases there is major bleeding, coffee-grounds haematemesis, melaena, or metrorrhagia. Laboratory abnormalities include thrombocytopenia, prolonged clotting and prothrombin times, reduced fibrinogen and factors II, V, VII, VIII, IX, and X, and the presence of fibrin split products. These abnormalities suggest a multifactorial bleeding disorder caused by reduced synthesis of clotting factors and consumption coagulopathy. Platelet dysfunction, demonstrated by collagen and ADP stimulated aggregation, has been demonstrated in the monkey model. Myocardial injury is manifest by ST-T wave abnormalities on the electrocardiogram, and occasionally by acute cardiac enlargement.

20-50% of patients with hepatorenal disease die, typically 7-10 days after onset. Events preceding death include hypotension-an increasingly difficult symptom to manage with fluids and vasopressors. Patients also experience agitated delirium, stupor, coma, Cheyne-Stokes respirations, metabolic acidosis, hyperkalaemia, hypoglycaemia, and hypothermia. The cerebrospinal fluid is under increased pressure, with raised albumin but no increase in white blood cells, which is consistent with cerebral oedema. Pathological changes include microscopic perivascular haemorrhages and oedema. True yellow fever viral encephalitis due to viral infection of brain tissue (as opposed to encephalopathy) is very rare.
CHAPTER 2
YELLOW FEVER VACCINE

Yellow Fever Vaccine is an attenuated, live-virus preparation of the 17D strain of yellow fever virus grown in leucosis-free chick embryos. A single dose correctly given confers immunity in basically 100% of recipients. Protective immunity is achieved only after 10 days of yellow fever vaccination and persists for at least 10 years and re-immunization is currently recommended after 10 years. This vaccine is given as a single injection given subcutaneously. Yellow fever Vaccination Certificate becomes valid only after 10 days of vaccination.

2.1 Vaccine summary

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<tr>
<td>Number of doses</td>
<td>One dose of 0.5 ml subcutaneously</td>
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<tr>
<td>Route of Administration</td>
<td>Sub-cutaneous</td>
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<tr>
<td>Schedule</td>
<td>Can be given at nine months of age Require a booster every 10 years</td>
</tr>
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<td>Booster</td>
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</tr>
<tr>
<td>Contraindications</td>
<td>Egg allergy; immune deficiency from medication or disease; symptomatic HIV infection; hypersensitivity to previous dose; pregnancy</td>
</tr>
<tr>
<td>Adverse reactions</td>
<td>Hypersensitivity to egg; rarely, encephalitis in the very young; hepatic failure. Rare reports of death from massive organ failure. Do not give before six months of age; avoid during pregnancy</td>
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<tr>
<td>Special precautions</td>
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<tr>
<td>Storage temperature</td>
<td>+2 to +8 degrees centigrade</td>
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</table>

Source: WHO

2.2 SIDE EFFECTS

Severe or serious adverse reactions to 17D vaccine are extremely rare. Post-vaccinal encephalitis (due to invasion of the brain by the vaccine virus) has long been recognized as a rare complication related to use of the vaccine in very young infants. 18 of the 21 reported encephalitis cases were in children, of whom 16 were under 7 months. Virus recovered from the brain of the single reported fatal case contained two aminoacid changes in the E gene and exhibited increased neurovirulence in animals. It is unknown whether the other cases were due to mutations in the vaccine virus. Anaphylactic reactions to yellow fever vaccine occur at a frequency of approximately 1/58000 and may be due to sensitivity to gelatin used to stabilise the vaccine.

1. Mild Side Effects of Vaccination

- Yellow fever vaccine has been associated with fever and with aches, soreness, redness or swelling where the shot was given. These problems occur in up to 1 person out of 4. They usually begin soon after the shot, and can last up to a week.
- Most people will get a slight sore arm
- 2-10% may feel tired, headache, muscle aches, fever for 24 hours starting 3-9 days after the vaccine
- 1% need to curtail regular activities
2. More Serious Side Effects of Vaccination

- The risk of a vaccine causing serious harm, or death, is extremely low.
- Severe allergic reaction to a vaccine component (about 1 person in 58,000).
- Severe nervous system reaction (about 1 person in 125,000).
- Life-threatening severe illness with organ failure (about 1 person in 250,000). More than half the people who suffer this side effect die. These last two problems have never been reported after a booster dose.
- 1 in 130,000 will get immediate hypersensitivity – rash, itching faint or asthma – this is why you need to wait 30 minutes in the clinic
- 0.09-2.5 per million will get inflammation of multiple organs e.g. lungs, kidney, liver, spleen, skin, blood stream
- 1 in 8 million will get encephalitis (Inflammation of the brain)

2.3 MANUFACTURERS, PURCHASE AND SUPPLY OF YF VACCINE:

Presently there are 3 manufacturers of YF vaccine which are approved by WHO and are as follows:

1. Aventis Pasteur, France 58, avenue Leclerc
   BP 7046
   69348 Lyon Cedex 07,
   France
2. BioManguinhos, Brazil Av Brasil 4365-Manguinhos
   21045-900 Rio de Janeiro/RJ
   Brazil
3. Institute Pasteur Dakar, Senegal BP 220
   36, avenue Pasteur
   Dakar
   Senegal

In India vaccine is produced and supplied by Central Research Institute, Kasauli. However, in the recent years, there has been a shortfall of yellow fever vaccine in the above 27 centers because of short supply of the vaccine. The yellow fever vaccine is being imported through WHO (which takes nearly 8 to 9 months for supply) because of which there has been a delay and shortfall of the vaccine. If an uninterrupted supply of vaccine can be maintained then there would not be any shortfall or difficulty in yellow fever vaccination by the above centers.

CRI Kasauli: address and contact details are:
Treatment Centre,
Central Research Institute, Kasauli, HP
Phone-01792-272538,01792-273209

2.4 YELLOW FEVER VACCINE PROCUREMENT

The Yellow Fever vaccine is produced in the country by CRI, Kasauli and supplied to various recognized YF vaccination centers. In case of emergency or breakdown of vaccine production/supply, vaccine procurement by CRI, Kasauli is done through WHO and then supplied to various vaccination centers as above. Vaccination requirement is estimated on yearly consumption basis. The Yellow Fever Vaccination centers /Hospitals place the demand with CRI Kasauli and procure the Yellow Fever Vaccine from CRI, Kasauli, on quarterly basis. i.e four times a year or
as frequently as per their need. The Yellow Fever Center/ Hospital make the payment for the vaccination to C.R.I. (Kasauli) after receiving the vaccine from their allocated budget.

THE No. OF VACCINES TO BE ORDERED TO CRI (KASAULI)

It is suggested that each YF vaccination center while placing the demand should ensure that it has sufficient reserve stock as buffer to meet the demand for six months (which should ideally include 10% wastage amount). Demand should indicate no. and quantity of multi dose vial (10, 5 or 2 ml) required.

VIAL OF YELLOW FEVER VACCINES

Yellow fever vaccines are available in multi dose or single dose vials as given below:

- Multi dose (10, 5 & 2 doses vial)
- Single dose

Presently, the vaccination fee is charged as Rs. 300 per vaccination dose to the passenger. This includes syringes, sterilization, administering, transport and cold chain maintenance cost.

2.6 PRECAUTIONS TO BE TAKEN DURING ADMINISTRATION OF YF (Yellow Fever) VACCINES

Besides keeping a watch for anaphylactic reactions, sensitivity for egg proteins or to any other immunization or drug is invariably confirmed from all passengers. All aseptic precautions are taken. The reconstituted vaccines are used the same day (within 6 hours).

2.7 AUDITING OF YF VACCINES:

A monthly report is generated at each YF vaccination center giving details of the number of vaccines used and the balance in stock. A complete register is maintained at each centre with all details of the passenger immunized including his passport and contact details. Medical officer posted at vaccination centre supervises the total process of YF vaccination. As each vaccination costs Rs. 300/- a receipt is issued.
CHAPTER 3

YELLOW FEVER VACCINATION CENTERS

3.1 CAPACITY OF GOVERNMENT INSTITUTIONS IN GIVING YELLOW FEVER VACCINATIONS:

There are 27 vaccination centers (List enclosed as Annexure-1). All these vaccination centers are approved by DGHS and the Ministry of Health and Family Welfare and are based in government institutions either of Centre or State. These centres are spread over the states of TN, West Bengal, Gujarat, UP, Kerala, Maharashtra, Karnataka, HP, AP, Goa and Delhi. These centers follow all stringent measures abiding international health regulations and the rules of the country.

3.2 EXPANSION OF YELLOW FEVER VACCINATION IN OTHER SETTINGS

3.2.1 Expansion of YFV to all existing APHOs/PHOs: As mentioned above, the YFV services are, presently being provided in 27 government institutions. To expand the YFV, on the first hand all APHOs and PHOs be designated as YFV centres. This will include the following existing APHOs/PHOs:

- APHO Chennai
- PHO Tuticorin
- APHO Amritsar

3.2.2(a). Expansion in areas where there are no APHOs/PHOs: The following states, where international flights/traffics are operating, are not covered by YF vaccination centres:

- a. Rajasthan
- b. J & K
- c. Bihar
- d. Assam
- e. A & N islands

3.2.2 (b) Besides the above the following states, where international flights/traffics are operating, do not have any YFV centre:

- Arunachal Pradesh
- Chattisgarh
- Haryana
- Jharkhand
- Madhya Pradesh
- Manipur
- Meghalaya
- Mizoram
- Nagaland
- Orissa
- Sikkim
- Tripura
- Uttaranchal
- Chandigarh
- Dadar and Nagar Haveli
- Daman and Diu
Travelers who need YF vaccinations from the 3.2.2(a) and 3.2.2(b) areas have to travel to nearby designated vaccination. Feasibilities of opening YF vaccinations in these areas are being taken up with DHS of state.

3.3 Identification of New YF vaccination centers: MOHFW is exploring possibilities of new/additional vaccination centers for designating as per the WHO norms as authorized YF vaccination centers.

A. Medical Colleges/ Central Government Institutions: Vaccination centres can be located in the government settings (central or medical colleges/ institutions).

B. State Government Institutions: In areas where there are no Central Government or Medical colleges, State Government Institutions may be designated as YFV centers.

C. Other Organizations/ Private Organizations may be designated in case no central or state government institution or medical colleges are present.
CHAPTER – 4

PREREQUISITES FOR ESTABLISHING A YELLOW FEVER VACCINATION CENTRE

India is highly vulnerable to the yellow fever introduction in view of highly susceptible population and abundance of mosquito vector- Aedes aegypti. The dense population also will contribute to the high morbidity and mortality (case fatality rates being as high as 50 percent in virgin areas) in case yellow fever is introduced. In view of these facts a strict quality control of YF vaccination process has to be maintained and if introduced in other settings the following aspects will need to be taken care:

1. **Designated Yellow Fever Vaccination Centers**: For the purpose of yellow fever vaccination, only a vaccination center authorized by the Ministry of Health & FW, Government of India are recognized centers. These are designated by Directorate General of Health services and notified to WHO.

2. **COLD CHAIN ISSUES**: Yellow Fever vaccine has to be maintained at a temperature of +2 to +8 degrees centigrade having an effective cold chain mechanism. The maintenance of cold chain can be a problem leading to loss of viability of vaccines. In government settings, an Ice Lined refrigerator is a common practice originating from the large scale immunizations being done in government. For newer facilities similar cold chain mechanism would be required.

3. **DEMAND AND SUPPLY OF YFV**: Presently, each vial of vaccine consists of 10/5/2 doses. As mentioned above, YFV are imported presently from WHO recognized manufacturer and thus each institution will be given a demand for vaccines at least 6 months in advance to facilitate procurement and supply. Each institution will have to give the consumption report on three monthly bases to the CRI Kasauli/DGHS.

4. **INJECTION SAFETY PRACTICES**: Each institution will follow the Injection Safety Practices guidelines as indicated in the chapter on Safe Injection Practices.

5. **TRAINED MANPOWER FOR ADMINISTRATION OF VACCINE**: The manpower at each institution will be trained by the APHO/PHO for administration of YFV. A standard training of 2 days has to be undertaken by the personnel of the institutions giving YFV.

6. **AUTHORIZED INTERNATIONAL YF CARDS – DIFFICULTY IN MAINTAINING UNIFORMITY OF THE YF CARDS OF PASSENGERS COMING TO INDIA**: As such, at all recognized YFV centers, the International YF Vaccination Cards printed as per WHO format in IHR (2005) document of WHO, procured from authorized agents will be used. In case YF vaccination cards are printed on different stationary it may be difficult to recognize by the immigration officials.

7. **AUTHORIZED SIGNATORY ON YF CARDS**: Medical Officer & Official appointed by Center/State govt. only will be allowed to sign the YF cards.

4.1 **SPACE & INFRASTRUCTURE FOR VACCINATION CENTER** -

An ideal yellow fever vaccination center should have sufficient space for Registration, Space for waiting area/room, Injection (vaccination) Room, Observation Room and Facilities for public use.
4.1.1 The Space for waiting area/room

The APHO Delhi is providing yellow fever vaccination on Tuesday & Thursday between 2-4 pm. The APHO Delhi is providing vaccination to 60-80 people per vaccination day. The Waiting room in APHO Delhi is having following dimension

SPACE        CHAIR
36 ft x 18 ft (length x breath)  25
4.1.2 Injection (vaccination) Room:

The Vaccination room in APHO Delhi is having following dimension

<table>
<thead>
<tr>
<th>SPACE</th>
<th>CHAIR</th>
</tr>
</thead>
<tbody>
<tr>
<td>VACCINATION ROOM</td>
<td>18 ft x 19 ft (length x breath)</td>
</tr>
</tbody>
</table>

4.1.2a. Equipments & Infrastructure of Vaccination room:-

1) One ml Disposable / A.D. Syringe & Needle
2) 05 ml Disposable syringe & needle
3) Glove
4) Cotton/water Swab
5) Hub cutter
6) Needle destroy
7) Waste disposable bag/bucket
8) Stool (two)
9) Almirah (one)
10) Chair (fifteen- Five for Staff & Ten for Vaccinee)
11) Table (one)
12) Tray,
13) Scissor
14) One bed
15) One Couch
16) Stretcher
17) Moveable screen
18) Two Fridge of 400 liters & 165 liters capacity.

4.1.2b Space for vaccine storage:-

Vaccine Storage:-

The vaccine is to be stored and transported at the temperature of 2 to 8°C. in the place inaccessible to children. The diluents of the vaccine are to be stored at 2-8°C.

Vaccine Storage Space:-

A freezer compartment with size of 12"x21"x19" of 400 liters capacity refrigerator can stores up to 2000 vaccine dose.

4.1.3 Observation Room (In case of anaphylactic shock/adverse reactions)

Observation room should have-

1) Four Bed
2) Thermometer
3) BP instrument
4) Stethoscope

4.1.3a Emergency Medicine Kit (in Observation Room for any time):-

1) Plastic/disposable syringes
2) Injections
   - Adrenaline
   - Anti-histamine
   - Hydrocortisone
   - Terbutaline
   - Dextrose (25%)
3) IV Canulas (20G and 22G)
4) Cotton gauze
5) IV Infusion set
6) Oral drugs: Paracetamol Antihistamines
7) Mouth gags and tongue depressor
8) Oxygen cylinder
9) AMBU bag
10) Face mask (adult/pediatric)
11) IV Fluids
   - Normal saline
   - N/5 in 5% Dextrose
   - Ringer lactate
4.1.4 Basic Facilities (Optional):-
   Facility for drinking water,
   Wash room,
   TV

4.2 Manpower: (Only for vaccine days and time)
1 Doctor
1 Nurse
1 Clerk/ person for registration
1 Helper for vaccination

4.3 THE NECESSARY INFORMATION FOR YELLOW FEVER VACCINE BENEFICIARIES (To be displayed at YF centre for passenger – see Annexure 2)
CHAPTER 5
VACCINATION PROCEDURE

All the necessary information regarding the procedure of vaccination and the side effects / Adverse effects related to the Yellow Fever Vaccination should be displayed & informed to all the vaccinee.

The vaccine beneficiary move in following direction

Flow of vaccine Beneficiary

Registration counter → waiting area → INJECTION ROOM

Consent → Record & fee → Vaccination → Observation Room
(In case of Anaphylaxis / adverse reaction)

The procedure for Yellow Fever Vaccination:

1. The vaccination services are to be provided on the first come first served basis.
2. The registration / token distribution system may be followed to maintain the first come first served system.
3. At time of registration, the Travel Document (passport) is to be checked and all the vaccinees are instructed to read the necessary information regarding Yellow Fever Vaccination displayed in the registration / waiting area.
4. The vaccinees are informed to bring/keep the Travel Document (passport) and the vaccination fee Rs.300/- with them at the vaccination time.
5. All the vaccinees are instructed to wait in the waiting area and the vaccinees are called for vaccination in batches of 10 persons in vaccination room.
6. All the vaccinees are informed and allowed to read about the side effects / adverse reactions and other related information about Yellow Fever Vaccination.
7. The informed consent is to be taken from all the vaccinees.
8. The entries are filled up in the vaccination register from Travel Document (passport) & subsequently the fee for the vaccination are collect and the receipt for the same is given to vaccinee.
9. The vaccinees are directed to complete the entries related to vaccine in WHO Yellow Fever Vaccination card and directed for vaccine inoculation.
10. The doctor/nurse start vaccination procedure as follows:
   a. Checks the Vial Viability Marker (see the Annexure-3 for VVM)
   b. The required amount of diluents mixed in the vial with 5ml disposable plastic syringe.
   c. All the bio-medical waste are segregated and collected/disposed in the respective bags at the time of procedure only as per biomedical waste rules.
   d. The water swab is used to clean the inoculation area.
   e. The vaccination dose i.e. 0.5ml for everybody is inoculated to the vaccinee with 1ml disposable/AD plastic syringe.
f. After inoculation the vaccinees are asked to wait for 30 minutes and inform then & there any side effects / adverse reactions to doctor on duty.
CHAPTER 6
RECORD MAINTENANCE

The following records are to be maintained

1. Registration record - record vaccinee’s name & travel document details (passport No.).

2. Consent form/register- The informed consent is recorded from every vaccinee before vaccination.
   Consent
   I hereby, am giving my full, free & voluntary consent for yellow fever vaccination. The procedure, risk, complication, contraindication & other related information to the vaccination has been provided to read and explained to me by the Doctor on duty in the language I understand.
   Signature of the passenger.

3. Yellow fever vaccination register- The following entries are to be completed in the register –
   Sl. No., Name, Date of Birth, Sex, Passport No., Address, Vaccine Batch No., Receipt No., Signature of passenger, Signature of Medical Officer

4. Yellow fever card- Only WHO recommended yellow fever card is to be used.
CHAPTER 7
GUIDELINES FOR SAFE INJECTION PRACTICES

1. Use sterile injection equipment

- Use Auto-diable sterile syringe and needle for each injection and to reconstitute each unit of medication.
- Inspect packaging for breaches in barrier integrity. Discard a needle or syringe if the package has been punctured, torn, or damaged by exposure to moisture

AD Syringes – Instructions for Use

1. Select the correct syringe for the vaccine to be administered

2. Check the packaging. Don't use if the package is damaged, opened or expired.

3. Peel open or tear the package from the plunger side and remove the syringe by holding the plunger. Discard the packaging into a black plastic bag.

4. Remove the needle cover / cap and discard it into the black plastic bag. Do not move the plunger until you are ready to fill the syringe with the vaccine and do not inject air into the vial as this will lock the syringe.

5. Take the appropriate vaccine vial, invert the vial, and insert the needle into the vial through the rubber cap. Insert the needle such that the tip is within the level of the vaccine. If inserted beyond you may draw air bubble, which is very difficult to expel. Do not touch the needle or the rubber cap (septum) of the vial.

6. Pull the plunger back slowly to fill the syringe. The plunger will automatically stop when the necessary dose of the vaccine has been drawn (0.1 or 0.5 ml). Do not draw air into the syringe. In case air should accidentally enter the syringe, follow these steps to remove the air bubbles:

   a) Remove the needle from the vial. Holding the syringe upright, tap the barrel to bring the bubbles towards the tip of the syringe.

   b) Pull the plunger back to allow air to come in through the needle until it comes in contact with the air bubble in the syringe barrel.

   c) Then carefully push the plunger to the dose mark (0.5 or 0.1 ml) thus expelling the air bubble.

7. Clean appropriate injection site, if necessary with a wet swab and administer the vaccine.

8. Push the plunger completely to deliver the dose till it gets locked.
9. Cut the hub of the syringe immediately after use with a hub-cutter that collects the sharps in a hard white translucent plastic container. Do not recap the needle. Then collect the cut syringes in a red plastic bag. The cut/destroyed syringes, barrels and needles must be disinfected at the designated place and properly disposed off.

Use and Disposal of Syringes
(Preferably Auto-Disable (AD) Syringes should be used)

In practice, at most of the centres, 1 ml disposable plastic syringes are being used for single use, and after use, the syringe is discarded using needle destroyer. The recommended biomedical waste disposal guidelines are to be followed.

Where ever practically feasible, Auto-Disable (AD) syringes are to be used for immunization instead of glass or disposable syringes. In parallel to introducing AD syringes, MoHFW has also developed and disseminated detailed user guidelines that outline steps that should be followed when using an AD syringe and disposing of AD syringes.

Steps / stages for safe disposal:

1. Procedure for use of Disposable syringes (Plastic):
   - Injection at the immunisation site using a hub-cutter that cuts plastic hub of syringe and not the metal part of needle
   - The cut needles will get collected in the puncture proof white translucent container of the hub cutter.
   - Segregate and store syringes and unbroken (but discarded) vials in red bag or container. If the Immunisation waste is generated from outreach centres, then handover these to the District Hospitals / CHC / PHC for further disposal.
   - Send the collected materials to the Common Bio-Medical Waste Treatment Facilities. If such facilities do not exist, then go to the next step.
   - Treat the collected material in an autoclave. If it is unable to impart autoclaving, boiling such waste in water for at least 10 minutes / chemical treatment may be imparted. It shall be ensured that these treatments ensure disinfection.
   - Dispose the autoclaved waste as follows: (i) Dispose the needles and broken vials in a pit / tank, (ii) Send the syringes and unbroken vials for recycling or landfill.
   - Wash properly the containers for reuse.
   - Make a proper record of generation, treatment and disposal of waste.

2. Procedure for use of AD syringes (Plastic):
   - Remove needles from AD Plastic syringe immediately after administering
injection at the immunisation site using a hub-cutter that cuts plastic hub of syringe and not the metal part of needle

- The cut needles will get collected in the puncture proof white translucent container of the hub cutter.

- Segregate and store syringes and unbroken (but discarded) vials in red bag or container. If the Immunisation waste is generated from outreach centres, then handover these to the District Hospitals / CHC / PHC for further disposal.
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- Wash properly the containers for reuse.

- Make a proper record of generation, treatment and disposal of waste.

2. **Prevent contamination of injection equipment and medication**
   - Prepare each injection in a clean designated area where blood or body fluid contamination is unlikely. Prepare each injection in a clean designated area where blood or body fluid contamination is unlikely.
   - Select pop-open ampoules rather than ampoules that require use of a metal file to open.
   - If using an ampoule that requires a metal file to open, protect fingers with a clean barrier (e.g. small gauze pad) when opening the ampoule.
   - Inspect for and discard medications with visible contamination or breaches of integrity (e.g. cracks, leaks).
   - Follow specific recommendations for use, storage, and handling.
   - Discard a syringe and needle that has touched any non sterile surface.

3. **Prevent needle stick injuries to the provider**
   - Anticipate and take measures to prevent sudden patient movement during and after injection.
   - Avoid recapping and other hand manipulations of needles. If recapping is necessary, use a single-handed scoop technique.
   - Collect used syringes and needles at the point of use in a sharps container that is puncture and leak-proof and that can be sealed before completely full.

4. **Prevent access to used needles**
   - Seal sharps containers for transport to a secure area in preparation for disposal. After closing and sealing sharps containers, do not open, empty, reuse, or sell them.
   - Manage sharps waste in an efficient, safe, and environment friendly way to protect people from voluntary and accidental exposure to used injection
5. Other practice issues

- **Provider's hand hygiene and skin integrity.** Perform hand hygiene (i.e., wash or disinfect hands) prior to preparing injection material and giving injections. The need for hand hygiene between each injection will vary based on the setting and whether there was contact with soil, blood or body fluids. Avoid giving injections if skin integrity is compromised by local infection or other skin condition (e.g., weeping dermatitis, skin lesions, and cuts). Cover any small cuts.

- **Gloves.** Gloves are not needed for injections. Single use gloves may be indicated if excessive bleeding is anticipated.

- **Swabbing of vial tops or ampoules.** Swabbing of vial tops or ampoules with an antiseptic or disinfectant is unnecessary. If swabbing with an antiseptic is selected for use, use a clean, single use swab and maintain product specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.

- **Skin preparation prior to injection.** Wash skin that is visibly soiled or dirty. Swabbing of the clean skin prior to giving an injection is unnecessary. If swabbing with an antiseptic is selected for use, use a clean, single use swab and maintain product specific recommended contact time. Do not use cotton balls stored wet in a multi-use container.
ANNEX. 1

THE NECESSARY INFORMATION FOR YELLOW FEVER VACCINE BENEFICIARIES

1. All the vaccine beneficiary have to read the following carefully and comply strictly and honestly.

- All vaccine beneficiaries has to wait approximately for 30 minutes after receiving the vaccination and
- inform immediately to then & there doctor on duty in case of any uneasiness, side effect, reaction or any other adverse reaction to the beneficiary

2. Who should not get yellow fever vaccine?
   - Anyone with allergy to eggs, chicken proteins, or gelatin,
   - who had a severe allergic reaction to a previous dose of Yellow fever vaccine (Tell your doctor if you have any severe allergies)
   - You are pregnant, or could be pregnant now or in the next two weeks
   - Children younger than 12 months of age (as per existing norms of Govt. of India),
   - You have HIV/AIDS
   - Your immune system is weakened as a result of cancer or other medical conditions, a transplant, or radiation or drug treatment (such as steroids or cortisone, cancer chemotherapy, or other drugs that affect immune cell function).
   - Persons who have an acute/moderate illness (with or without a fever) should postpone receiving this vaccine until they are well.
   - Who have a thymus disorder, such as myasthenia gravis, DiGeorge syndrome, or thymoma or Thymus removed.
   - You have any major liver or kidney disease

3. Other Advisory
   - Nursing mothers should avoid or postpone travel to an area where there is risk of yellow fever
   - Adults 60 years of age and older might be at increased risk for severe problems following vaccination.

# Exemption or contraindication to yellow fever Vaccination does not provide any immunity from quarantine (isolation)

4. Mild Side Effects of Vaccination
   - Yellow fever vaccine has been associated with fever and with aches, soreness, redness or swelling where the shot was given. These problems occur in up to 1 person out of 4. They usually begin soon after the shot, and can last up to a week.
   - Most people will get a slight sore arm
   - 2-10% may feel tired, headache, muscle aches, fever for 24 hours starting 3-9 days after the vaccine
   - 1% need to curtail regular activities

5. More Serious Side Effects of Vaccination
   - The risk of a vaccine causing serious harm, or death, is extremely low.
   - Severe allergic reaction to a vaccine component (about 1 person in 58,000).
   - Severe nervous system reaction (about 1 person in 125,000).
- Life-threatening severe illness with organ failure (about 1 person in 250,000). More than half the people who suffer this side effect die. These last two problems have never been reported after a booster dose.
- 1 in 130,000 will get immediate hypersensitivity – rash, itching faint or asthma – this is why you need to wait 30 minutes in the clinic
- 0.09-2.5 per million will get inflammation of multiple organs e.g. lungs, kidney, liver, spleen, skin, blood stream
- 1 in 8 million will get encephalitis (Inflammation of the brain)

6. What if there is a severe reaction?
   a. What should I look for?
      o Look for any unusual condition, such as a high fever, behavior changes, or flu-like symptoms
      o Signs of an allergic reaction can include difficulty in breathing, hoarseness or wheezing, hives, paleness, weakness, a fast heart-beat, or dizziness within a few minutes to a few hours after the shot.
   b. What should I do?
      o Call a doctor, or get the person to a doctor right away.
      o Tell the doctor what happened, the date and time it happened, and when the vaccination was given.
ANNEX. 2

VIAL VIABLITY MARKER (VVM)

A vaccine vial monitor (VVM) is a label containing a heat sensitive material which is placed on a vaccine vial to register cumulative heat exposure over time. The combined effects of time and temperature cause the inner square of the VVM to darken, gradually and irreversibly. A direct relationship exists between the rate of colour change and temperature:

- The lower the temperature, the slower the colour change.
- The higher the temperature, the faster the colour change.

The VVM is a circle with a small square inside it. It can be printed on a product label, attached to the cap of a vaccine vial or tube, or attached to the neck of an ampoule.

The inner square of the VVM is made of heat sensitive material that is light at the starting point and becomes darker with exposure to heat. At the starting point, the inner square is a lighter colour than the outer circle. From then on, until the temperature and/or duration of heat reaches a level known to degrade the vaccine beyond acceptable limits, the inner square remains lighter than the outer circle.

At the discard point, the inner square is the same colour as the outer circle. This reflects that the vial has been exposed to an unacceptable level of heat and the vaccine degraded beyond acceptable limits. The inner square will continue to darken with heat exposure until it is much darker than the outer circle. Whenever the inner square matches or is darker than the outer circle, the vial must be discarded.

VVMs are located either on the label or on the top of the cap or on the neck of the ampoule depending on the type of vaccine (liquid or freeze-dried). VVM for liquid type vaccines are placed on custom labels to allow reference to VVM readings even though those vials have been opened and intended to be used in subsequent
sessions according to multi-dose vial policy (MDVP). VVM for freeze dried vaccines are placed either on top of the cap (vials) or on the neck of the ampoule so it is discarded by the time of reconstitution. Since freeze-dried vaccines must be discarded within six hours or at the end of the session whichever comes first, VVM can only be referred until the time of reconstitution.

The point to focus on is the colour of the inner square relative to the colour of the outer circle:

Rule 1: If the inner square is lighter than the outer circle, the vaccine may be used.

Rule 2: If the inner square is the same colour as, or darker than, the outer circle, the vaccine must not be used.

There are four different types of VVMs designed for different types of vaccines depending on their heat stability. Reaction rates are specific to four different models of VVM, relating to four groups of vaccines according to their heat stability at two specific temperature points.