CLINICAL GUIDELINES FOR BEST PRACTICE IN IMMUNIZATION

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Public Health Protection Department

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Dubai Health Authority

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INTRODUCTION

Public Health Protection Department (PHPD) forms an integral part of Dubai Health Authority (DHA) and is mandated by DHA Law No. (14) of the year (2021) amending some clauses of law No. (6) of 2018 pertaining to the Dubai Health Authority (DHA), to undertake several functions including but not limited to:

- Developing and monitoring early screening programs for chronic disease such as diabetes, high blood pressure, cardiovascular diseases, cancer and mental health diseases.
- Develop public health policies and strategies and give them priority.
- Monitor and estimate population health, and prepare periodic reports about the health situation in the Emirate of Dubai.
- Develop surveillance systems for communicable and non-communicable diseases.
- Develop and update public health indicators with the coordination of the concerned stakeholders, taking into consideration social, economic, cultural and biological factors.
- Design and implement public health programs and activate the community role through community participation in these programs.
- Connect the population of Dubai with the necessary health promotion services through social network/media channels, prepare and implement health-promoting health campaigns, projects and initiatives aligned with the strategic vision of DHA.

- Participate actively in educating the community about disease prevention and empower the community to follow healthy lifestyles and control the risk factors for disease.
- Develop guidelines through publications, announcements, brochures, workshops and conferences aimed at promoting public health.
- Evaluate the results of interventions programs and monitoring the general health situation of the Emirate of Dubai.

The Guideline for best practices in immunization aims to fulfil the following overarching Dubai Health Sector Strategy 2026:

- Pioneering Human-cantered health system to promote trust, safety, quality and care for patients and their families.
- Make Dubai a lighthouse for healthcare governance, integration and regulation.
- Promote the healthiest lifestyle for the people of Dubai.
- Leading global efforts to combat epidemics and infectious diseases and prepare for disasters.
- Pioneering prevention efforts against non-communicable diseases.

EXECUTIVE SUMMARY

As the UAE grows in economic prosperity and in providing quality care, there shall be greater stress on the two aspects of good quality health care. One is provision of appropriate, evidence-based care for acute illnesses, and the second is an increasing emphasis on preventive care.

Prevention of Vaccine preventable diseases play an important part in the overall wellbeing of the entire society. Immunization is a proven tool for controlling and eliminating life-threatening infectious diseases and is estimated to avert between 2 and 3 million deaths each year. It is one of the most cost-effective health investments, has clearly defined target groups and it can be delivered effectively through all health facilities.

This guideline is developed/adopted with main reference to WHO Immunization recommendation, CDC immunization resources and UK immunization guideline and best practice 2024. This guideline presents a framework intended to guide and assist all healthcare providers in Dubai to facilitate the successful administration of immunization to all target groups in our community.

DEFINITIONS

Active immunization is the production of antibody or other immune responses through administration of a vaccine or toxoid.

Hasana is Dubai Health Authority Public Health electronic system providing services of reporting (notification), referral and registry of communicable diseases and Dubai unified immunization registry.

Healthcare workers include physicians, nurses, emergency medical personnel, dental professionals and students, medical and nursing students, laboratory technicians, pharmacists, hospital volunteers, and administrative staff.

Human immunoglobulin is that fraction of blood plasma that contains antibodies, notably those against infectious agents. Preparations of immunoglobulin belong to two main categories:

- Human Normal Immunoglobulin (HNIG).
- Human Specific Immunoglobulin/Hyperimmune Globulin.

Immunization denotes the process of artificially inducing or providing immunity. This may be either active or passive.

Immunocompromising conditions include chronic renal failure, nephrotic syndrome, immunodeficiency, iatrogenic immunosuppression, generalized malignancy, human immunodeficiency virus, Hodgkin disease, leukaemia, lymphoma, multiple myeloma, solid organ transplants, congenital or acquired asplenia, sickle cell disease, or other hemoglobinopathies.

Inactivated vaccines or killed vaccines Inactivated vaccines can be composed of either whole cell or fractions of either viruses or bacteria. Inactivated vaccines always require multiple doses. In general, the

first dose does not produce protective immunity. However, primes the immune system. A protective immune response develops after the second or third dose and needs booster doses. Inactivated poses no risk for immunocompromised persons.

Inactivated vaccines use the killed version of the pathogens that causes a disease.

Inactivated vaccines usually do not provide immunity (protection) that is as strong as live vaccines. Therefore, patient may need several doses over time (booster shots) in order to get ongoing immunity against diseases.

Inactivated vaccines are used to protect against the following:

- Hepatitis A
- Flu (injectable vaccine)
- Polio (injectable vaccine)
- Rabies

Live attenuated vaccines (LAV): LAV are produced by modifying a disease producing microorganism (virus or bacterium) in a laboratory, usually by repeated culturing. The resulting vaccine organism retains the ability to replicate and produce immunity, but usually does not cause illness. So live vaccines use a weakened (or attenuated) form of the pathogen that causes a disease.

Because these vaccines are so similar to the natural infection that they help prevent, they create a strong and long-lasting immune response. Just 1 or 2 doses of most live vaccines can give a lifetime of protection against the pathogens that causes a disease.

However, live vaccines also have some limitations. For example:

- Because they contain a small amount of the weakened live virus, some people should talk to their health care provider before receiving them, such as people with weakened immune systems, long-term health problems, or people who have had an organ transplant.
- These need to be kept cool, so they do not travel well. That means they cannot be used in countries with limited access to refrigerators.
- Live vaccines are contraindicated for people with severe/significant immunodeficiency and pregnant women.

Live vaccines are used to protect against the following:

- Measles, mumps, rubella (MMR combined vaccine)
- Rotavirus
- Smallpox
- Chickenpox
- Yellow fever
- Shingles
- Typhoid (oral vaccine)

mRNA vaccines are a preparation of genetic material (such as a strand of synthesized messenger RNA) that is used by the cells of the body to produce an antigenic substance (such as a fragment of virus spike protein).

Passive immunization means the provision of temporary immunity by the administration of preformed antibodies e.g. Nirsevimab.

RSV season means the period between first and last of two consecutive weeks during which the mean percentage of specimens testing positive for RSV PCR is > 3%." (In Dubai it is considered between September 1 and March 31).

Subunit, recombinant, polysaccharide, and conjugate vaccines: Subunit, recombinant, polysaccharide, and conjugate vaccines use specific pieces of the germ like its protein, sugar, or capsid (a casing around the germ). Sub-unit vaccines are developed using only the antigens known to elicit protective immunity. Because these vaccines use only specific pieces of the germ, they give a very strong immune response that is targeted to key parts of the germ. They can also be used on almost everyone who needs them, including people with weakened immune systems and long-term health problems.

One limitation of these vaccines is that patient may need booster shots to get ongoing protection against diseases.

These vaccines are used to protect against the following:

- Hib (*Haemophilus influenzae* type b) disease
- Hepatitis B
- HPV (Human papillomavirus)
- Whooping cough (part of the DTaP combined vaccine)
- Pneumococcal disease
- Meningococcal disease
- Covid-19 disease

Temperature excursion: is any temperature reading outside of the recommended range for vaccine storage as defined in the manufacturer's package insert.

Toxoid vaccines: In some bacterial infections (e.g., diphtheria, tetanus), the clinical manifestations of disease are caused not by the bacteria themselves but by the toxins they secrete. Toxoid vaccines are produced by harvesting a toxin and altering it chemically (usually with formaldehyde) to convert the toxin to a toxoid. The toxoid is then purified. Toxoid vaccines induce antibodies able to neutralize the harmful exotoxins released from these bacteria.

Toxoid vaccines use a toxin (harmful product) made by the germ that causes a disease. They create immunity to the parts of the germ that cause a disease instead of the germ itself. That means the immune response is targeted to the toxin instead of the whole germ.

Like some other types of vaccines, you may need booster shots to get ongoing protection against diseases.

Toxoid vaccines are used to protect against the following:

- Diphtheria.
- Tetanus.

Underlying medical conditions or other risk factors include alcoholism, chronic heart/liver/ lung disease, chronic renal failure, cigarette smoking, cochlear implant, congenital or acquired asplenia, CSF leak, diabetes mellitus, generalized malignancy, HIV, Hodgkin disease, immunodeficiency, iatrogenic immunosuppression, leukemia, lymphoma, multiple myeloma, nephrotic syndrome, solid organ transplants, or sickle cell disease or other hemoglobinopathies.

Vaccination is the term used to refer to the administration of any vaccine or toxoid.

Vaccine It is a suspension of weakened, killed, or fragmented microorganisms or toxins or other biological preparation, such as those consisting of antibodies, lymphocytes, or mRNA, that is administered primarily to prevent disease.

Viral vector vaccines use a modified version of a different virus as a vector to deliver protection e.g. Adenovirus is one of the viral vectors used in some COVID-19 vaccines.

ABBREVIATIONS

AEFI	:	Adverse Event Following Immunization
aIIV4	:	Adjuvanted Inactivated Influenza Vaccine, Quadrivalent
BCG	:	Bacille Calmette-Guérin
DV	:	Dengue Vaccine
DT	:	Diphtheria and tetanus toxoids, paediatric formulation
DTaP	:	Diphtheria and tetanus toxoids and acellular pertussis
DTaP-HepB-IPV	:	DTaP, hepatitis B and inactivated poliovirus vaccine
DTaP-IPV/Hib	:	DTaP, inactivated poliovirus and Haemophilus influenza type B
DTaP-IPV	:	DTaP and inactivated poliovirus vaccine
DTP	:	Diphtheria, Tetanus Toxoids and Pertussis
DTwP	:	Diphtheria, Tetanus Toxoids and Whole-Cell Pertussis
eIPV	:	Enhanced inactivated polio vaccine
HD-IIV4	:	High Dose-Inactivated Influenza Vaccine, Quadrivalent

HepA	:	Hepatitis A Vaccine
HepB	:	Hepatitis B Vaccine
Hib	:	Haemophilus influenzae type b
Hib MenCY-TT	:	Hib-Meningococcal (Bivalent) Conjugate Vaccine (MenHibrix®)
HPV	:	Human Papillomavirus
HPV2	:	Human Papillomavirus vaccine, bivalent (Cervarix®)
2vHPV	:	Bivalent HPV vaccine (Cervarix®)
4vHPV	:	Quadrivalent HPV vaccine (Gardasil®)
9vHPV	:	9-valent HPV vaccine (Gardasil®)
IPV	:	Inactivated Poliovirus Vaccine
IIV	:	Inactivated Influenza Vaccine (formerly called TIV)
IIV3	:	Inactivated Influenza Vaccine, Trivalent
IIV4	:	Inactivated Influenza Vaccine, Quadrivalent
IM	:	Intramuscular Route
LAIV	:	Live, Attenuated Influenza Vaccine (Nasal Spray)
LAIV4	:	Live, Attenuated Influenza Vaccine (Quadrivalent)
MCV4	:	Meningococcal Conjugate Vaccine (Quadravalent)
MenACWY-CRM	:	CRM197 conjugated Meningococcal Vaccine, Quadrivalent (Menveo®)
MenACWY-D	:	Diphtheria Toxoid conjugated Meningococcal vaccine Quadrivalent (Menactra®)

MenACWY-TT	:	Tetanus Toxoid conjugated Meningococcal vaccine, Quadrivalent (Nimenrix; Menquadfi)
MenB	:	Serogroup B meningococcal vaccine
MenB-FHbp	:	Serogroup B meningococcal vaccine (Trumenba®)
MenB-4C	:	Serogroup B meningococcal vaccine (Bexsero®)
MMR	:	Measles, Mumps & Rubella Vaccine
MMRV	:	Measles, Mumps, Rubella & Varicella Vaccine
Mpox	:	Monkeypox
MPSV4	:	Meningococcal Polysaccharide Vaccine (Quadravalent)
MR	:	Measles-Rubella Vaccine
NAS	:	Intranasal Route
OPV	:	Oral Polio Vaccine
OVC	:	Original Vaccination Card
PCV13	:	Pneumococcal Conjugate Vaccine (13-valent)
PCV15	:	Pneumococcal Conjugate Vaccine (15-valent)
PCV20	:	Pneumococcal Conjugate Vaccine (20-valent)
PPSV23	:	Pneumococcal Polysaccharide Vaccine (23-valent)
PO	:	Per Oral (Oral Route)
RIV3	:	Recombinant Influenza Vaccine, Trivalent (Flublok®)
RIV4	:	Recombinant Influenza Vaccine, Quadrivalent

ROTA	:	Rotavirus Vaccine (replaced by the terms RV1 and RV5)
RSVV	:	Respiratory Syncytial Virus Vaccine
RRV-TV	:	Live, Tetravalent Rotavirus Vaccine (RotaShield™)
RV1	:	Rota-Virus Vaccine (Rotarix®)
RV5	:	Rota-Virus Vaccine, pentavalent (RotaTeq®)
RZV	:	Recombinant Zoster Vaccine
SHS	:	School Health Section
Subcut	:	Subcutaneous Route
Td	:	Tetanus and Diphtheria Vaccine
Tdap	:	Tetanus, Diphtheria & Acellular Pertussis
TIV	:	Trivalent (Inactivated) Influenza Vaccine
TT	:	Tetanus Toxoid
Ty21a	:	Live Oral Typhoid Vaccine
ViCPS	:	Vi Capsular Polysaccharide (Inactivated Typhoid) Vaccine
VVM	:	Vaccine Vial Monitor
VZV	:	Varicella Zoster Virus
YF	:	Yellow Fever
ZV	:	Zoster Vaccine (Live)

1. BACKGROUND

Immunization is one of the most successful and cost-effective public health interventions. Globally, it prevents an estimated 2.5 million child deaths every year in all age groups from diphtheria, tetanus, pertussis, and measles. Small pox has already been eradicated and Polio is the next disease targeted for eradication using vaccines and is to be followed by Measles. Vaccines reduce the need for visits to physician's offices, hospital admissions, medication use, and contribute to better school attendance by healthier students.

The DHA Immunization Program is continually updated to include the best and safest available technology to Dubai community.

The terms vaccine and vaccination are derived from vacca, the Latin term for cow. Vaccine was the term used by Edward Jenner to describe material used (i.e., cowpox virus) to produce immunity to smallpox. Louis Pasteur used the term vaccination in the 19th century to include the physical act of administering any vaccine or toxoid. Immunization denotes the process of artificially inducing or providing immunity. This is achieved by either active or passive immunization.

There are several different types of vaccines. Each type is designed to teach immune system how to fight off certain kinds of germs and the serious diseases they cause. When scientists create vaccines, they consider:

a. How immune system responds to the microorganisms.

b. Who needs to be vaccinated against the microorganisms.

c. The best technology or approach to create the vaccine.

Based on a number of these factors, scientists decide which type of vaccine they will make.

There are 6 main types of vaccines:

- Live-attenuated vaccines
- Inactivated vaccines
- Subunit, recombinant, polysaccharide, and conjugate vaccines
- Toxoid vaccines.
- mRNA vaccines.
- Viral vector vaccines.

2. SCOPE

2.1. This regulation applies to every health facility licensed under the Dubai Health Authority (DHA) establishment law, including government, semi government, and private hospitals, and hospitals operating in free zone areas.

3. PURPOSE

3.1. The DHA is the sole responsible entity ensuring that all health facilities and professionals in the Emirate of Dubai provide the highest level of safety and quality immunization services at all times, through the development, establishment, and enforcement of minimum required international best practices.

3.2. To regulate immunization practice and vaccination against the communicable diseases in the Emirate of Dubai.

4. APPLICABILITY

4.1. This guideline is intended to be used by all healthcare providers in public and private health settings.

5. RECOMMENDATION ONE: CHILDHOOD IMMUNIZATION PROGRAM 0 TO 6 YEARS

5.1. Childhood recommended vaccines include BCG, Diphtheria, Tetanus toxoid, Pertussis (DTaP/DPT), Poliovirus vaccine (IPV/OPV), Measles, Mumps, Rubella (MMR), Haemophilus Influenza type b (Hib) vaccine, hepatitis B vaccine (HepB), Varicella, Rota, Pneumococcal, Meningococcal vaccines, COVID-19 vaccine (as per the guidelines) and monoclonal antibodies against RSV -Nirsevimab.

5.1.1. Refer to the National immunization program schedule for children aged 0 through 6 Years in **(Appendix 1).**

5.1.2. Meningococcal vaccines MCV4 and MenB though currently not part of the childhood immunization schedule are highly recommended vaccines for this age group.

5.1.3. Nirsevimab, though currently not part of the childhood immunization schedule, is recommended to be administered as a 1-dose intramuscular injection to infants who are born during the RSV season or are aged <8 months in the RSV season and for infants and children aged 8–19 months who are at increased risk for severe RSV disease and are entering their second RSV season.

5.1.4. Nirsevimab or Palvizumab can be given after the RSV season has ended on case-by-case basis but only where the local RSV season is definitely active and ongoing. Whereupon, the RSV season is considered ongoing when there are two or more local RSV related hospitalizations per week for two consecutive weeks. The requesting prescriber must have approval from local or regional hospital's pediatric infectious disease department, to confirm the current status of the LOCAL RSV season. (50)

5.2. Timing and Spacing of Vaccines

5.2.1. Spacing of Multiple Doses of the Same Antigen;

a. Vaccination providers should adhere to recommended vaccination schedules.

b. Administration at recommended ages and in accordance with recommended intervals between doses of multi-dose antigens provides optimal protection; refer to **(Appendix 2).**

c. Administration of doses of a multi-dose vaccine using intervals that are shorter than recommended might be necessary in certain circumstances, such as when a person is behind schedule on vaccinations but needs rapid protection. In these situations, an accelerated schedule (catch-up schedule) can be implemented using intervals between doses that are shorter than intervals recommended for routine vaccination.

d. Vaccine doses should not be administered at intervals less than these minimum intervals or at an age that is younger than the minimum age.

e. Known as the “grace period”, vaccine doses administered ≤4 days before the minimum interval or age are considered valid.

    i. Because of the unique schedule for rabies vaccine and the accelerated Twinrix schedule the 4-day guideline does not apply to this vaccine.

    ii. The “grace period” does not apply to dosage regimens of Live vaccines and COVID-19 vaccines.

f. Doses of any vaccine administered ≥5 days earlier than the minimum interval or age should not be counted as valid doses and should be repeated as age appropriate.

    i. The repeat dose should be spaced after the invalid dose by the recommended minimum interval. For example, if the first and second doses of *Haemophilus influenzae* type b (Hib) were administered only 14 days apart, the second dose would be invalid and need to be repeated because the minimum interval from dose 1 to dose 2 is 4 weeks.

    ii. The repeat dose should be administered ≥4 weeks after the invalid dose (in this case, the second).

iii. The repeat dose is counted as the valid second dose.

g. If the first dose in a series is given ≥5 days before the recommended minimum age, the dose should be repeated on or after the date when the child reaches at least the minimum age.

h. If the vaccine is a live vaccine, ensuring that a minimum interval of 28 days has elapsed from the invalid dose is recommended. For example, if the first dose of varicella vaccine were inadvertently administered at age 10 months, the repeat dose would be administered no earlier than the child's first birthday (the minimum age for the first dose).

i. If the first dose of varicella vaccine were administered at age 11 months and 2 weeks, the repeat dose should be administered no earlier than 4 weeks thereafter, which would occur after the first birthday.

5.2.2. Simultaneous Administration of Different Vaccines

a. Simultaneous administration (i.e., administration of two or more vaccines on the same day) at different anatomic sites, and not combined in the same syringe.

b. Simultaneously administering all vaccines for which a person is eligible at the time of a visit increases the probability that a child, adolescent, or adult will be vaccinated fully by the appropriate age

c. As a general rule, almost all vaccines can be administered at the same visit. Exceptions to this include:

   i. PCV13 (Prevnar 13) vaccine and MenACWY-D (Menactra) vaccine should not be administered simultaneously to persons with functional or anatomic asplenia or HIV. Menactra (Diphtheria Toxoid conjugated Meningococcal vaccine -MenACWY-D) is thought to interfere with the antibody response to Prevnar 13. When both Prevnar 13 and Menactra are indicated, Prevnar 13 should be administered first, followed by Menactra at least 4 weeks later.

   ii. PCV13 (Prevnar 13) vaccine and PPSV23 (Pneumovax 23) vaccine should not be administered at the same visit; studies show a better immune response when Prevnar 13 is administered before Pneumovax 23. When both Prevnar 13 and Pneumovax 23 are indicated, Prevnar 13 should be administered first, and Pneumovax 23 should be administered either at least 8 weeks later or at least 1 year later, depending on the age and health conditions of the vaccine recipient.

   iii. Varicella (VAR [Varivax]) vaccine should not be administered simultaneously with smallpox vaccine.

d. Considerations when administering multiple injections include:

i. Administer each vaccine in a different injection site. Recommended sites (i.e., vastus lateralis and deltoid muscles) have multiple injection sites. Separate injection sites by 1 inch or more, if possible, so that any local reactions can be differentiated.

ii. For infants and younger children, if more than two vaccines are being injected into the same limb, the thigh is the preferred site because of the greater muscle mass. For older children and adults, the deltoid muscle can be used for more than one intramuscular injection.

iii. Vaccines that are the most reactive and more likely to cause an enhanced injection site reaction (e.g., DTaP, PCV13) should be administered in different limbs, if possible.

iv. Vaccines that are known to be painful when injected (e.g., HPV, MMR) should be administered after other vaccines.

v. If both a vaccine and an immune globulin (Ig) preparation are needed (e.g., Td/Tdap and tetanus immune globulin [TIG] or hepatitis B vaccine and hepatitis B immune globulin [HBIG]), administer the vaccine in a separate limb from the immune globulin.

5.2.3. Non-simultaneous Administration

a. Any inactivated vaccine can be administered either simultaneously or at any time before or after a different inactivated vaccine or live vaccine, with 2 exceptions:
    i. A 4-week interval between PCV13 and MenACWY-D in a person with anatomic asplenia.
    ii. The separation of doses between PCV13 and PPSV23 (6-12 months recommended for non-high risk, 8 weeks minimum) if PCV13 is given first, 8 weeks in children 6-18 years, and 1 year minimum in adults 19 years and older if PPSV23 is given first.
b. Two or more injectable or intra-nasally administered live vaccines not administered on the same day should be separated by at least 4 weeks, to minimize the potential risk for interference. If 2 such vaccines are separated by <4 weeks, the second vaccine administered should not be counted and the dose should be repeated at least 4 weeks later.
c. On the day a live injectable or intranasal vaccine will be administered, providers should ensure that no live injectable or intranasal vaccine was given in the previous 28 days.
d. The 4-day grace period discussed earlier, which may be used to shorten the minimum interval between doses of the same vaccine, does not apply to live vaccines administered separately or in group.

e. For example, 2nd dose of MMR vaccine given before the lapse of a 28 days period from the 1st dose will be considered invalid and has to be repeated at an adequate interval (28 days from the invalid dose) at an appropriate age.

f. Preferably, Yellow fever vaccine and MMR doses should be spaced 30 days apart as limited data suggest that coadministration of yellow fever vaccine with measles-rubella or MMR vaccines might decrease the immune response.

5.3. Spacing of Vaccines and Antibody-Containing Products

5.3.1. Live Vaccines

a. Blood (e.g., whole blood, packed red blood cells, and plasma) and other antibody-containing blood products (e.g., immune globulin, Hyperimmune globulin, and IGIV) can inhibit the immune response to measles and rubella vaccines for ≥3 months.

b. The length of time that interference can persist after the antibody-containing product is a function of the amount of antigen-specific antibody contained in the product. Refer to **(Appendix 3).**

c. If a dose of injectable live-virus vaccine (other than yellow fever and zoster) is administered after an antibody-containing product but at an interval shorter than recommended in the table below, the vaccine dose

should be repeated unless serologic testing is feasible and indicates a response to the vaccine.

i. The repeat dose or serologic testing should be performed after the interval indicated for the antibody-containing product.

d. Interference might occur if administration of an antibody-containing product becomes necessary after administration of MMR or varicella vaccines.

i. Usually, vaccine virus replication and stimulation of immunity occurs 1-2 weeks after vaccination.

ii. If the interval between administration of any of these vaccines and subsequent administration of an antibody-containing product is <14 days, vaccination should be repeated after the recommended interval unless serologic testing indicates a protective antibody response.

e. BCG, OPV, rotavirus, LAIV, zoster, yellow fever, and Ty21a typhoid vaccines may be administered at any time before, concurrent with, or after administration of any antibody-containing preparation.

5.3.2. Inactivated Vaccines

a. Administering inactivated vaccines and toxoids either simultaneously with or at any interval before or after receipt of an antibody-containing product does not impair development of a protective antibody response.

b. The vaccine or toxoid and antibody preparation should be administered at different sites using the standard recommended dose.

5.3.3. Lapsed Vaccination Schedule

a. Vaccination providers should administer vaccines as close to the recommended intervals as possible.

b. Intervals between doses that are longer than recommended typically do not reduce final antibody concentrations, although protection might not be attained until the recommended number of doses has been administered.

c. With some exceptions (e.g. oral typhoid vaccine) an interruption in the vaccination schedule does not require restarting the entire series of a vaccine or toxoid or addition of extra doses.

5.3.4. Combination Vaccines

a. Combination vaccines merge equivalent component vaccines into single products to prevent more than one disease or to protect against multiple strains of infectious agents causing the same disease.

b. Potential advantages of combination vaccines include:

i. Reduce the number of injections,

ii. Improved vaccine coverage rates,

iii. Timely vaccination coverage for children who are behind in the schedule,

iv. Reduced shipping and stocking costs,

v. Reduced costs for extra health care visits necessitated by deferral of vaccination, and

vi. Facilitation of additional new vaccines into vaccination programs.

c. Potential disadvantages of combination vaccines include the following:

i. Adverse events that might occur more frequently after administration of a combination vaccine compared with administration of separate antigens at the same visit;

ii. Confusion and uncertainty about selection of vaccine combinations and schedules for subsequent doses, especially when vaccinations are given by multiple providers who might be using different products;

iii. Reduced pathogen coverage if the combination product covers fewer types of one particular vaccine-preventable disease-causing agent;

iv. Extra doses of certain antigens in the combination product (e.g., a provider who administers 4 doses of DTaP-HepB-IPV vaccine will give an extra dose of hepatitis B component); and

v. A shorter shelf life than the individual component vaccines.

d. Licensed combination vaccines can be used whenever any components of the combination are indicated and its other components are not contraindicated.

e. The use of a combination vaccine generally is preferred over separate injections of the equivalent component vaccines.

i. An exception is the administration of MMRV as the first dose. Separate MMR and varicella vaccines should preferably be administered as first doses instead of MMRV vaccine in children aged 12-47 months

5.4. Extra Doses of Vaccine Antigens

5.4.1. Administering extra antigens contained in a combination vaccine should be avoided in most situations.

5.4.2. Using combination vaccines containing certain antigens not indicated at the time of administration to a patient might be justified when:

a. The extra antigen is not contraindicated,

b. Products that contain only the needed antigens are not readily available, and

c. Potential benefits to the patient outweigh the potential risk for adverse events associated with the extra antigens.

5.4.3. An extra dose of many live-virus vaccines and Hib or hepatitis B vaccine has not been found to be harmful. However, the risk for an adverse event might increase when extra doses are administered at an earlier time than the recommended interval for certain vaccines (e.g., tetanus toxoid vaccines and PPSV23).

5.4.4. The benefits and risks of administering the combination vaccine with an unneeded antigen should be carefully considered and discussed with the parent.

5.5. Catch-Up Immunization for Children Aged 4 Months Through 6 Year

5.5.1. Routine immunizations are started in infancy; however, if a child is not immunized in infancy, immunizations should be started as early as possible. When this happens, a catch-up schedule may be followed, depending on the child's age and the prevalence of specific diseases at the time.

5.5.2. A vaccine series does not need to be restarted, regardless of the time that has elapsed between doses.

5.5.3. Every opportunity should be taken to review a child's vaccination history and to administer the appropriate vaccine(s).

5.5.4. The objective of catch up schedule is to complete the vaccination schedule and provide optimal protection as quickly as possible for defaulters.

5.5.5. Consider the minimum intervals when planning for catch-up vaccination until a child is back on schedule for their age. Refer to **(Appendix 4)**.

a. For further information please refer to catch-up immunization schedule for children and adolescents who start late or who are more than 1 month behind with the following link: https://www.cdc.gov/vaccines/hcp/imz-schedules/child-adolescent-catch-up.html

6. RECOMMENDATION TWO: SCHOOL HEALTH IMMUNIZATION PROGRAM

6.1. School vaccination requirements are widely thought to serve important public health purposes. Incidents of communicable disease (for which there are vaccines) among children have significantly declined since the introduction and regular enforcement of the national immunization program including the standard school immunization schedule. Refer to **(Appendix 5).**

6.2. The objective of the catch-up vaccination is to complete the vaccination schedule and provide optimal protection as quickly as possible. Refer to **(Appendix 6)** for Catch up immunization schedule.

6.3. General Principles for defaulter Children / Adolescent Immunization:

6.3.1. Give as many vaccines as possible in single visit to complete the immunization schedule with minimum number of visits of a defaulter;

6.3.2. Giving the vaccine at more than the recommended interval will not diminish the response. Therefore, there it is NOT necessary to restart an interrupted schedule, as even if the previous dose was given long time ago, the memory cells will remain active;

6.3.3. Giving a vaccine with less than the recommended interval will diminish the response and hence it is not advisable.

6.3.4. Doses given at the less than the minimum intervals must be repeated;

6.3.5. If two live parenteral vaccines are given in interval less than four weeks then the second vaccine must be repeated.

6.3.6. If written records are not available, the vaccines must be considered as not received, and the child must be offered a catch-up course of vaccination appropriate for age and circumstances.

6.3.7. Catch-up immunization schedule for persons aged 7 through 18 years who start late or who are more than 1 month behind the regulatory body vaccination schedule. Refer to **(Appendix 7)**.

6.4. Vaccines:

6.4.1. Td /Tdap:

a. Use recommended minimum intervals to complete the serious for those not received doses before.

b. Children with in complete schedule of DPT/ DTaP/ DT/Td doses should be counted as part of the Td/Tdap series.

c. Td doses is recommended each 10 years.

d. Tdap can be substituted for a single dose of Td in the catch-up series or as a booster; Td should be used for other doses.

6.4.2. Hep B:

a. The minimum interval between the first and second doses is 4 weeks.

b. The minimum interval between the second and third doses is 8 weeks.

6.4.3. MMR:

a. MMR vaccine is given as 2 doses at least one month apart.

b. Use recommended routine dosing intervals for series catch-up and complete the schedule if one dose received previously on the proper age.

6.4.4. Varicella:

a. Varicella vaccine is given as 2 doses 3 months apart for children <13 years of age and at least 4 weeks apart for children older than 13 years of age and adults.

b. Use recommended routine dosing intervals for series catch-up and complete the schedule if one dose received previously on the proper age.

6.4.5. Polio:

a. OPV must not be given to the patients who lives with a person who has impaired immunity, they must receive IPV instead OPV.

6.4.6. Human papillomavirus vaccine (HPV):

a. Recommend the series to males and females if not previously vaccinated or have not completed the vaccine series.

6.4.7. Meningococcal Vaccine:

a. One dose of MCV4 vaccine at the school entry level age/ age >6 years if already not taken earlier and then at age 15-18 years.

6.4.8. COVID-19 vaccine as per the guidelines

6.5. Forms of School Age Vaccination Program:

a. Vaccination Consent Form.

b. Pre-vaccination Checklist.

c. Excel sheet of the refusal cases.

d. Vaccine Estimation.

e. Vaccines and Consumables Request.

f. Actual Consumption Form.

g. Vaccination Notification.

h. HPV students list.

6.6. Pre-Planning (At the beginning of the Academic year)

6.6.1. School administration shall request from the parents to submit their child's updated vaccination card to school clinic upon admission.

6.6.2. Obtain the Original/Updated Vaccination Card (OVC) from all students, take a copy and attach it in the Student's Health File with the name of the student and date. full

6.6.3. If the original vaccination card is provided in another language other than English, ensure that it is translated into English.

6.6.4. Ensure that the student's demographic data and vaccination details (immunization history) are registered and updated in Hasana immunization system and documented in the Students' Health Record using pen. (Pencil is not allowed).

6.6.5. With the help of the school administration, the medical team shall keep on following up with the parents to obtain the vaccination card:

a. Start Pre-planning by reviewing the immunization history of all students in grade 1/year 2, grade 8/year 9 and grade 11/year 12.

b. Assess their immunization status according to the National Immunization Schedule, while taking into consideration any contraindications and precautions.

c. Next, review the immunization history of students in all other grades. Assess their immunization needs according to the catch up immunization

schedule while taking into consideration assessment for contraindications and precautions.

6.7. Planning for Vaccination Session

6.7.1. Plan for the vaccination session day by selecting the date based on your school's convenience as early as possible in the beginning of the academic year to ensure covering all due and overdue students.

6.7.2. Do not delay the vaccination session until the end of the academic year, as the delay may have an impact on the school's vaccination coverage rate.

a. Note: Vaccination sessions can be scheduled more than once during the academic year, to ensure covering all due and overdue students.

6.7.3. Send the vaccination consent form and the pre-vaccination checklist to the parents/ guardian of the identified eligible students.

a. Note: While filling the consent form, the school medical team shall fill the students' demographic data, vaccination session date and tick the due vaccine (do not send empty form to the parents).

6.7.4. Ensure receiving back the vaccination consent form along with pre-vaccination checklists filled and signed by the parents/guardians (without missing any questions).

a. Note: The signed consent form is valid for one month from signature date.

6.7.5. Follow up with the parents/guardians if they did not respond.

6.7.6. If the parents/guardians refuse to vaccinate their child, ensure that the reason of refusal is mentioned clearly.

6.7.7. Communicate with the parents/guardians to understand the reasons for refusing the vaccinations, and educate them regarding the importance of vaccination.

6.7.8. If the students are already vaccinated or the parents/ guardians prefer the vaccination outside the school premises; then you will need to follow up with the parents/guardians to obtain the updated record of the administered vaccination to complete the documentation process in the Student's Health File and Hasana system.

6.7.9. Keep the vaccination consent with the refusal signature in the Student's Health Record.

6.7.10. Fill the students' details in the excel sheet named (Refusal for Vaccination in the School Premises) for school reference.

6.7.11. Schedule appointments to all students with agreed vaccination consent forms including students in distance learning.

6.7.12. Ensure that a comprehensive medical examination is done for all due and overdue students before the vaccination day.

6.7.13. Create mass immunization event in Hasana System.

6.8. Vaccination Implementation Day (Collection, preparation, administration and documentation).

6.8.1. Vaccine Collection and Preparation

a. Prepare the vaccine carrier with ice packs, digital thermometer and vaccine tray while maintaining a cold chain (+2 °C to +8 °C), and document the temperature on the temperature chart.

b. In the event of vaccine temperature excursion:

i. Immediately isolate the affected vaccines separately to prevent further use - Clearly label the affected vaccines with: " DO NOT USE"

ii. Keep the affected vaccines in another vaccine carrier while maintaining the temperature between (+2 °C to +8 °C).

iii. Affected vaccines vaccine vials are considered medical waste and should be disposed of according to UAE regulations.

c. The Vaccination Implementation team consists of the school doctor and nurse.

d. The school doctor is responsible of making the final decision for the vaccination.

e. Arrange the vaccination session in a clean area inside the school clinic while taking into consideration privacy, infection control, safe distance and observation area.

f. Ensure the availability of Adrenaline and hydrocortisone injections and maintain the minimum emergency medication required.

6.8.2. Vaccine Administration

a. Identify students using 3 main identifiers (Full name, Emirates ID number and D.O.B).

b. Perform an assessment and evaluation (check again quickly for eligibility).

c. Check temperature and fitness for vaccination (consider screening for contraindications and precautions).

d. Follow the 10 rights of medication administration:

i. Right student.

ii. Right medication.

iii. Right dose.

iv. Right route.

v. Right time.

vi. Right documentation.

vii. Right assessment.

viii. Right education.

ix. Right to refuse.

x. Right evaluation.

e. Follow the medication administration policy and safe injection practice while administering the vaccine.

f. Maintain hand washing or hand sanitizing before and after each student.

g. Follow sterile aseptic technique while administering the vaccine.

h. Follow infection control measures.

i. Follow the policies and procedures of safe handling and disposal of sharp objects.

j. Follow the policies and procedures of administering oral, IM and SC injection. Use proper size of needles (IM, SC).

k. Expose and prepare the injection site.

l. Clean the injection site with an alcohol swab (a circular motion from inside to outside), and allow it to dry.

m. Check the vaccine label 3 times and check the vial for any leakage, breakage or particles.

n. Administer the vaccine properly.

o. Observe the vaccinated students for 30 minutes for any reactions.

6.8.3. Vaccine Documentation

a. Accurate and timely documentation can help prevent administration errors and curtail the number and cost of excess vaccine doses.

b. All vaccines administered should be fully documented in the patient's medical record.

c. HP should document the vaccination administration in both student health record and Hasana DHA Public Health system.

d. If any adverse reaction occurs, report it to DHA School Health Section Nurses Coordinators and document it in both Hasana System and the Student's Health Record.

e. If medication errors occur, report the incident to DHA School Health Section Nurses Coordinators and document it in the Student's Health Record.

f. Fill in the notification of vaccination and send it to the parents.

6.8.4. Post Vaccination

a. Parent education should also include a discussion of comfort and care strategies after vaccination.

b. After-care instructions should include information for dealing with common side effects such as injection site pain, fever, and fussiness.

7. **RECOMMENDATION THREE:** ADULT IMMUNIZATION

7.1. All adults need immunizations to help them prevent getting and spreading serious diseases.

7.2. Every opportunity should be utilized to advise age-appropriate immunization to adults based on their health status.

7.3. Immunization services should be made available in every health facility providing premarital consultation, ante-natal care, elderly care or care for patients with chronic diseases accordingly.

7.4. For more information for vaccines in adult immunization schedule; refer to **(Appendix 8).**

7.5. Influenza (flu): Based on WHO Global Influenza Surveillance and Response System (GISRS) recommendations that provide a guide to national public health and regulatory authorities and vaccine manufacturers for the development and production of influenza vaccines for the next influenza season. Recommendations are usually made in February for the following influenza season in the northern hemisphere and in September for the following influenza season in the southern hemisphere. This timeframe is applied as approximately 6-8 months are needed to produce, approve and distribute manufactured vaccines.

7.5.1. In selecting which vaccine formulation to use in UAE, Ministry of Health and prevention (MOHAP) consider epidemiologic and virologic surveillance data in the country to decide when to start vaccination and whether to use the formulation recommended for the northern or southern hemisphere influenza season.

7.5.2. Influenza Trivalent and quadrivalent vaccines protect against three and four very different groups of viruses that circulate in humans, respectively. Changes to

vaccine components are made based on the best available data at the time of the WHO meeting on the composition of influenza virus vaccines.

7.5.3. The Quadrivalent vaccines include two subtypes of influenza A viruses (an A(H1N1)pdm09 virus and an A(H3N2) virus) and two lineages of influenza B viruses (a B/Victoria lineage virus and a B/Yamagata lineage virus).

7.5.4. The Trivalent vaccines include two subtypes of influenza A viruses (an A(H1N1)pdm09 virus and an A(H3N2) virus) and one type B virus Influenza vaccine either Inactivated influenza vaccines (IIV4s) contains inactivated viruses, recombinant influenza vaccine (RIV4) contains only antigen no viruses, and live attenuated influenza vaccine (LAIV4) contains live viruses.

7.5.5. Influenza (flu) vaccine every year: vaccination should ideally be offered during September or October every year. However, vaccination should continue after October and throughout the season as long as influenza viruses are circulating and unexpired vaccine is available.

7.5.6. Routine annual influenza vaccination is recommended for all persons aged ≥6 months who do not have contraindications, including history of severe allergic reaction (e.g., anaphylaxis) to any component of the vaccine or to a previous dose of any influenza vaccine, or consider a precaution for influenza vaccination to persons with Moderate or severe acute illness with or without fever and person

with history of Guillain-Barré syndrome within 6 weeks of receipt of influenza vaccine. For further information refer to **(Appendix 20).**

7.5.7. persons aged ≥6 months with egg allergy should receive influenza vaccine. Any influenza vaccine (egg based or nonegg based) that is otherwise appropriate for the recipient's age and health status. Egg allergy alone necessitates no additional safety measures for influenza vaccination beyond those recommended for any recipient of any vaccine, regardless of severity of previous reaction to egg. All vaccines should be administered in settings in which personnel and equipment needed for rapid recognition and treatment of acute hypersensitivity reactions are available.

7.5.8. If supply is limited, the vaccination should be offered to priority groups: especially people with chronic health conditions, pregnant women, Persons who are extremely obese (body mass index ≥40 for adults), older adults (aged ≥65 years), children (aged 6 through 59 months) and Children and adolescents (aged 6 months through 18 years) who are receiving aspirin- or salicylate-containing medications and who might be at risk for experiencing Reye syndrome after influenza virus infection.

7.5.9. Travelers who want to reduce their risk for influenza should consider influenza vaccination, preferably at least 2 weeks before departure specially for Hajj and Umrah. Persons who are at higher risk for influenza complications and who were

not vaccinated with influenza vaccine during the previous Northern Hemisphere fall or winter should consider receiving influenza vaccination before departure if they plan to travel to the tropics, to the Southern Hemisphere during the Southern Hemisphere influenza season (April–September), however influenza vaccine formulated for the Southern Hemisphere might differ in viral composition from the Northern Hemisphere vaccine. For persons traveling to the Southern Hemisphere during the Southern Hemisphere influenza season, it's reasonable to receive Southern Hemisphere influenza vaccine formulation before departure but might not be feasible because of limited access to or unavailability of Southern Hemisphere formulations.

7.6. COVID-19 vaccine, as per DHA guidelines.

7.7. Td or Tdap vaccine: Every adult should get a Tdap vaccine once if they did not receive it as an adolescent to protect against pertussis (whooping cough).

7.8. At the time of Pre-marital consultation HepB, MMR and HPV vaccines should be offered to the prospective couples.

7.9. Adults 19-26 years old:

7.9.1. They may need other vaccines based on their age, health conditions, job, lifestyle, or travel habits.

a. For CDC recommendation in adult immunization schedule by age group refer to schedules in **(Appendix 9)**.

b. For CDC recommendation in adult immunization schedule by medical condition and other indications refer to schedules in **(Appendix 10)**.

7.9.2. In addition to seasonal flu (influenza) vaccine and Td or Tdap vaccine (Tetanus, diphtheria, and pertussis), it's recommended also to get HPV vaccine, which protects against the types of human papillomaviruses (HPV) that cause most cervical, anal, and other cancers, as well as genital warts. Advisory committee on immunization Practices (ACIP) USA recommends:

a. Routine HPV vaccination for all preteens at age 11 or 12 years.

b. Catch-up HPV vaccination for all persons through age 26 years who are not adequately vaccinated.

c. However, its recommended to use the HPV vaccine for males and females, from age 9 up to age 45.

d. For adults ages 27 through 45 years, clinicians can consider discussing HPV vaccination with people who are most likely to benefit.

7.10. Adults 50 years and older:

7.10.1. COVID-19 vaccine, as per DHA guidelines.

7.10.2. Shingles vaccine, which protects against shingles and the complications from the disease (recommended for healthy adults 50 years and older).

7.10.3. RSV Vaccine (ABRYSVO & AREXVY) is indicated for active immunization for the prevention of lower respiratory tract disease (LRTD) caused by RSV in individuals 60 years of age and older.

7.10.4. Pneumococcal conjugate vaccine (PCV13/PCV15/PCV20), which protects against serious pneumococcal disease and pneumonia (recommended for all adults 65 years or older, and for adults younger than 65 years who have certain health conditions).

a. For further information please refer to **(Appendix 11)** for adult pneumococcal vaccines summary.

7.10.5. Pneumococcal polysaccharide vaccine (PPSV23), which protects against serious pneumococcal disease, including meningitis and bloodstream infections (recommended for all adults 65 years or older, and for adults younger than 65 years who have certain health conditions).

7.10.6. Adults aged ≥65 years should preferentially receive any one of the following higher dose or adjuvanted influenza vaccines:

a. High-Dose-Inactivated Influenza Vaccine Quadrivalent- (HD-IIV4): contains 4 times the dose of antigen compares to standard dose

b. Recombinant Influenza Vaccine Quadrivalent (RIV4): contains 3 times the dose of antigen compares to standard dose

c. Adjuvanted Inactivated Influenza Vaccine Quadrivalent (aIIV4): contains standard dose of antigen

d. If none of these three vaccines is available at an opportunity for vaccine administration, then any other age-appropriate influenza vaccine should be used.

* Note: Data support greater potential effectiveness of HD-IIV3, aIIV3, or RIV4 compared with standard-dose unadjuvanted IIVs. Comparisons of these vaccines with one another are limited, as are data for currently available quadrivalent HD-IIV and aIIV. Most data available for HD-IIV3.

7.11. Additional vaccines recommended:

7.11.1. Additional vaccines may be needed if adults have any of these conditions:

a. Asplenia

b. Diabetes Type 1 and Type 2

c. Heart Disease, Stroke, or Other Cardiovascular Disease

d. HIV Infection

e. Liver Disease

f. Lung Disease including Asthma

g. Renal Disease

h. Weakened Immune System

7.11.2. Adult patients should consult their healthcare professional to find out which vaccines are recommended for them based on their specific health status, age, and lifestyle.

7.12. Pregnant women:

7.12.1. Tdap vaccine (between 27 and 36 weeks of pregnancy - preferably during the earlier part of this time period) to help protect against whooping cough.

7.12.2. The flu shot during flu season, is recommended to protect against influenza.

7.12.3. COVID-19 vaccine, as per guidelines.

7.12.4. A single dose of RSVV is recommended for pregnant women during their gestational period from 32 through 36 weeks (32 weeks 0 days until 36 weeks and 6 days) who are expected to deliver during the RSV season (September through March), for the protection of their infants from RSV associated Lower respiratory tract infection (LRTI) in the first 6 months of life.

7.12.5. Pregnant women may also need other vaccines. Its preferable to refer to the health professional for further information of other recommended vaccines.

7.13. Occupation specific vaccine recommendations (Healthcare workers):

7.13.1. Healthcare workers are at risk for exposure to serious, and sometimes fatal diseases. If they work directly with patients or handle material that could spread infection, they should get appropriate vaccines to reduce the chance of getting or spreading the vaccine-preventable diseases.

7.13.2. Healthcare workers should protect themselves, their patients, and their family members by making sure that they are up-to-date with recommended following vaccines:

a. Seasonal flu (influenza) vaccine:

i. Get 1 dose of quadrivalent influenza vaccine annually. Those 65 years of age and older should take any of the HD-IIV4 or RIV4 or aIIV4 Influenza vaccines as mentioned in 7.7.6. However, in case of non-availability, any age-appropriate influenza vaccine should be taken.

b. Td or Tdap vaccine (Tetanus, diphtheria, and pertussis):

i. Get a one-time dose of Tdap as soon as possible if the health care worker has not received Tdap previously (regardless of when previous dose of Td was received).

ii. Get either a Td or Tdap booster shot every 10 years thereafter.

iii. Pregnant healthcare workers need to get a dose of Tdap during each pregnancy.

c. Hepatitis B:

i. If the health worker dose not has documented evidence of a complete hep B vaccine series, or an up-to-date blood test that shows his/her is immune to hepatitis B (i.e., no serologic evidence of immunity or prior

vaccination) then he/she should get the 3-dose series (dose #1 now, #2 in 1 month, #3 approximately 5 months after #2).

ii. Get anti-HBs serologic tested 1–2 months after dose #3.

d. MMR (Measles, Mumps, & Rubella):

i. If the healthcare professional is born in the year of 1957 or later and has not had the MMR vaccine, or

ii. If he/she does not have an up-to-date blood test that shows he/ she is immune to measles, mumps, and rubella (i.e., no serologic evidence of immunity or prior vaccination), he/she should get 2 doses of MMR, 4 weeks apart.

e. Varicella (Chickenpox):

i. If the health worker has not had chickenpox (varicella) or

ii. If he she does not have an up-to-date blood test that shows that they are immune to varicella (i.e., no serologic evidence of immunity or prior vaccination) he/she should get that 2 doses of varicella vaccine, 4 weeks apart.

f. Meningococcal:

a. Those who are routinely exposed to isolates of N. meningitides including but not limited to healthcare workers working in hospital Emergency departments, Intensive care units (ICU), Infectious disease

units (IDU) and laboratory personnel should get one dose of Meningococcal conjugate vaccine as and when required.

g. Pneumococcal Vaccines:

    a. According to the clinical indications for the pneumococcal vaccines.

h. COVID-19 vaccine, as per DHA guidelines

i. Shingles (Herpes Zoster) vaccine for healthcare professionals aged 50 and over.

j. Mpox vaccine.
Except in rare circumstances (e.g. non-availability of personal protective equipment and or possibility of unprotected exposure), healthcare personnel who do not have any of the sexual risk factors described above should not receive Mpox vaccine (Jynneos).

k. Any other vaccines recommended for the age and health condition.

7.13.3. Vaccine recommendations according to the occupational risk and for Medical fitness category.

a. Immunization recommendations for various occupations are based on the general and specific risks of exposure to sources of infections -humans, animals or contaminated and infectious materials. Similarly, individuals intending to take up residency in UAE should be given a set of vaccines based on these recommendations. The details of immunization

recommendations based on occupation and for the purpose of Medical Fitness are listed in **(Appendix 19)**.

7.14. Recommended Adult Immunization for ages 19 years or older:

7.14.1. Dengue Vaccine: (Routine); Dengue vaccine is recommended for all adults who are at an increased risk of exposure to mosquitoes and hence Dengue.

7.14.2. Haemophilus influenzae type b vaccination (special situations):

a. Anatomical or functional asplenia (including sickle cell disease): 1 dose if previously did not receive Hib; if elective splenectomy, 1 dose, preferably at least 14 days before splenectomy.

b. Hematopoietic stem cell transplant (HSCT): 3-dose series 4 weeks apart starting 6–12 months after successful transplant, regardless of Hib vaccination history.

7.14.3. Hepatitis A Vaccination (routine vaccination)

a. Not at risk but want protection from hepatitis A (identification of risk factor not required): 2-dose series Hep A (Havrix 6–12 months apart or Vaqta 6–18 months apart [minimum interval: 6 months]) or 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 5 months]).

7.14.4. Hepatitis A Vaccination (special situations)

a. At risk for hepatitis A virus infection: 2-dose series Hep A or 3-dose series HepA-HepB as above.

b. Chronic liver disease (e.g., persons with hepatitis B, hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice the upper limit of normal).

c. HIV infection

d. Men who have sex with men.

e. Injectable or non-injectable drug use.

f. Persons experiencing homelessness.

g. Work with hepatitis A virus in research laboratory or with nonhuman primates with hepatitis A virus infection.

h. Travel in countries with high or intermediate endemic hepatitis A (HepA-HepB [Twinrix] may be administered on an accelerated schedule of 3 doses at 0, 7, and 21–30 days, followed by a booster dose at 12 months).

i. Close, personal contact with international adoptee (e.g., household or regular babysitting) in first 60 days after arrival from country with high or intermediate endemic hepatitis A (administer dose 1 as soon as adoption is planned, at least 2 weeks before adoptee's arrival).

j. Pregnancy if at risk for infection or severe outcome from infection during pregnancy.

k. Settings for exposure, including health care settings targeting services to injection or non-injection drug users or outpatient care facilities for people of determination (individual risk factor screening not required).

7.14.5. Hepatitis B Vaccination (Routine vaccination)

a. Age 19 through 59 years: complete a 2- or 3- or 4-dose series.

i. 2-dose series only applies when 2 doses of Heplisav-B* are used at least 4 weeks apart.

ii. 3-dose series Engerix-B, PreHevbrio*, or Recombivax HB at 0, 1, 6 months [minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 8 weeks / dose 1 to dose 3: 16 weeks]).

iii. 3-dose series HepA-HepB (Twinrix at 0, 1, 6 months [minimum intervals: dose 1 to dose 2: 4 weeks / dose 2 to dose 3: 5 months]).

iv. 4-dose series HepA-HepB (Twinrix) accelerated schedule of 3 doses at 0, 7, and 21–30 days, followed by a booster dose at 12 months.

*Note: Heplisav-B and PreHevbrio are not recommended in pregnancy due to lack of safety data in pregnant persons.

b. Age 60 years or older with known risk factors for hepatitis B virus infection should complete a HepB vaccine series.

c. Age 60 years or older without known risk factors for hepatitis B virus infection may complete a HepB vaccine series.

7.14.6. Risk factors for hepatitis B virus infection include:

a. Chronic liver disease (e.g., persons with hepatitis C, cirrhosis, fatty liver disease, alcoholic liver disease, autoimmune hepatitis, alanine aminotransferase [ALT] or aspartate aminotransferase [AST] level greater than twice upper limit of normal).

b. HIV infection.

c. Sexual exposure risk (e.g., sex partners of hepatitis B surface antigen [HBsAg]-positive persons; sexually active persons not in mutually monogamous relationships; persons seeking evaluation or treatment for a sexually transmitted infection; men who have sex with men).

d. Current or recent injection drug use.

e. Percutaneous or mucosal risk for exposure to blood (e.g., household contacts of HBsAg-positive persons; residents and staff of facilities for people of determination; health care and public safety personnel with reasonably anticipated risk for exposure to blood or blood-contaminated body fluids; persons on maintenance dialysis, including in-centre or home

hemodialysis and peritoneal dialysis, and persons who are predialysis; patients with diabetes).

f. Incarceration.

g. Travel in countries with high or intermediate endemic hepatitis B.

7.14.7. Hepatitis B vaccination (Special situations)

a. Patients on dialysis: complete a 3- or 4-dose series - 3-dose series Recombivax HB at 0, 1, 6 months (note: use Dialysis Formulation 1 mL = 40 mcg) - 4-dose series Engerix-B at 0, 1, 2, and 6 months (note: use 2 mL dose instead of the normal adult dose of 1 mL).

7.14.8. Human papillomavirus vaccination (Routine vaccination)

a. HPV vaccination recommended for all persons (all genders alike) aged 9 through 26 years: 2- or 3-dose series depending on age at initial vaccination or condition.

b. If the age is 15 years or older at initial vaccination: 3-dose series at 0, 1–2 months, 6 months (minimum intervals: dose 1 to dose 2 is 1 month; dose 2 to dose 3 is 4 months and dose 1 to dose 3 should be 5 months. If the intervals are shorter dose should be repeated).

c. If the age is 9–14 years at initial vaccination and received 2 doses at least 5 months apart; HPV vaccination series complete, no additional dose needed.

d. If the age is 9–14 years at initial vaccination and the individual received 2nd dose less than 5 months after the initial dose, an additional dose to be given at least 4 months from the 2nd dose.

e. For persons initiating vaccination before their 15th birthday, the recommended immunization schedule is 2 doses of HPV vaccine (0, 6–12 month schedule).

f. Interrupted schedules: If vaccination schedule is interrupted, the series does not need to be restarted.

g. No additional dose recommended when any HPV vaccine series has been completed using the recommended dosing intervals.

h. Recommended 2 or 3-dose series for adults 27–45 years of age based on shared clinical decision-making.

7.14.9. Human papillomavirus vaccination (Special situations)

a. Age ranges recommended above for routine and catch-up vaccination or shared clinical decision making also apply in special situations.

b. Immunocompromising conditions, including HIV infection: 3-dose series, even for those who initiate vaccination at age 9 through 14 years.

c. Pregnancy: Pregnancy testing is not needed before vaccination; HPV vaccination is not recommended until after pregnancy; no intervention needed if inadvertently vaccinated while pregnant.

7.14.10. Influenza Vaccination (Routine vaccinations)

a. Age 19 years or older: 1 dose any Quadrivalent influenza vaccine appropriate for age and health status annually.

b. Age 65 years or older: As mentioned in the guidelines.

7.14.11. Influenza Vaccination (Special situations)

a. Egg allergy, hives only: any influenza vaccine appropriate for age and health status annually.

b. Egg allergy –any symptom other than hives (e.g., angioedema, respiratory distress or required epinephrine or another emergency medical intervention): Any influenza vaccine appropriate for age and health status may be administered. If using egg-based IIV4 or LAIV4, administer in medical setting under supervision of health care provider who can recognize and manage severe allergic reactions.

c. Close contacts (e.g., caregivers, healthcare workers) of severely immunosuppressed persons who require a protected environment: these persons should not receive LAIV4. If LAIV4 is given, they should avoid contact with/caring for such immunosuppressed persons for 7 days after vaccination.

d. Severe allergic reaction (e.g., anaphylaxis) to a vaccine component or a previous dose of any influenza vaccine.

e. History of Guillain-Barré syndrome within 6 weeks after previous dose of influenza vaccine: Generally, should not be vaccinated unless vaccination benefits outweigh risks for those at higher risk for severe complications from influenza.

7.14.12. Measles, mumps, and rubella vaccination (Routine vaccination)

a. No evidence of immunity to measles, mumps, or rubella: 1 dose.

b. Evidence of immunity: Born before 1957 (health care personnel, refer to below), documentation of receipt of MMR vaccine, laboratory evidence of immunity or disease (diagnosis of disease without laboratory confirmation is not evidence of immunity).

7.14.13. Measles, mumps, and rubella vaccination (Special situations)

a. Pregnancy with no evidence of immunity to rubella: MMR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose.

b. Nonpregnant persons of childbearing age with no evidence of immunity to rubella: 1 dose.

c. HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm3 for at least 6 months and no evidence of immunity to measles, mumps, or rubella: 2-dose series at least 4 weeks apart; MMR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm3.

d. Severe immunocompromising conditions: MMR contraindicated.

e. Students in postsecondary educational institutions, international travellers, and household or close, personal contacts of immunocompromised persons with no evidence of immunity to measles, mumps, or rubella: 2-dose series at least 4 weeks apart if previously did not receive any doses of MMR or 1 dose if previously received 1 dose MMR.

f. In mumps outbreak settings, for information about additional doses of MMR (including 3rd dose of MMR), refer to the following link;

https://www.cdc.gov/mmwr/volumes/67/wr/mm6701a7.htm

g. Health care personnel:

i. No evidence of immunity to measles, mumps, or rubella: Consider 2-dose series at least 4 weeks apart for protection against measles, mumps and rubella.

7.14.14. Meningococcal ACWY vaccination (Special situations for MenACWY)

a. Anatomical or functional asplenia (including sickle cell disease), HIV infection, persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use: 2-dose series MenACWY-D (Menactra, Menveo, or MenQuadfi) at least 8 weeks apart and revaccinate every 5 years if risk remains.

b. Travel in countries with hyperendemic or epidemic meningococcal disease, or microbiologists routinely exposed to Neisseria meningitidis: 1 dose MenACWY (Menactra, Menveo, or MenQuadfi) and revaccinate every 5 years if risk remains.

c. First-year college students who live in residential housing (if not previously vaccinated at age 16 years or older) or military recruits: 1 dose MenACWY (Menactra, Menveo, or MenQuadfi).

d. For MenACWY booster dose recommendations for groups listed under "Special situations" and in an outbreak setting (e.g., in community or organizational settings and among men who have sex with men) and additional meningococcal vaccination information, refer to the below link: https://www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm

7.14.15. Serogroup B meningococcal vaccine (MenB) Shared clinical decision-making:

a. Adolescents and young adults age 16–23 years (age 16–18 years preferred) not at increased risk for meningococcal disease: Based on shared clinical decision-making, 2-dose series MenB-4C (Bexsero) at least 1 month apart or 2-dose series MenB-FHbp (Trumenba) at 0, 6 months (if dose 2 was administered less than 6 months after dose 1, administer dose 3 at least 4 months after dose 2);

MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series).

7.14.16. Special situations for MenB

a. Anatomical or functional asplenia (including sickle cell disease), persistent complement component deficiency, complement inhibitor (e.g., eculizumab, ravulizumab) use, microbiologists routinely exposed to Neisseria meningitidis: 2-dose primary series MenB-4C (Bexsero) at least 1 month apart or 3-dose primary series MenB-FHbp (Trumenba) at 0, 1–2, 6 months (if dose 2 was administered at least 6 months after dose 1, dose 3 not needed; if dose 3 is administered earlier than 4 months after dose 2, a fourth dose should be administered at least 4 months after dose 3); MenB-4C and MenB-FHbp are not interchangeable (use same product for all doses in series); 1 dose MenB booster 1 year after primary series and revaccinate every 2–3 years if risk remains.

b. Pregnancy: Delay MenB until after pregnancy unless at increased risk and vaccination benefits outweigh potential risks

c. For MenB booster dose recommendations for groups listed under “Special situations” and in an outbreak setting (e.g., in community or organizational settings and among men who have sex with men) and additional meningococcal vaccination information, please refer to:

https://www.cdc.gov/mmwr/volumes/69/rr/rr6909a1.htm

Note: MenB vaccines may be administered simultaneously with MenACWY vaccines if indicated, but at a different anatomic site, if feasible.

7.14.17. Monkeypox Vaccination

a. Any person at risk for Monkeypox infection should receive 2-dose series of Mpox vaccine (Jynneos) 28 days apart.

b. Risk factors for Monkeypox infection include:

i. Persons who are gay, bisexual, and other MSM, transgender or nonbinary people who in the past 6 months have had:

- A new diagnosis of at least 1 sexually transmitted disease
- More than 1 sex partner
- Sex at a commercial sex venue
- Sex in association with a large public event in a geographic area where Monkeypox transmission is occurring

ii. Persons who are sexual partners of the persons described above

iii. Persons who anticipate experiencing any of the situations described above

iv. Pregnancy: There is currently no ACIP recommendation for Jynneos use in pregnancy due to lack of safety data in pregnant persons. Pregnant persons with any risk factor described above may receive Jynneos.

v. Healthcare personnel: Except in rare circumstances (e.g. non-availability of personal protective equipment and or possibility of unprotected exposure), healthcare personnel who do not have any of the sexual risk factors described above should not receive Mpox vaccine (Jynneos).

7.14.18. Pneumococcal vaccination (Routine vaccination):

a. Age 65 years or older who have:

i. Not previously received a dose of PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown: 1 dose PCV15 OR 1 dose PCV20. If PCV15 is used, this should be followed by a dose of PPSV23 given at least 1 year after the PCV15 dose. A minimum interval of 8 weeks between PCV15 and PPSV23 can be considered for adults with an immunocompromising condition, * cochlear implant, or cerebrospinal fluid leak to minimize the risk of invasive pneumococcal disease caused by serotypes unique to PPSV23 in these vulnerable groups.

ii. Previously received only PCV7: follow the recommendation above.

iii. Previously received only PCV13: 1 dose PCV20 at least 1 year after the PCV13 dose OR complete the recommended PPSV23 series.

iv. Previously received only PPSV23: 1 dose PCV15 OR 1 dose PCV20 at least 1 year after the PPSV23 dose. If PCV15 is used, it need not be followed by another dose of PPSV23.

v. Previously received both PCV13 and PPSV23 but NO PPSV23 was received at age 65 years or older: 1 dose PCV20 at least 5 years after their last pneumococcal vaccine dose OR complete the recommended PPSV23 series.

vi. Previously received both PCV13 and PPSV23, AND PPSV23 was received at age 65 years or older: Based on shared clinical decision-making, 1 dose of PCV20 at least 5 years after the last pneumococcal vaccine dose. For further information refer to the following link: https://www.cdc.gov/pneumococcal/downloads/vaccine-timing-adults-jobaid.pdf?CDC_AAref_Val=https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf

7.14.19. Pneumococcal vaccination (Special situations):

a. Age 19–64 years with certain underlying medical conditions or other risk factors who have -Not previously received a PCV13, PCV15, or PCV20 or whose previous vaccination history is unknown:1 dose PCV15 OR 1 dose PCV20. If PCV15 is used, this should be followed by a dose of PPSV23 given

at least 1 year after the PCV15 dose. A minimum interval of 8 weeks between PCV15 and PPSV23 can be considered for adults with an immunocompromising condition, cochlear implant, or cerebrospinal fluid leak.

b. Previously received only PCV7: follow the recommendation above.

c. Previously received only PCV13: 1 dose PCV20 at least 1 year after the PCV13 dose OR complete the recommended PPSV23 series.

d. Previously received only PPSV23: 1 dose PCV15 OR 1 dose PCV20 at least 1 year after the PPSV23 dose. If PCV15 is used, it need not be followed by another dose of PPSV23.

e. Previously received both PCV13 and PPSV23 but have not completed the recommended series: 1 dose PCV20 at least 5 years after their last pneumococcal vaccine dose OR complete the recommended PPSV23 series. For further information refer to the following link: https://www.cdc.gov/pneumococcal/downloads/vaccine-timing-adults-jobaid.pdf?CDC_AAref_Val=https://www.cdc.gov/vaccines/vpd/pneumo/downloads/pneumo-vaccine-timing.pdf

7.14.20. Polio vaccination (Routine vaccination):

a. Routine poliovirus vaccination of adults residing in the United States is not necessary.

7.14.21. Polio vaccination (Special situations):

a. Adults at increased risk of exposure to poliovirus with:

I. No evidence of a complete polio vaccination series (i.e., at least 3 doses): administer remaining doses (1, 2, or 3 doses) to complete a 3-dose series.

II. Evidence of completed polio vaccination series (i.e., at least 3 doses): may administer one lifetime IPV booster.

For detailed information, refer to the below link:

https://www.cdc.gov/vaccines/vpd/polio/hcp/recommendations.html

7.14.22. Respiratory Syncytial virus Vaccine (RSVV):

a. RSVV (Routine Vaccination): CDC recommends only a single dose of RSV vaccine for all adults ages 75 and older and adults ages 60-74 who are at increased risk of severe RSV disease (38).

b. RSVV (Special situations): A single dose of RSVV is recommended for pregnant women during their gestational period from 32 through 36 weeks (32 weeks 0 days until 36 weeks and 6 days) who are expected to deliver during the RSV season, for the protection of their infants from RSV associated Lower respiratory tract infection (LRTI) in the first 6 months of life.

7.14.23. Tetanus, Diphtheria, and Pertussis Vaccination (Routine vaccination):

a. Previously did not receive Tdap at or after age 11 years: 1 dose Tdap, then Td or Tdap every 10 years.

7.14.24. Tetanus, Diphtheria, and Pertussis Vaccination (Special situations):

a. Previously did not receive primary vaccination series for tetanus, diphtheria, or pertussis: 1 dose Tdap followed by 1 dose Td or Tdap at least 4 weeks later, and a third dose of Td or Tdap 6–12 months later (Tdap can be substituted for any Td dose, but preferred as first dose), Td or Tdap every 10 years thereafter.

b. Pregnancy: 1 dose Tdap during each pregnancy, preferably in early part of gestational weeks 27–36.

c. Wound management: Persons with 3 or more doses of tetanus-toxoid-containing vaccine: For clean and minor wounds, administer Tdap or Td if more than 10 years since last dose of tetanus-toxoid-containing vaccine; for all other wounds, administer Tdap or Td if more than 5 years since last dose of tetanus toxoid containing vaccine. Tdap is preferred for persons who have not previously received Tdap or whose Tdap history is unknown. If a tetanus-toxoid-containing vaccine is indicated for a pregnant woman, use Tdap. For detailed information, refer to the following link:

https://www.cdc.gov/mmwr/volumes/69/wr/mm6903a5.htm

7.14.25. Varicella vaccination (Routine vaccination):

a. No evidence of immunity to varicella: 2-dose series 4–8 weeks apart if previously did not receive varicella containing vaccine (VAR or MMRV [measles-mumps-rubella-varicella vaccine] for children); if previously received 1 dose varicella-containing vaccine, 1 dose at least 4 weeks after first dose.

b. Evidence of immunity: Documentation of 2 doses varicella containing vaccine at least 4 weeks apart, diagnosis or verification of history of varicella or herpes zoster by a health care provider, laboratory evidence of immunity or disease.

7.14.26. Varicella vaccination (Special situations):

a. Pregnancy with no evidence of immunity to varicella: VAR contraindicated during pregnancy; after pregnancy (before discharge from health care facility), 1 dose if previously received 1 dose varicella containing vaccine or dose 1 of 2-dose series (dose 2: 4–8 weeks later) if previously did not receive any varicella containing vaccine, regardless of whether born before 1980.

b. Health care personnel with no evidence of immunity to varicella: 1 dose if previously received 1 dose varicella containing vaccine; 2-dose series 4–8 weeks apart if previously did not receive any varicella containing vaccine, regardless of whether born before 1980.

c. HIV infection with CD4 percentages ≥15% and CD4 count ≥200 cells/mm3 with no evidence of immunity: Vaccination may be considered (2 doses 3

months apart); VAR contraindicated for HIV infection with CD4 percentage <15% or CD4 count <200 cells/mm3.

d. Severe immunocompromising conditions: VAR contraindicated.

7.14.27. Zoster vaccination (Routine vaccination):

a. Age 50 years or older: 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2–6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon), regardless of previous herpes zoster or history of zoster vaccine live (ZVL, Zostavax) vaccination.

7.14.28. Zoster vaccination (Special situations):

a. Pregnancy: There is currently no ACIP recommendation for RZV use in pregnancy. Consider delaying RZV until after pregnancy.

b. Immunocompromising conditions (including persons with HIV regardless of CD4 count): 2-dose series recombinant zoster vaccine (RZV, Shingrix) 2–6 months apart (minimum interval: 4 weeks; repeat dose if administered too soon). For detailed information, kindly refer to the below link: https://www.cdc.gov/shingles/hcp/vaccine-considerations/immunocompromised-adults.html

8. **RECOMMENDATION FOUR:** CONTRAINDICATIONS AND PRECAUTIONS FOR VACCINES ROUTINELY RECOMMENDED FOR ADULTS

8.1 Contraindications: (conditions in a recipient that increases the risk for a serious adverse reaction) to vaccination are conditions under which vaccines should not be administered. Because the majority of contraindications are temporary, vaccinations often can be administered later when the condition leading to a contraindication no longer exists.

8.1.1 A vaccine should not be administered when a contraindication is present; for example, MMR vaccine should not be administered to severely immunocompromised persons. However, certain conditions are commonly misperceived as contraindications (i.e., are not valid reasons to defer vaccination).

8.1.2 Severely immunocompromised persons generally should not receive live vaccines.

8.1.3 Persons who experienced encephalopathy within 7 days after administration of a previous dose of pertussis-containing vaccine not attributable to another identifiable cause should not receive additional doses of a vaccine that contains pertussis.

8.1.4 Severe Combined Immunodeficiency (SCID) disease and a history of intussusception are both contraindications to the receipt of rotavirus vaccines.

8.2 Precautions: A precaution is a condition in a recipient that might increase the risk for a serious adverse reaction, might cause diagnostic confusion, or might compromise the ability of the vaccine to produce immunity (e.g., administering measles vaccine to a person with passive immunity to measles from a blood transfusion administered up to 7 months prior.

8.2.1 A person might experience a more severe reaction to the vaccine than would have otherwise been expected; however, the risk for this happening is less than the risk expected with a contraindication.

8.2.2 In general, vaccinations should be deferred when a precaution is present.

8.2.3 However, a vaccination might be indicated in the presence of a precaution if the benefit of protection from the vaccine outweighs the risk for an adverse reaction.

8.2.4 Vaccination should be deferred for persons with a moderate or severe acute illness. This precaution avoids causing diagnostic confusion between manifestations of the underlying illness and possible adverse effects of vaccination or superimposing adverse effects of the vaccine on the underlying illness. After they are screened for contraindications, persons with moderate or severe acute illness should be vaccinated as soon as the acute illness has improved.

8.3 Neither Contraindications Nor Precautions: Physicians or health facilities might misperceive certain conditions or circumstances as valid contraindications or precautions to vaccination when they actually do not preclude vaccination. These misperceptions result in missed opportunities to administer recommended vaccines

8.3.1 Routine physical examinations and procedures (e.g., measuring temperatures) are not prerequisites for vaccinating persons who appear to be healthy. The health facility should ask the parent or guardian if the child is ill. If the child has a moderate or severe illness, the vaccination should be postponed.

For further information regarding Contraindications and precautions(a) to commonly used vaccines please refer to the below link:

https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/contraindications.html#t-01

9. **RECOMMENDATION FIVE:** IMMUNIZATION FOR TRAVELERS

9.1 International travellers are frequently at risk of exposure to infectious pathogens and should seek advice about immunizations and other necessary prophylaxis prior to departure.

9.2 Immunization needs are based on the traveller's prior immunizations, health conditions, and likely exposures while traveling. Those exposures depend upon the countries and regions to be visited and on the nature of potential exposures to infectious agents. For

example, travellers with short-term tourism itineraries may have different requirements from those with longer-term occupational exposures.

9.3 A pretravel consultation enables updating of routine immunizations to protect against illness due to infections for which there is an increased risk of exposure during travel (such as diphtheria, measles, mumps, and varicella).

9.4 Travellers should check on their routine vaccinations. Routine schedule for childhood immunizations may need to be adjusted if a child is traveling (check his/her vaccination record) and update.

9.5 Examples of recommended possible vaccines that travellers may need to get for the first time or boosters before traveling:

9.5.1 COVID-19.

9.5.2 Chickenpox.

9.5.3 Cholera.

9.5.4 Dengue Vaccine

9.5.5 Flu (Influenza).

9.5.6 Hepatitis A.

9.5.7 Hepatitis B.

9.5.8 Japanese encephalitis.

9.5.9 MMR (Measles, Mumps, Rubella).

9.5.10 Meningococcal.

9.5.11 Monkeypox

9.5.12 Pneumococcal.

9.5.13 Polio.

9.5.14 Rabies.

9.5.15 Shingles.

9.5.16 Tdap (Tetanus, Diphtheria, Pertussis).

9.5.17 Typhoid.

9.5.18 Yellow fever.

9.6 For more information about countries and recommended vaccine refer to the CDC destinations page and look up the country or countries refer to the below link:

http://wwwnc.cdc.gov/travel/destinations/list.aspx

10. **RECOMMENDATION SIX:** IMMUNIZATION MEDICAL NOTES IN PREGNANCY

10.1 Preconception immunizations are preferred to vaccination during pregnancy.

10.2 A woman should postpone pregnancy for at least 4 weeks after receiving live vaccines (e.g.: MMR, yellow fever).

10.3 If a woman is found to be pregnant after initiating the HPV vaccination series, then she should postpone the remaining doses until after her delivery.

10.4 Pregnant women should be advised to consult with their health care providers before making any travel decisions, however mostly the safest time to travel is during the second trimester (18–24 weeks).

10.5 In general, three vaccines are recommended during pregnancy:

10.5.1 Quadrivalent Influenza vaccine dose if not given before pregnancy.

10.5.2 Tdap vaccine dose as early as possible between 27 and 36 weeks of pregnancy. Getting the Tdap vaccine during pregnancy helps protect infant from pertussis in the first few months of life before she gets vaccinated herself. A Tdap vaccine dose is recommended during every pregnancy.

10.5.3 RSVV dose is recommended for pregnant women during their gestational period from 32 through 36 weeks (32 weeks 0 days until 36 weeks and 6 days) for the protection of their infants from RSV associated Lower respiratory tract infection (LRTI) in the first 6 months of life. Currently only Abrysvo is approved for administration during pregnancy.

10.6 If pregnant patient is at risk, the physician may recommend vaccinations during pregnancy to help protect from:

10.6.1 Hepatitis A and B

10.6.2 Meningitis

10.6.3 Pneumonia

10.6.4 Tetanus and diphtheria (Td vaccination), although the Tdap vaccination is recommended.

10.7 If pregnant patient is at high risk for serious infections because of travel outside the country or other possible exposure, the physician may recommend these vaccinations during pregnancy:

10.7.1 Anthrax; This is a rare disease caused by bacteria. It can be found in soil, and people can get very sick when they come in contact with it. It's not passed from person to person.

10.7.2 Japanese encephalitis; patient can get the Japanese encephalitis virus from a bite from an infected mosquito. This disease can cause swelling of the brain. It kills 1 in 4 people who get infected.

10.7.3 Polio; This is a disease is caused by a virus that infects the central nervous system (brain and spinal cord). It can cause lasting disabilities.

10.7.4 Rabies; patient get rabies from a bite from an infected animal. Rabies is a serious disease that can cause death if it's not treated immediately.

10.7.5 Typhoid (also called typhoid fever). Typhoid fever is serious and common in most of the world. patient can get it from food and water. It can cause high fever. In rare cases, it can cause internal bleeding (bleeding inside your body) and death.

10.7.6 Vaccinia (for smallpox). Smallpox is a disease caused by a virus. It can spread from person to person, causing a rash and sometimes death. Patient don't need this vaccination unless they been exposed to smallpox, which isn't likely.

10.7.7 Yellow fever; This disease is caused by a virus and spread by infected mosquitoes. In some cases, it causes high fever, bleeding, organ failure and death.

10.7.8 COVID-19; According to the CDC, the American College of Obstetricians and Gynecologists (ACOG) and the Society for Maternal-Fetal Medicine (SMFM), pregnant and breastfeeding people may choose to get the COVID-19 vaccine when it's available to them.

10.8 For further information regarding vaccines during and after pregnancy please refer to the following link:

https://www.cdc.gov/vaccines-pregnancy/recommended-vaccines/index.html

11. **RECOMMENDATION SEVEN:** SPECIAL SITUATIONS

11.1 Concurrent Administration of Antimicrobial Agents and Vaccines:

11.1.1 With a few exceptions, use of an antimicrobial agent does not interfere with the effectiveness of vaccination. Antibacterial agents have no effect on non-live vaccines. They also have no effect on response to live, attenuated vaccines, except BCG vaccines. Antimicrobial or immunosuppressive agents may interfere with the immune response to BCG and should only be used under medical supervision.

11.1.2 Antiviral drugs used for treatment or prophylaxis of influenza virus infections have no effect on the response to inactivated influenza vaccine. However, live,

attenuated influenza vaccine should not be administered until 48 hours after cessation of therapy with antiviral influenza drugs. If feasible, to avoid possible reduction in vaccine effectiveness, antiviral medication should not be administered for 14 days after LAIV administration. If influenza antiviral medications are administered within 2 weeks after receipt of LAIV, the LAIV dose should be repeated 48 or more hours after the last dose of zanamivir or oseltamivir.

11.1.3 The LAIV dose should be repeated 5 days after peramivir and 17 days after baloxavir. Alternatively, persons receiving antiviral drugs within the period 2 days before to 14 days after vaccination with LAIV may be revaccinated with another approved vaccine formulation (e.g., IIV or recombinant influenza vaccine). Antiviral drugs active against herpesviruses (e.g., acyclovir or valacyclovir) might reduce the efficacy of vaccines containing live, attenuated varicella zoster virus (i.e., Varivax and ProQuad). These drugs should be discontinued at least 24 hours before administration, if possible. If clinically appropriate, delay use or resumption of antiviral therapy for 14 days after vaccination. No data exist to suggest that commonly used antiviral drugs have an effect on rotavirus vaccine or MMR.

11.1.4 Dengue vaccine brand -Dengvaxia is recommended for persons aged 9–45 years with a history of confirmed previous Dengue virus infection.

DENGVAXIA administration to individuals not previously infected by dengue virus is associated with an increased risk of severe dengue disease when the vaccinated individuals are subsequently infected with any dengue virus serotype.

In children younger than 6 years of age, regardless of previous infection by dengue virus, an increased risk of severe and hospitalized dengue disease can occur following vaccination with DENGVAXIA and subsequent infection with any dengue virus serotype.

11.2 Concurrent Administration of Antiviral drugs and Vaccines:

11.2.1 Antiviral drugs used for treatment or prophylaxis of influenza virus infections have no effect on the response to inactivated influenza vaccine. However, live, attenuated influenza vaccine should not be administered until 48 hours after cessation of therapy with antiviral influenza drugs.

a. If feasible, to avoid possible reduction in vaccine effectiveness, antiviral medication should not be administered for 14 days after LAIV administration.

b. If influenza antiviral medications are administered within 2 weeks after receipt of LAIV, the LAIV dose should be repeated 48 or more hours after the last dose of antiviral medication.

11.2.2 Antiviral drugs active against herpesviruses (e.g., acyclovir or valacyclovir) might reduce the efficacy of vaccines containing live, attenuated varicella zoster virus (i.e., Varivax, ProQuad, and Zostavax).

a. These drugs should be discontinued at least 24 hours before administration, if possible.

b. If clinically appropriate, delay use or resumption of antiviral therapy for 14 days after vaccination.

11.2.3 No data exist to suggest that commonly used antiviral drugs have an effect on rotavirus vaccine or MMR.

11.3 Administration of Live Vaccines and Tuberculin Skin Tests (TSTs) and Interferon-gamma Release Assays (IGRAs):

11.3.1 Measles illness, severe acute or chronic infections, HIV infection, and malnutrition can create a relatively anergic state during which the TST might have a false-negative reaction.

11.3.2 Although live, attenuated measles vaccine theoretically can suppress TST reactivity, the degree of suppression is likely less than that occurring from acute infection from wild-type measles virus.

11.3.3 TST may be administered before or simultaneously with live vaccines, or should be deferred for 28 days after vaccination.

a. If live vaccine is indicated, and TST has been administered more than one day previous, the live vaccine can be administered at any interval after the TST. If TST is recommended, and the live vaccine has already been administered more than one day previous, the TST should be deferred for 28 days after vaccine dose.

11.3.4 Interferon gamma release assays (IGRAs), such as the QuantiFERON-TB Gold In-Tube test and the T-Spot TB test, are blood-test alternatives to the TST for *detecting* Mycobacterium tuberculosis *infection*.

a. The IGRA requires only a single visit to complete and may be less effected by previous BCG vaccination.

11.3.5 The same timing guidelines that apply to the interval between a live vaccine and TST apply to IGRA (i.e., 28 days between live vaccine and IGRA if they do not occur on the same day).

11.4 Vaccination of Preterm Infants:

11.4.1 In the majority of cases, preterm infants (infants born before 37 weeks' gestation), regardless of birth weight, should be vaccinated at the same chronological age and according to the same schedule and using the same precautions as for full-term infants and children.

11.4.2 Birth weight and size are not factors in deciding whether to vaccinate a clinically stable preterm infant except for hepatitis B vaccination.

11.4.3 The full-recommended dose of each vaccine should be used. Divided or reduced doses are not recommended.

11.4.4 Infants weighing <2,000 g born to HBsAg-negative mothers should receive the first dose of the hepatitis B vaccine series at chronological age 1 month or hospital discharge, if hospital discharge occurs when the infant is younger than one month of age.

11.4.5 Preterm low-birth-weight–infants born to HBsAg-positive mothers and mothers with unknown HBsAg status should receive hepatitis B vaccine and hepatitis B Immunoglobulin within 12 hours after birth.

a. The initial vaccine dose should not be counted toward completion of the hepatitis B series, and 3 additional doses of hepatitis B vaccine should be administered, beginning when the infant is aged 1 month.

11.5 Breastfeeding and Vaccination:

11.5.1 According to the ACIP's General Best Practice Guidelines for Immunization in Special Situations, except for smallpox and yellow fever vaccines, neither inactivated nor live-virus vaccines administered to a lactating woman affect the safety of breastfeeding for women or their infants.

11.5.2 Although live viruses in vaccines can replicate in the mother, the majority of live viruses in vaccines have been demonstrated not to be excreted in human milk. Inactivated, recombinant, subunit, polysaccharide, and conjugate

vaccines, as well as toxoids, pose no risk for mothers who are breastfeeding or for their infants.

11.5.3 Breastfeeding is a contraindication for smallpox vaccination of the mother because of the theoretical risk for contact transmission from mother to infant. Two serious adverse events have been reported in exclusively breastfed infants whose mothers were vaccinated with Yellow Fever vaccine.

11.5.4 Until more information is available, Yellow Fever vaccine should be avoided in breastfeeding women. However, when travel of nursing mothers to a Yellow Fever endemic area cannot be avoided or postponed, these women should be vaccinated.

11.6 Vaccinating Persons with Increased Bleeding Risk:

11.6.1 Individuals with a bleeding disorder or who are receiving anticoagulant therapy may develop hematomas in IM injection sites.

11.6.2 Vaccines should be administered with caution to individuals with increased bleeding risk.

11.6.3 Administer vaccines by recommended IM route IF physician familiar with patient's bleeding risk determines that the vaccine can be administered by this route with reasonable safety.

11.6.4 Prior to administration of IM vaccines, the patient or family should be instructed about the risk of hematoma formation from the injection.

11.6.5 If the patient periodically receives antihemophilia or similar therapy, IM vaccine administration should be scheduled shortly after such therapy is administered.

11.6.6 In those with a severe bleeding tendency vaccination can be scheduled shortly (within 1 day) after administration of clotting factor replacement or similar therapy.

11.6.7 The following procedures are recommended to be followed:

a. A fine-gauge needle (23 gauge or smaller caliber) should be used.
b. If using a 25-gauge needle, the vaccine should be injected into the muscle over 5 seconds to reduce the risk of tissue damage.
c. Firm pressure should be applied to the site for at least 2 minutes without rubbing.
d. Do NOT rub or massage injection site
e. For pain/fever relief, avoid aspirin and NSAIDS (such as ibuprofen, naproxen sodium) because of the potential risk of bleeding. Acetaminophen is a safe alternative, but should be used with caution, especially in individuals at risk for liver disease.

11.6.8 Providers should not administer a vaccine by a route that is not approved by the FDA for that particular vaccine (e.g., administration of IM vaccines by the SC route).

11.6.9 The vaccines (single vaccines, not in combination with other vaccines) that have been tested and demonstrated to be effective when administered either IM or SQ include:

a. Pneumococcal polysaccharide (PPSV)

b. Polio, inactivated (IPV)

c. Hepatitis A Hepatitis B

12. **RECOMMENDATION EIGHT:** VACCINATION OF IMMUNOSUPRESSIVE PATIENTS

12.1 Vaccination in patient with planned immunosuppression:

12.1.1 When feasible, vaccines should be administered before planned immunosuppression.

12.1.2 Live vaccines should be given at least four weeks in advance and should be avoided in the two weeks before immunosuppression is started.

12.1.3 Inactivated vaccines should be administered at least two weeks in advance.

12.1.4 Varicella vaccine should not be administered to severely immunocompromised patients. However, select patients (e.g., those with HIV infection who are not severely Immunocompromised, those with a primary immunodeficiency without defective T cell–mediated immunity) should receive two doses of vaccine three months apart.

a. Varicella vaccination can be considered in patients who do not have evidence of immunity (i.e., age-appropriate varicella vaccination,

serologic evidence of immunity, clinician-diagnosed or -verified history of varicella or zoster, or laboratory-proven varicella or zoster) and who are receiving long-term, low-dose immunosuppressant drugs.

b. When indicated, varicella vaccine should be administered as a single-antigen product and not combined with the MMR vaccine.

12.1.5 Zoster vaccine should be administered to patients 60 years and older who are receiving therapy to induce low-level immunosuppression.

a. The vaccine should not be administered to highly immunocompromised patients.

12.1.6 Influenza Vaccination; Annual administration of inactivated influenza vaccine is recommended for immunocompromised patients six months and older, except those who are unlikely to respond (e.g., those receiving intensive chemotherapy, those who have received anti–B-cell antibodies within the previous six months).

a. Live attenuated influenza vaccine should not be administered to immunocompromised persons.

12.2 Vaccination for household members of immunocompromised patients

12.2.1 Immunocompetent individuals who live in a household with immunocompromised patients can safely receive inactivated vaccines based on

the CDC–ACIP's annually updated recommended vaccination schedules for children and adults

12.2.2 Individuals who live in a household with immunocompromised patient's age ≥6 months should receive influenza vaccine annually. They should receive either:

a. Inactivated influenza vaccine IIV or Live attenuated influenza vaccine (LAIV) provided they are healthy, not pregnant, and aged 2–49 years.

b. Exceptions include:

i. individuals who live in a household with an immunocompromised patient who was a hematopoietic stem cell transplant (HSCT) recipient within 2 months after transplant or with graft vs host disease (GVHD) or

ii. is a patient with severe combined immune deficiency (SCID).

iii. In these exceptions, LAIV should not be administered or, if administered, contact between the immunocompromised patient and household member should be avoided for 7 days.

12.2.3 Healthy immunocompetent individuals who live in a household with immunocompromised patients should receive the following live vaccines based on the CDC annual schedule: combined measles, mumps, and rubella (MMR) vaccines; rotavirus vaccine in infants aged 2–7 months; varicella vaccine VAR;

and zoster vaccine ZOS. Also, these individuals can safely receive the following vaccines for travel: Yellow fever vaccine and oral typhoid vaccine.

12.2.4 Oral polio vaccine (OPV) should not be administered to individuals who live in a household with immunocompromised patients.

12.2.5 Highly immunocompromised patients should avoid handling diapers of infants who have been vaccinated with rotavirus vaccine for 4 weeks after vaccination.

12.2.6 Immunocompromised patients should avoid contact with persons who develop skin lesions after receipt VAR or ZOS until the lesions clear.

12.3 Vaccination in HIV-infected adults, adolescents, and children

12.3.1 HIV-infected patients should be vaccinated according to the CDC annual schedule for the following inactivated vaccines:

a. PCV13 in patients aged <2 years

b. H. influenza type b conjugate (Hib) vaccine; diphtheria toxoid, tetanus toxoid, a cellular pertussis (DTaP); tetanus toxoid, reduced diphtheria toxoid (Td) vaccine; hepatitis B (HepB) vaccine; hepatitis A (HepA) vaccine; inactivated poliovirus (IPV) vaccine; and quadrivalent human Papillomavirus (HPV4) vaccine in females and males aged 11–26 years with additions noted below.

c. PCV13 should be administered to HIV-infected patients aged ≥2 years as in recommendations.

d. PPSV23 should be administered to HIV-infected children aged ≥2 years of age who have received indicated doses of PCV, HIV-infected adults with CD4 T-lymphocyte counts of ≥200 cells/mm3, and HIV-infected adults with CD4 T-lymphocyte counts of <200 cells/mm3 PPSV23 should be given ≥8 weeks after indicated dose(s) of PCV13, and a second dose of PPSV23 should be given 5 years later.

e. HIV-infected children who are aged >59 months and have not received Hib vaccine should receive 1 dose of Hib vaccine. Hib vaccine is not recommended for HIV-infected adults.

f. HIV-infected children aged 11–18 years should receive a 2-dose Primary series of MCV4 2 month's apart. A single booster dose (third dose) should be given at age 16 years if the primary Series was given at age 11 or 12 years and at age 16–18 years if the primary series was given at age 13–15 years.

g. HIV-infected patients should receive the HepB vaccine series, with consideration of high-dose HepB vaccine (40 µg/dose) for adults and adolescents. One to 2 months after completion, patients should be tested for anti-HBs (antibodies to HepB surface antigen). If a post vaccination anti-HB concentration of ≥10 mIU/mL is not attained, a second 3-dose series of HepB vaccine (alternative: 1 dose of HepB

vaccine after which anti-HBs is tested, using standard dose or high dose (40 µg) for children and high dose for adolescents and adults should be administered.

h. Internationally adopted HIV-infected children who have received doses of OPV should receive a total of 4 doses of a combination of OPV and IPV vaccine.

i. HPV9 is recommended over HPV2/ HPV4 because it protects against a wider range of Human Papillomavirus (HPV) strains responsible for causing genital warts, cervical, vulvar, vaginal, anal, oropharyngeal and other head and neck cancers.

12.3.2 HIV exposed or infected infants should receive rotavirus vaccine according to the schedule for uninfected infants.

12.3.3 HIV-infected patients should not receive LAIV.

12.3.4 MMR vaccine should be administered to clinically stable HIV-infected children aged 1–13 years without severe immunosuppression and HIV infected patients aged ≥14 years without measles immunity and with a CD4 T-cell lymphocyte count ≥200/mm3.

12.3.5 HIV-infected children with a CD4 T-cell percentage <15 or patients aged ≥14 years with a CD4 Tcell lymphocyte count <200 cells/mm3 should not receive MMR vaccine.

12.3.6 HIV-infected patients should not receive quadrivalent MMR-varicella (MMRV) vaccine.

12.3.7 Varicella-no immune, clinically stable HIV-infected patients aged 1–8 years with ≥15% CD4 T-lymphocyte percentage, aged 9–13 years with ≥15% CD4 T-lymphocyte percentage, and aged ≥14 years with CD4 T-lymphocyte counts ≥200 cells/mm3 should receive VAR. The 2 doses should be separated by ≥3 months.

12.4 Vaccination in patients with cancer

12.4.1 Patients aged ≥6 months with hematological malignancies or solid tumor malignancies except those receiving anti–B-cell antibodies or intensive chemotherapy, such as for induction or consolidation chemotherapy for acute leukemia should receive IIV annually.

12.4.2 PCV13 should be administered to newly diagnosed adults with hematological or solid malignancies and children with malignancies as described in recommendations. PPSV23 should be administered to adults and children aged ≥2 years at least 8 weeks after the indicated dose(s) of PCV13.

12.4.3 Inactivated vaccines (other than IIV) recommended for immunocompetent children in the CDC annual schedule can be considered for children who are receiving maintenance chemotherapy. However, vaccines administered during

cancer chemotherapy should not be considered valid doses unless there is documentation of a protective antibody level.

12.4.4 Live viral vaccines should not be administered during chemotherapy.

12.4.5 Three months after cancer chemotherapy, patients should be vaccinated with inactivated vaccines and the live vaccines for varicella; measles, mumps, and rubella; and measles, mumps, and rubella– varicella according to the CDC annual schedule that is routinely indicated for immunocompetent persons. In regimens that included anti–B-cell antibodies, vaccinations should be delayed at least 6 months.

12.5 Vaccination of hematopoietic stem cell transplant patients

12.5.1 The HSCT donor should be current with routinely recommended vaccines based on age, vaccination history, and exposure history according to the CDC annual schedule. However, administration of MMR, MMRV, VAR, and ZOS vaccines should be avoided within 4 weeks of stem cell harvest. Vaccination of the donor for the benefit of the recipient is not recommended.

12.5.2 Prior to HSCT, candidates should receive vaccines indicated for immunocompetent persons based on age, vaccination history, and exposure history according to the CDC annual schedule if they are not already immunosuppressed and when the interval to start of the conditioning regimen is ≥4 weeks for live vaccines and ≥2 weeks for inactivated vaccines.

12.5.3 No immune HSCT candidates aged ≥12 months should receive VAR (as a 2-dose regimen if there is sufficient time) if they are not immunosuppressed and when the interval to start the conditioning regimen is ≥4 weeks.

12.5.4 One dose of IIV should be administered annually to persons aged ≥6 months starting 6 months after HSCT and starting 4 months after if there is a community outbreak of influenza as defined by the local health department. For children aged 6 months–8 years who are receiving influenza vaccine for the first time, 2 doses should be administered.

12.5.5 Three doses of PCV13 should be administered to adults and children starting at age 3–6 months after HSCT. At 12 months after HSCT, 1 dose of PPSV23 should be given provided the patient does not have chronic GVHD.

12.5.6 For patients with chronic GVHD, a fourth dose of PCV13 can be given at 12 months after HSCT.

a. Three doses of Hib vaccine should be administered 6–12 months after HSCT.

b. Two doses of MCV4 should be administered 6–12 months after HSCT to persons aged 11–18 years, with a booster dose given at age 16–18 years for those who received the initial post-HSCT dose of vaccine at age 11–15 years.

c. Three doses of tetanus/diphtheria–containing vaccine should be administered 6 months after HSCT. For children aged <7 years, 3 doses of DTaP should be administered. For patients aged ≥7 years, administration of 3 doses of DTaP should be considered. Alternatively, a dose of Tdap vaccine should be administered followed by either 2 doses of diphtheria toxoid combined with tetanus toxoid (DT) or 2 doses of Td vaccine.

d. Three doses of HepB vaccine should be administered 6– 12 months after HSCT. If a post vaccination anti-HBs concentration of ≥10 mIU/mL is not attained, a second 3-dose series of HepB vaccine (alternative: 1 dose of HepB vaccine after which anti-HBs is tested), using standard dose or high dose (40 µg weak, low) for children and high dose for adolescents and adults, should be administered.

e. Three doses of IPV vaccine should be administered 6–12 months after HSCT.

f. Consider administration of 3 doses of HPV vaccine 6–12 months after HSCT for female patients aged 11–26 years and HPV4 vaccine for males aged 11–26 years.

g. Do not administer live vaccines to HSCT patients with active GVHD or ongoing immunosuppression.

h. A 2-dose series of MMR vaccine should be administered to measles-seronegative adolescents and adults and to measles-seronegative children 24 months after HSCT in patients with neither chronic GVHD nor ongoing immunosuppression and 8–11 months (or earlier if there is a measles outbreak) after the last dose of immune globulin intravenous (IGIV).

i. A 2-dose series of VAR should be administered 24 months after HSCT to varicella-seronegative patients with neither GVHD nor ongoing immunosuppression and 8–11 months after the last dose of IGIV.

12.6 Vaccination of patients with chronic inflammatory diseases on immunosuppressive medications

12.6.1 Inactivated vaccines, including IIV, should be administered to patients with chronic inflammatory illness treated or about to be treated with immunosuppressive agents as for immunocompetent persons based on the CDC annual schedule.

12.6.2 PCV13 should be administered to adults and children with a chronic inflammatory illness that is being treated with immunosuppression's described in the standard schedule for children and in recommendations.

12.6.3 PPSV23 should be administered to patients aged ≥2years with chronic inflammatory illnesses with planned initiation of immunosuppression, low-

level immunosuppression, and high-level immunosuppression. Patients should receive PPSV23 ≥8 weeks after PCV13, and a second dose of PPSV23 should be given 5 years later.

12.6.4 VAR should be administered to patients with chronic inflammatory diseases without evidence of varicella immunity (defined in recommendations) ≥4 weeks prior to initiation of immunosuppression if treatment initiation can be safely delayed.

12.6.5 VAR should be considered for patients without evidence of varicella immunity (defined in recommendations) being treated for chronic inflammatory diseases with long-term, low-level immunosuppression.

12.6.6 ZOS should be administered to patients with chronic inflammatory disorders who are aged ≥60 years prior to initiation of immunosuppression or being treated with low-dose immunosuppression and those who are aged 50–59 years and varicella positive prior to initiation of immunosuppression or being treated with low-dose immunosuppression.

12.6.7 Other live vaccines should not be administered to patients with chronic inflammatory diseases on maintenance immunosuppression: LAIV, MMR vaccine in patients receiving low-level and high-level immunosuppression; and MMRV vaccine in patients receiving low-level and high-level immunosuppression.

12.6.8 Other recommended vaccines, including IIV and HepB vaccine, should not be withheld because of concerns about exacerbation of chronic immune-mediated or inflammatory illness.

12.7 Vaccination of patients with asplenia or sickle cell diseases:

12.7.1 Asplenic patients and those with sickle cell diseases should receive vaccines including PCV13 for children aged <2years, as recommended routinely for immunocompetent persons based on the CDC annual schedule. No vaccine is contraindicated except LAIV.

12.7.2 PCV13 should be administered to asplenic patients and patients with sickle cell diseases aged ≥2 years based on the CDC annual schedule for children and in recommendations.

12.7.3 PPSV23 should be administered to a splenic patients and patients with a sickle cell disease aged ≥2 years with an interval of ≥8 weeks after PCV13, and a second dose of PPSV23 should be administered 5 years later.

12.7.4 For PPSV23-naive patients aged ≥2 years for whom a splenectomy is planned, PPSV23 should be administered ≥2 weeks prior to surgery (and following indicated dose(s) of PCV13) or ≥2 weeks following surgery.

12.7.5 One dose of Hib vaccine should be administered to unvaccinated persons aged ≥5 years who are a splenic or have a sickle cell disease.

12.7.6 Meningococcal vaccine should be administered to patients aged ≥2 months who are a splenic or have a sickle cell disease, as in recommendations. However, MCV4-D should not be administered in patients aged <2 years because of a reduced antibody response to some pneumococcal serotypes when both MCV4 and PCV are administered simultaneously. Revaccination with MCV4 (or MPSV4 for those aged >55 years who have not received MCV4) is recommended every 5 years.

12.8 Vaccination of solid organ transplant recipients

12.8.1 Living donors should be current with vaccines based on age, vaccination history, and exposure history according to the CDC annual schedule MMR, MMRV, VAR, and ZOS vaccine administration should be avoided within 4 weeks of organ donation. Vaccination of donors solely for the recipient's benefit is generally not recommended.

12.8.2 Vaccination should be withheld from SOT recipients during intensified immunosuppression, including the first 2-month posttransplant period, because of the likelihood of inadequate response. However, IIV can be administered ≥1 month after transplant during a community influenza outbreak.

12.8.3 Standard age-appropriate inactivated vaccine series should be administered 2 to 6 months after SOT based on the CDC annual schedule including IIV.

12.8.4 PCV13 should be administered 2 to 6 months after SOT if not administered before SOT, with the timing based on the patient's degree of immunosuppression, as described in recommendations.

12.8.5 For SOT patients aged ≥2 years, 1 dose of PPSV23 should be administered 2 to 6 months after SOT, with the timing based on the patient's degree of immunosuppression, and ≥8 weeks after indicated doses of PCV13, if not given within 5 years and if the patient has received no more than 1 previous lifetime dose.

12.8.6 HepB vaccine should be considered for chronic Hepatitis B infected recipients 2 to 6 months after liver transplant in an attempt to eliminate the lifelong requirement for Hepatitis B immune globulin (HBIG).

12.8.7 MMR vaccine and VAR should generally not be administered to SOT recipients because of insufficient safety and effectiveness data except for varicella in children without evidence of immunity (as defined in recommendation who are renal or liver transplant recipients, are receiving minimal or no immunosuppression, and have no recent graft rejection.

12.8.8 Vaccination should not be withheld because of concern about transplant organ rejection. Or about to be treated with immunosuppressive agents as for immunocompetent persons based on the CDC annual schedule.

12.8.9 PCV13 should be administered to adults and children with a chronic inflammatory illness that is being treated with immunosuppression as described in the standard schedule for children and in recommendations.

12.8.10 PPSV23 should be administered to patients aged ≥2 years with chronic inflammatory illnesses with planned initiation of immunosuppression low-level immunosuppression, and high-level immunosuppression. Patients should receive PPSV23 ≥8 weeks after PCV13, and a second dose of PPSV23 should be given 5 years later.

12.8.11 VAR should be administered to patients with chronic inflammatory diseases without evidence of varicella immunity (defined in recommendations) ≥4 weeks prior to initiation of immunosuppression if treatment initiation can be safely delayed.

12.8.12 VAR should be considered for patients without evidence of varicella immunity (defined in recommendations being treated for chronic inflammatory diseases with long-term, low-level immunosuppression.

12.8.13 ZOS should be administered to patients with chronic inflammatory disorders who are aged ≥60 years prior to initiation of immunosuppression or being treated with low-dose immunosuppression and those who are aged 50–59 years and varicella positive prior to initiation of immunosuppression or being treated with low-dose immunosuppression.

12.8.14 Other live vaccines should not be administered to patients with chronic inflammatory diseases on maintenance immunosuppression: LAIV, MMR vaccine in patients receiving low-level and high-level immunosuppression; and MMRV vaccine in patients receiving low-level and high-level immunosuppression.

12.8.15 Other recommended vaccines, including IIV and HepB vaccine, should not be withheld because of concerns about exacerbation of chronic immune-mediated or inflammatory illness.

13. **RECOMMENDATION NINE:** CONTRAINDICATIONS AND PRECAUTIONS

13.1 Before administering any vaccine, patients should be screened for contraindications and precautions, even if the patient has previously received that vaccine. The patient's health condition or recommendations regarding contraindications and precautions for vaccination may change from one visit to the next.

13.2 To assess patients correctly and consistently, healthcare providers should use a standardized, comprehensive screening tool.

13.3 Contraindication;

13.3.1 A condition that increases the likelihood of a serious adverse reaction to a vaccine for a patient with that condition.

13.3.2 In general, vaccines should not be administered when a contraindication condition is present.

13.4 Precaution;

13.4.1 A condition in a recipient that might increase the chance or severity of an adverse reaction,

13.4.2 Might cause diagnostic confusion, or

13.4.3 Might compromise the ability of the vaccine to produce immunity

13.5 Injury could result, but the chance of this happening is less than with a contraindication.

13.6 In general, vaccines are deferred when a precaution condition is present. However, situations may arise when the benefit of protection from the vaccine outweighs the risk of an adverse reaction, and a provider may decide to give the vaccine.

13.7 Persons who administer vaccines should screen patients for contraindications and precautions to the vaccine before each dose of vaccine is administered.

13.8 Routine physical examinations are not prerequisites for vaccinating persons who appear to be healthy.

13.9 General contraindications to vaccination:

13.9.1 A confirmed anaphylactic reaction to a vaccine component (e.g. neomycin, streptomycin or Polymyxin B) or following a prior dose.

13.9.2 Encephalopathy not due to another identifiable cause occurring within 7 days of pertussis containing vaccination.

13.9.3 Severely immunocompromised persons generally should not receive live vaccines.

13.9.4 Severe Combined Immunodeficiency (SCID) disease and a history of intussusception are both contraindications to the receipt of rotavirus vaccines.

13.10 The presence of a moderate or severe acute illness with or without a fever is a precaution to administration of all vaccines.

13.10.1 The decision to administer or delay vaccination because of a current or recent acute illness depends on the severity of symptoms and etiology of the condition.

13.11 For Contraindications and precautions to commonly used vaccines; refer to **(Appendix 12).**

13.12 If HIV-infected individuals, including children, are receiving anti-retroviral therapy (ART), are clinically well and immunologically stable (CD4% >25% for children aged 5 years) they should be vaccinated with BCG.

13.12.1 However, BCG can be administered to neonates born to HIV-positive mothers after three appropriately timed (Birth, 6 weeks & 3 months) negative postnatal PCR tests for HIV infection.

13.13 A substantially immunosuppressive steroid dose is considered to be ≥2 weeks of daily receipt of 20 mg or 2 mg/kg body weight of prednisone or equivalent.

13.14 Family history of congenital or hereditary immunodeficiency in first-degree relatives (e.g., parents and siblings), unless the immune competence of the potential vaccine recipient has been substantiated clinically or verified by a laboratory.

13.15 No adverse events associated with the use of aspirin or aspirin-containing products after varicella vaccination have been reported; however, the vaccine manufacturer recommends that vaccine recipients avoid using aspirin or aspirin-containing products for 6 weeks after receiving varicella vaccines because of the association between aspirin use and Reye syndrome after varicella.

13.15.1 Vaccination with subsequent close monitoring should be considered for children who have rheumatoid arthritis or other conditions requiring therapeutic aspirin.

13.15.2 The risk for serious complications associated with aspirin is likely to be greater in children in whom natural varicella develops than it is in children who receive the vaccine containing attenuated VZV.

13.15.3 No association has been documented between Reye syndrome and analgesics or antipyretics that do not contain aspirin."

13.16 Invalid Contraindications to Vaccination

13.16.1 Some healthcare providers inappropriately consider certain conditions or circumstances to be contraindications or precautions to vaccinations. Such conditions or circumstances are known as invalid contraindications; these misperceptions result in missed opportunities to administer needed vaccines.

13.16.2 The following conditions are NOT contraindications to routine immunization:

a. Mild illness.

b. Antimicrobial therapy.

c. Disease exposure or convalescence.

d. Recent or imminent elective surgery.

e. Stable neurological conditions such as cerebral palsy and Down's syndrome.

f. History of Asthma or eczema and use of topical or inhaled steroids.

g. Breastfeeding.

h. Preterm birth.

i. Underweight.

j. Allergy to products not present in vaccine or allergy that is not anaphylactic.

k. Pregnant or immunosuppressed person in the household.

l. Family history of adverse events following immunization.

m. Personal or family history of febrile convulsions or epilepsy (a precaution for MMRV vaccination).

n. Tuberculin skin testing.

o. Multiple vaccines.

p. Over the age recommended in the immunization schedule.

13.17 For conditions incorrectly perceived as contraindications to vaccination (i.e., vaccines may be given under these conditions). Refer to **(Appendix 13)**.

14. **RECOMMENDATION TEN:** ADVERSE REACTIONS

14.1 An adverse event following immunization (AEFI) is any adverse event that follows immunization and is believed to be caused by the immunization.

14.1.1 Reported adverse events can be either be true adverse events, i.e. really a result of the vaccine or immunization process, or coincidental events that are not due to the vaccine or immunization process but are temporally associated with immunization.

14.2 AEFIs are classified into five categories; vaccination reaction, program error, coincidental, injection reaction, and unknown when the cause of the AEFI remains unknown.

14.3 Vaccine reactions

14.3.1 Vaccine reactions are events caused or precipitated by the vaccine when given correctly caused by the inherent properties of the vaccine.

14.3.2 Vaccine reactions may be classified into common, minor reactions or rare, more serious reactions.

14.3.3 Most vaccine reactions are minor and settle on their own. More serious reactions are very rare and in general do not result in long - term problems.

14.4 Common, minor vaccine reactions

14.4.1 Common, minor vaccine reactions include local and systemic reactions.

14.4.2 These reactions can result as part of immune response, or reaction to some of the vaccine's components such as aluminum adjuvant, stabilizers or preservatives.

14.4.3 These reactions occur within a day or two of immunization (except for measles/MMR – 6 to 12 days after immunization) and only last few days.

14.5 Local reactions

14.5.1 Local reactions include pain, swelling and/or redness at the injection site and can be expected in about 10% of vaccines, except for those injected with DTP (whole cell), or tetanus boosters, where up to half can be affected.

14.5.2 BCG causes a specific local reaction that starts as a papule (lump) two or more weeks after immunization that then becomes ulcerated and heals after several months, leaving a scar.

14.5.3 Keloid (thickened scar tissue) from the BCG lesion is more common among Asian and African populations.

14.6 Systemic reactions

14.6.1 Systemic reactions include fever and occur in about 10% or less of vaccines, except for DTP where it is again about half.

14.6.2 Other common systemic reactions (e.g., irritability, malaise, loss of appetite) can also occur after DTP.

14.6.3 For measles/MMR and OPV the systemic reactions arise from vaccine virus infection.

14.6.4 Measles' vaccine causes fever, rash and/or conjunctivitis, and affects 5-15% of vaccines.

14.6.5 It is very mild compared to 'wild' measles, but for severely immunocompromised individuals, it can be severe, even fatal.

14.6.6 Vaccine reactions for mumps (swollen parotid gland) and rubella (joint pains and swollen lymph nodes) affect less than 1% of children.

14.6.7 Rubella vaccine causes symptoms more often in adults, with 15% suffering from joint pains.

14.6.8 Systemic reactions from OPV affect less than 1% of vaccines with diarrhea, headache and/or muscle pain.

14.7 For common minor vaccine reactions and their treatments; refer to **(Appendix 14)**.

14.8 For an overview on rare more serious vaccine reactions; refer to **(Appendix 15)**.

14.8.1 Rare and more serious vaccine reactions include reactions such as seizures, thrombocytopenia, hypotonic hypo responsive episodes, and persistent inconsolable screaming. Most of these reactions do not lead to long – term problems.

14.8.2 Anaphylaxis, while potentially fatal, is treatable without leaving any long – term effects.

14.8.3 Although encephalopathy is included as a rare reaction to measles or DTP vaccine, it is not certain that these vaccines in fact cause encephalopathy (brain damage).

14.8.4 Some serious events have been reported following immunization is likely to be coincidental rather than true reactions.

14.9 Prevention and treatment of vaccine reactions

14.9.1 Vaccines are very rarely contraindicated.

a. However, it is important to check for contraindications to avoid serious reactions.

b. For example, vaccines are contraindicated if there is serious allergy to the vaccine or its components.

c. Live vaccines should not be given to immune-deficient children.

14.9.2 Advice on managing the common reactions should be given to parents, as well as instructions to return if there are more serious symptoms.

a. This will help to reassure parents about immunization and prepare them for these common reactions.

14.9.3 Paracetamol is useful for the common minor reactions.

a. It eases pain and reduces fever.

b. It can also be used at the time of DTP immunization to prevent fever.

14.9.4 A feverish child can be cooled with a tepid sponge or bath, and by wearing cool clothing.

14.10 Program errors

14.10.1 Program errors result from errors and accidents in vaccine preparation, handling, or administration. Refer to **(Appendix 16).**

a. They are preventable and detract from the overall benefit of the immunization program. The identification and correction of these errors are of great importance.

14.10.2 To avoid program errors:

a. Vaccines must only be reconstituted with the diluents' supplied by the manufacturer.

b. Reconstituted vaccines must be discarded at the end of each immunization session and never retained.

c. No other drugs or substances should be stored in the refrigerator of the vaccines.

d. Healthcare professionals must be adequately trained and closely supervised to ensure that proper procedures are being followed

e. Careful epidemiological investigation of an AEFI is needed to pinpoint the cause and to correct immunization practices.

14.11 Coincidental events

14.11.1 An event may occur coincidentally with immunization and at times may be falsely attributed to be a result of the vaccine.

a. These coincidental events are inevitable given the large number of vaccine doses administered, especially in a mass campaign.

14.11.2 Vaccines are normally scheduled early in life, when infections and other illnesses are common, including manifestations of an underlying congenital or neurological condition. It is therefore possible for many events, including deaths, to be falsely attributed to vaccine through chance association.

14.12 Injection reactions

14.12.1 Injection reactions are not related to the vaccine, but to the injection. Individuals can react in anticipation to and as a result of an injection of any kind. This reaction is unrelated to the content of the vaccine.

14.12.2 Fainting is relatively common injection reaction among individuals who are needle- phobic.

a. Fainting can be anticipated when immunization older children, and can be reduced by minimizing stress in those awaiting injection, through short waiting times, comfortable room temperatures, preparation of vaccines out of recipient's view, and privacy during the procedure.

b. Fainting does not require any management beyond placing the patient in a recumbent position.

c. Avoiding injury from the fall is important, and those at risk should be immunized while seated.

14.12.3 Hyperventilation can occur as a result of anxiety about the immunization, leading to light-headedness, dizziness, tingling around the mouth and in the hands.

a. Younger children tend to react in a different to anxiety.

b. They can react with screaming, vomiting, or breath – holding which can cause unconsciousness.

c. In some cases, children may develop convulsions as a result of anxiety; however, they may do not need to be investigated but should be reassured.

14.13 Anaphylaxis

14.13.1 Anaphylaxis is a potentially life-threatening allergic reaction to foreign protein antigens.

a. It is a rare complication of immunization but, even so, it should be anticipated in every vaccine.

14.13.2 Prevention is the best approach.

a. Pre-vaccination screening should include questions about possible allergy to any component of the product(s) being considered in order to identify this contraindication.

14.13.3 As avoidance is not always possible, every vaccine provider should be familiar with the symptoms of anaphylaxis and be ready to initiate management and administer appropriate medications.

14.13.4 Most instances begin within 30 minutes after an injection of vaccine; shorter intervals to onset foretell more severe reactions.

a. Thus, vaccine recipients should be kept under supervision for at least 15 minutes after immunization; 30 minutes is a safer interval when there is a specific concern about possible vaccine allergy.

14.13.5 Allergic reactions can include: local or generalized urticaria (hives) or angioedema; respiratory compromise due to wheezing or swelling of the throat; hypotension; and shock.

14.13.6 Rapid recognition and initiation of treatment are required to prevent possible progression to respiratory failure or cardiovascular collapse.

14.13.7 It is important to note that urticaria may not be present in all cases of anaphylaxis.

14.13.8 For respiratory or cardiovascular symptoms, or other signs or symptoms of anaphylaxis, immediate intramuscular epinephrine is the treatment of choice.

14.13.9 Additional doses of epinephrine as well as other drugs also might be indicated.

14.13.10 If hypotension is present, the patient should be placed in a recumbent position with the legs elevated.

14.13.11 Maintenance of the airway, oxygen administration, and intravenous normal saline might be necessary.

14.13.12 After the patient is stabilized, arrangements should be made for immediate transfer to an emergency facility for additional evaluation and treatment.

14.13.13 Because anaphylaxis may recur after patients begin to recover, monitoring in a health facility for several hours is advised, even after complete resolution of symptoms and signs.

14.13.14 For rapid overview of emergent management of anaphylaxis in infants and child; refer to **(Appendix 17).**

14.13.15 For distinguishing anaphylaxis from a fainting (vasovagal reaction); refer to **(Appendix 18).**

14.14 Patient Care after Vaccine Administration

14.14.1 All health facilities administering vaccines or managing any AEFI shall develop and implement internal policy and procedure for reporting process for any side effect, unpredicted adverse effect or serious adverse event based on DHA rules and regulation, Ministry of Health and Prevention (MOHAP) ministerial decrees and UAE federal laws.

14.14.2 The health facility shall ensure the awareness of all healthcare staff on the ADR monitoring and reporting program.

14.14.3 The health facility shall implement an ongoing and concurrent surveillance system to identify potential AEFI.

14.14.4 Monitoring and assessing the potential side effect of the vaccine includes direct observation of the patient's physiological response to the vaccine administered and any problems or adverse effects associated with the vaccine.

14.14.5 Healthcare professionals should counsel the patient for any Adverse Drug Reactions (ADRs).

14.14.6 The DHA licensed treating physician must take full responsibility for any AEFI.

14.14.7 Physician/nursing staff/paramedical staff are responsible to report to the pharmacist/deputy incharge the identified AEFI.

15. **RECOMMENDATION ELEVEN:** VACCINE ADMINISTRATION AND RECORDING

15.1 Appropriate vaccine administration is critical to vaccine effectiveness.

15.2 Healthcare professionals should be knowledgeable about appropriate techniques to prepare and care for individuals when administering vaccines referring to professional standards for medication administration and vaccine manufacturers' product guidelines.

15.3 Preparing the individuals for vaccination

15.3.1 individuals should be prepared for vaccination with consideration for their age and stage of development.

15.3.2 Parents/guardians of children and dependents should be encouraged to take an active role before, during and after the administration of vaccines.

15.4 Screening

15.4.1 All individuals should be screened for contraindications and precautions for each scheduled vaccine.

15.4.2 Immunization Providers should:

a. Ensure that they have the right person to be vaccinated

b. Ensure which vaccine(s) are indicated, including any previously missed vaccine doses

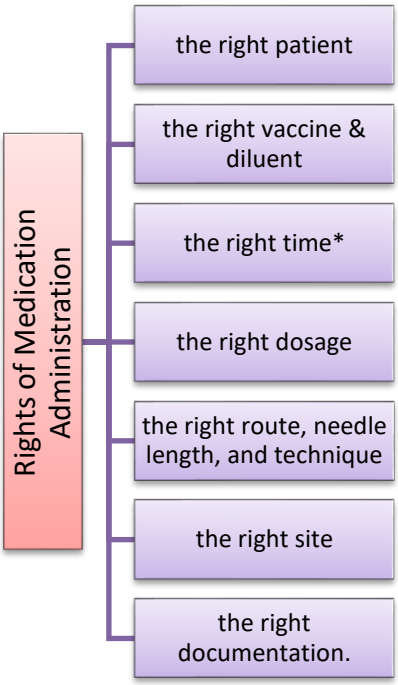
c. Check if there are any contraindications or precautions to the vaccines that are to be given

d. Ensure that the person to be vaccinated is of the appropriate age for the vaccines to be given

e. Check that the correct time interval has passed since any previous vaccine(s) or any blood products were given.

15.4.3 The "Rights of Medication Administration" should be applied to each encounter when vaccines are administered. These rights include:

*(includes administering at the correct age, the appropriate interval, and before vaccine or diluent expires).



15.5 Key Interview Questions for all Vaccines

15.5.1 The Nurse screens for the following to identify contraindications and precautions and refers the individual to the doctor if required for further advice.

a. Is the individual sick today?

b. Does the individual have any allergies to medications, food or any vaccine?

c. Has he individual suffered from any episode of severe allergic reaction to any medication or vaccination previously.

d. Does the individual has history a seizure or neurological problem post vaccination?

e. Does the individual have cancer, leukemia, AIDS or any other immune system problem?

f. Does the individual live with someone who has a disease which lowers immunity (such as leukaemia, cancer, HIV/AIDS), or lives with someone who is having treatment which lowers immunity (for example, oral steroid medicines such as cortisone and prednisone, radiotherapy, chemotherapy)?

g. Has the individual taken cortisone, prednisone, other steroids or anticancer drugs like chemotherapy or radiotherapy in the past 3 months?

h. Has the individual received a transfusion of blood /blood products/immunoglobulin in the past year?

i. Has the individual received any vaccinations in the past 4 weeks?

j. Does the individual have a history of Guillain –Barre syndrome//has a chronic illness//has a bleeding disorder

15.6 Patient Education

15.6.1 Healthcare professionals should be prepared to discuss the benefits and risks of vaccines using reliable resources.

15.6.2 Patient and parent education should also include a discussion of comfort and care strategies after vaccination.

15.6.3 After-care instructions should include information for dealing with common side effects such as injection site pain, fever, and fussiness (especially in infants).

15.6.4 Instructions should also provide information about when to seek medical attention and when to notify the facility about concerns that arise following vaccination.

15.6.5 After-care information can be given to patients or parents before vaccines are administered.

15.7 Atraumatic Care

15.7.1 Healthcare providers need to utilize a variety of techniques to minimize the stress and discomfort associated with receiving injections.

15.8 Techniques to decrease pain and anxiety in children

15.8.1 Breastfeeding:

a. Breastfeeding has been demonstrated as a soothing measure for infants up to 12 months of age receiving injections.

b. Breastfeeding should occur before, during and after the administration of vaccines.

15.8.2 Sweet tasting solutions

a. Sweet tasting liquids are an analgesic for infants up to 12 months of age.

b. A small amount (a few drops to half a teaspoon) of a sugary solution ingested prior to administration of the vaccine.

15.8.3 Position of child

a. Do *not* place children in a supine position during vaccination.

b. Infants and children should be held by a parent in a position that is most comfortable for both of them. Avoid excessive restraint.

15.8.4 Injection technique

a. Administer intramuscular vaccines to children using a rapid injection technique without aspiration.

15.8.5 Order of injections

a. When administering multiple vaccine injections to children sequentially, inject the most painful vaccine last to reduce pain at the time of injection.

15.8.6 Distraction techniques

a. Psychological interventions such as distraction in children have been shown to be effective at reducing stress and the perception of pain from the injection.

b. Distraction can be accomplished through a variety of techniques (e.g. nonprocedural talk, suggestions on how to cope, humour, pretending to blow away the pain, deep breathing techniques).

c. Whereas other techniques (e.g., reassurances, apologies) have been related to increases in children's distress and pain.

15.8.7 Pharmacologic agents

a. Topical anesthetics (e.g., 5% lidocaine-prilocaine emulsion) may be applied to decrease pain at the injection site.

b. Topical anesthetics often need to be applied before (20 to 60 minutes depending on the product) vaccine administration to be effective.

15.9 Infection Control

15.9.1 Healthcare professionals should follow Standard Precautions to minimize the risks of spreading disease during vaccine administration.

15.10 Hand washing

15.10.1 Hand hygiene is critical to prevent the spread of illness and disease.

15.10.2 Hand hygiene should be performed before vaccine preparation, between patients, and any time hands become soiled (e.g., when diapering).

15.10.3 Hands should be cleansed with a waterless, alcohol-based hand rub or soap and water. When hands are visibly dirty or contaminated with blood or other body fluids, they should be washed thoroughly with soap and water.

15.11 Gloving

15.11.1 Gloves are not required to be worn when administering vaccines unless the person administering the vaccine is likely to come into contact with potentially infectious body fluids or has open lesions on the hands.

15.11.2 If gloves are worn, they should be changed, and hand hygiene should be performed between patients.

15.12 Needle stick injuries

15.12.1 Needle stick injuries should be reported immediately to the site supervisor, with appropriate care and follow-up given as directed by the institution guidelines.

15.13 Vaccine and Supply Disposal

15.13.1 All used syringe/needle devices should be placed in biohazard containers that are closable, puncture resistant, leakproof on sides and bottom, and labeled or color-coded to prevent accidental needlestick, injury and reuse.

15.13.2 Empty or expired vaccine vials are considered medical waste and should be disposed of according to UAE regulations.

15.14 Vaccine Preparation

15.14.1 Equipment selection - Syringe Selection

a. A separate needle and syringe should be used for each injection.

b. A parenteral vaccine may be delivered in either a 1-mL or 3-mL syringe as long as the prescribed dosage is delivered.

15.15 Equipment selection – Needle Selection

15.15.1 Vaccine must reach the desired tissue site for optimal immune response.

15.15.2 Therefore, needle selection should be based upon the prescribed route, size of the individual, volume and viscosity of the vaccine, and injection technique.

15.16 Inspecting vaccine

15.16.1 Each vaccine vial should be carefully inspected for damage or contamination prior to use. The expiration date printed on the vial or box should be checked.

15.16.2 Vaccine can be used through the last day of the month indicated by the expiration date unless otherwise stated on the package labeling. Expired vaccine should never be used.

15.17 Reconstitution

15.17.1 Some vaccines are prepared in a lyophilized form that requires reconstitution, which should be done according to manufacturer guidelines. Diluent solutions vary; use only the specific diluent supplied for the vaccine.

15.17.2 Once reconstituted, the vaccine must be either administered within the time guidelines provided by the manufacturer or discarded.

a. Changing the needle after reconstitution of the vaccine is not necessary unless the needle has become contaminated or bent.

15.18 Prefilling syringes

15.18.1 Filling syringes in advance is strongly discouraged, because of the increased risk of administration errors, and possible contamination in vaccines that do not contain a preservative.

15.18.2 Only in certain circumstances, such as a busy school clinic, more than one syringe can be filled.

a. One person should prefill only a few syringes at a time, and the same person should administer them.

b. Any syringes left at the end of the clinic day should be discarded.

15.18.3 Once a vaccine is drawn into a syringe, the content should be indicated on the syringe.

a. There are a variety of methods for identifying or labeling syringes; e.g. keep syringes with the appropriate vaccine vials, place the syringes in a labeled partitioned tray or use color coded labels or (preprinted labels).

15.18.4 Under no circumstances should MMR, varicella, or zoster vaccines ever be reconstituted and drawn prior to the immediate need for them.

a. These live virus vaccines are unstable and begin to deteriorate as soon as they are reconstituted with diluent.

15.18.5 For prefilled syringes:

a. Where needle is provided separately break rubber seal on prefilled syringe and attach needle without removing the cap.

b. Rarely there may be a large air bubble in the pre-filled syringe. If so drawback slightly on the plunger to ensure no vaccine is expelled along with the air and then expel the air through the needle, until the hub is filled with vaccine.

c. Do not prime the needle with any of the vaccine, as this may cause an increased local reaction.

15.19 Routes of Administration:

15.19.1 Each vaccine has a recommended administration route and site. This information is included in the manufacturer's package insert for each vaccine. Deviation from the recommended route may reduce vaccine efficacy or increase local adverse reactions.

15.19.2 Vaccines are administered by 4 routes:

a. Oral Route (PO):

i. Oral vaccine is administered through drops to the mouth.

b. Intranasal Route (NAS):

i. Intranasal vaccine is administered into each nostril using a manufacturer-filled nasal sprayer.

c. Subcutaneous Route (Subcut):

i. Subcutaneous tissue can be found all over the body.

ii. Subcutaneous injections are administered into the fatty tissue found below the dermis and above muscle tissue.

iii. Subcutaneous injections are administered at a 45-degree angle, usually into the thigh for infants aged <12 months and in the upper-outer triceps area of persons aged ≥12 months.

iv. Subcutaneous injections may be administered into the upper-outer triceps area of an infant if necessary. A ⅝-inch, 23- to 25-gauge needle should be inserted into the subcutaneous tissue.

d. Intramuscular Route (IM):

i. IM injections are administered into muscle tissue below the dermis and subcutaneous tissue.

ii. The recommended site is based on age. The correct needle length and gauge is based on the age, weight, and gender of the recipient.

iii. Intramuscular injections are administered at a 90-degree angle to the skin, preferably into the anterolateral aspect of the thigh or the deltoid muscle of the upper arm, depending on the age of the patient.

15.19.3 Technique:

a. Follow standard medication administration guidelines for site assessment/selection and site preparation.

b. However, care should be taken to avoid the routine use of alcohol swabs to prepare the injection site since it can reduce the affectivity of the vaccine.

c. To avoid reaching the muscle, pinch up the fatty tissue, insert the needle at a 45° angle and inject the vaccine into the tissue.

d. Withdraw the needle and apply light pressure to the injection site for several seconds with a dry cotton ball or gauze.

15.19.4 Needle Length:

a. Use of longer needles has been associated with less redness or swelling than occurs with shorter needles because of injection into deeper muscle mass.

b. Appropriate needle length depends on age and body mass. Injection technique is the most important parameter to ensure efficient intramuscular vaccine delivery.

c. For all intramuscular injections; decision on needle size and site of injection must be made for each person on the basis of the following:

i. Size of the muscle,

ii. The thickness of adipose tissue at the injection site,

iii. The volume of the material to be administered,

iv. Injection technique, and

v. The depth below the muscle surface into which the material is to be injected.

d. For the majority of infants, a 1-inch, 22-25- gauge needle is sufficient to penetrate muscle in an infant's thigh.

e. For newborn (first 28 days of life) and premature infants, a 5/8-inch needle usually is adequate if the skin is stretched flat between thumb and forefinger and the needle inserted at a 90-degree angle to the skin.

f. Older Children (24months through 10 years), the deltoid muscle can be used if the muscle mass is adequate.

g. The needle size for deltoid site injections can range from 22 to 25 gauge and from 5/8 to 1 inch on the basis of the size of the muscle and the thickness of adipose tissue at the injection site.

h. A 5/8-inch needle is adequate only for the deltoid muscle and only if the skin is stretched flat between thumb and forefinger and the needle inserted at a 90° angle to the skin.

i. For toddlers, the anterolateral thigh can be used, but the needle should be at least 1 inch in length.

j. Adolescents and Adults (11 Years or Older), the deltoid muscle is recommended for routine intramuscular vaccinations.

k. The anterolateral thigh also can be used. For men and women weighing less than 130 lbs (60kg) a 5/8-1-inch needle is sufficient to ensure intramuscular injection.

l. For women weighing 130-200lbs (60-90 kg) and men 130-260 lbs (60-118kg), a 1-1½-inch needle is needed.

m. For women weighing more than 200 lbs (90 kg) or men weighing more than 260 lbs (118 kg), a 1½-inch needle is required.

For further details please refer to the following link:

https://www.cdc.gov/vaccines/hcp/acip-recs/general-recs/administration.html

15.20 Recording/ Documentation of Immunization

15.20.1 Immunization should be recorded in Hasana DHA Public Health System and immunization certificates should be issued to the person vaccinated accordingly.

16. RECOMMENDATION TWELVE: STORAGE AND HANDLING OF VACCINES

16.1 Vaccines are delicate biological substances that can become less effective or destroyed if they are frozen, exposed to heat, direct sunlight or fluorescent light.

16.2 Cold chain

16.2.1 Cold chain is an organized system composed of people, equipment and procedures aimed to maintain and monitor vaccines at an acceptable temperature from the manufacturer to the persons who are to be vaccinated so as to preserve safety, efficacy and potency of the vaccine.

16.2.2 The 'cold chain' is defined as 'the system of transporting and storing vaccines at +2°C to +8°C from the place of manufacture to the point of vaccine administration (the individual)'.

16.2.3 Vaccines can become less effective or destroyed if they are:

a. Frozen.

b. Allowed to get too hot (repeated exposures have cumulative effect).

c. Exposed to direct sunlight or fluorescent light.

16.3 The impact of thermal damage (heat or freezing) on vaccine potency is complex, and the knowledge of it is based on limited human data. Impact varies for each vaccine.

16.4 Once a vaccine has been thermally damaged, its loss of potency cannot be reversed.

16.5 The following vaccines are freeze-sensitive:

16.5.1 Diphtheria, tetanus and acellular pertussis containing vaccines.

16.5.2 Hepatitis B.

16.5.3 Haemophilus influenzae type b (Hib).

16.5.4 Inactivated polio (IPV).

16.5.5 Any combinations of the above.

16.5.6 Meningococcal.

16.5.7 Pneumococcal.

16.5.8 Influenza.

16.5.9 Human papillomavirus (HPV).

16.5.10 Rotavirus.

16.5.11 Vaccine diluents.

16.6 All vaccines are heat-sensitive, but the most heat-sensitive are:

16.6.1 measles-mumps-rubella (MMR).

16.6.2 IPV.

16.6.3 Bacille Calmette-Guérin (BCG).

16.6.4 varicella.

16.7 MMR, BCG and varicella become even more heat sensitive when reconstituted. They are also light sensitive.

16.8 Other vaccines that are light sensitive are:

16.8.1 HPV.

16.8.2 Infanrix-hexa.

16.9 The two essential elements of the cold chain system are:

16.9.1 The people managing vaccine manufacture, storage and distribution and those working in clinical practice.

16.9.2 The equipment used for storing, transporting and monitoring vaccines between delivery of the vaccine to an immunisation provider and administration to a patient.

16.10 Anyone handling vaccination is responsible for their potency, at each step in transport, storage and administration of vaccines. Vaccines must be strictly maintained at a temperature between +2C and +8C.

16.11 Cold Chain- Vaccine equipment

16.11.1 The Refrigerator.

a. A refrigerator has two compartments: the main compartment and the freezer.

b. The main compartment is where vaccines are stored.

c. It should work at temperatures between 2°C and +8°C.

d. The freezer is where ice is made; it works at temperatures below freezing.

16.11.2 Loading and using the refrigerator:

a. The vaccines should be stacked carefully so that air can circulate between the boxes.

b. The shelves, and any boxes used, must be of grille type to allow air to circulate. (Solid shelves inhibit air circulation and increase temperature gradients).

c. In domestic refrigerators, vaccines should be kept on the TOP and MIDDLE shelves of the main compartment. keep plastic bottles of water on the LOWER shelf of the main compartment and door, this helps to maintain the refrigerator working a constant temperature.

d. The diluent water, used to reconstitute vaccines should be kept in the main compartment with the vaccine.

e. A special box in the main compartment should be used for keeping RETURNED vaccine that has been taken to an immunization session in a vaccine carrier.

f. Ice packs and ice cubes should be kept in the freezer.

g. Absolutely NO FOOD or DRINK should be kept in the vaccine refrigerator.

h. Vaccines SHOULD NEVER be stacked on the shelves of the refrigerator door because this area is not cold enough.

i. EXPIRED vaccines or PARTLY USED vaccines should never be kept in the refrigerator and should be discarded immediately. In case they have to be saved for replacement or documentation, they have to be marked clearly and kept somewhere else outside the refrigerator.

j. The refrigerator door should be kept closed. Opening the refrigerator door should be limited to no more than two or three times a day and should be closed quickly.

k. Newer refrigerators specific for vaccines usually are equipped with auto-defrost. Clean refrigerator's interior every 6 months.

16.11.3 Maintaining and monitoring the temperature of the main compartment

a. The refrigerator is equipped with digital thermometer to control the refrigerator temperature and ensure the validity and stability of the vaccines.

b. A digital thermometer is required to be available refrigerator to ensure the validity and stability of the products.

c. Temperature and humidity monitoring charts readings should be logged on a separate sheet at least twice daily.

d. Temperature and humidity monitoring charts records should be kept on top or outside of the refrigerator door.

e. It is advisable to assign one person to be in charge for the vaccine refrigerator temperature checks and records.

f. All staffs who use the vaccine refrigerator should be aware of these records, and recognize any temperature defaults and what actions to take.

g. It is generally recommended that vaccine refrigerators should be maintained as close as possible to 5°C, as this gives a safety margin of +/- 3°C.

h. When a new refrigerator is installed temperature should allowed to stabilize for at least one week before it is used to store vaccines.

i. The refrigerator should be placed in a well-ventilated room, away from direct sunlight or heat source, and along an internal rather than external wall.

j. Sockets for fridges should be marked with a cautionary notice advising staff not to switch off power and should be connected to an external alarm system to indicate power failure.

k. A sufficient back-up emergency power supply for the refrigerator should be available to ensure protection and safety of medication in the event of an emergency power cut.

l. The biomedical engineer should check refrigerator function annually.

m. Vaccine carriers and an appropriate number of ice packs for transport or back-up storage must be available.

16.11.4 Cold-chain failure (temperature outside +2°C to +8°C range at any time).

a. Check the connections, the thermostat and the door if the temperature is outside safe range.

b. Do not use vaccines exposed to temperatures below +2°C or above +8°C without obtaining further advice.

c. Isolate the vaccines and label the vaccines 'Not for use' and return to pharmacy in a vaccine carrier with ice packs.

16.12 Vaccine Carriers

16.12.1 Vaccine carriers are containers made of insulation material.

16.12.2 They are used for carrying and storing small quantities of vaccines during transporting and immunization session. Ice packs are used in vaccine carriers to preserve temperature.

16.12.3 Care should be taken to avoid direct contact to vaccine vials including DPT/DTap, DT, Td, Hib, HBV and pneumococcal vaccines with ice packs.

16.13 Ice Packs

16.13.1 Ice packs are flat plastic bottles filled with water/gel.

16.13.2 They are used for lining the walls of cold boxes and vaccine carriers to keep them cold, and in vaccine refrigerator to help stabilize temperature and to maintain a safe temperature level for longer period of time in case of electricity failure.

16.13.3 Ice packs should be loosely packed in deep freezer or freezer compartment in upright or oblique position;

16.13.4 Keep the ice packs outside the freezer for 10 – 15 minutes before placing them in vaccine carrier to ensure that the vaccines like DPT, TT, Td, Hib & HBV are not frozen during the session or while transporting.

16.14 Cold Chain refrigerator graph

16.14.1 The purpose of the graph is to monitor the refrigerator and freezer temperature and to identify any impending problem of cold chain failure.

16.14.2 It is important that at least one vaccine thermometer is available in each vaccine refrigerator to monitor temperature.

16.14.3 There are several types of vaccine thermometers for this purpose

16.15 The Vaccine Vial Monitor (VVM)

16.15.1 The VVM is one of the most significant developments in the history of cold chain technology.

16.15.2 It is applied directly to a vaccine vial by the vaccine manufacturer; it enables the health professional to verify at the time of use whether each vaccine is in usable condition and/or has NOT lost its potency and efficacy due to exposure to heat.

16.15.3 More and more vaccines are now being supplied with VVM.

16.15.4 The benefits of using vaccine vial monitors include:

a. The ability to keep opened vials of polio vaccine until fresh supplies arrives.

b. The decrease of at least 30% in vaccine wastage rates.

c. The flexibility to take vaccine "beyond the cold chain" where it is necessary in reaching difficult locations and, above all.

d. It gives the health worker confidence that he/she is administering vaccine unharmed by exposure to heat.

16.16 Ordering and storing vaccines

16.16.1 Vaccines should be stored in the fridge immediately, with the new vaccines behind current stock to ensure rotation.

16.16.2 Batch number of new stock of vaccines should be entered in the book.

16.16.3 When storing vaccines, the following points should be considered:

a. Vaccines should be kept in their packaging as this provides insulation and protects against thermal insult.

b. Vaccine stock should not exceed 2/3rd of a refrigerator volume in order to allow for circulation of air in fridge.

c. Vaccines should not be stored against the walls of the refrigerator, on the refrigerator door, close to the rear freeze plate or the refrigerator icebox.

16.17 Cold Chain Emergency and Backup Plan

16.17.1 Emergencies in the cold chain usually occur due to technical faults in the refrigerator or due to power outage.

16.17.2 They are likely to happen from time to time. so prepare for these emergencies to keep vaccines safe.

16.17.3 The plan should be prepared by person responsible for vaccine handling and the supervisor. Back up should be reviewed periodical.

16.17.4 In case of a cold chain failure due to power failure for short breaks (< 2 hours); the best solution is to keep the fridge door closed with the vaccines inside, meanwhile, time should be utilized for identifying the problem, solving it, and preparing the cold box.

16.17.5 If power failure continued beyond 2 hours; the vaccines and cold chain monitors should be transferred to a vaccine carrier or vaccine cold box.

16.17.6 Conduct an inventory before you transport vaccines to back up location.

16.17.7 Do not return vaccines to the refrigerator until proper storage temperatures are restored (+2°C to +8°C).

16.17.8 Its recommended to have a sufficient back-up emergency power supply for the refrigerator to ensure protection and safety of medication in the event of an emergency power cut.

17. **RECOMMENDATION THIRTEEN:** STAFF TRAINING AND EDUCATION

17.1 Policies should be in place to validate health care professionals' knowledge of, and skills in, vaccine administration.

17.2 All health care professionals should receive comprehensive, competency-based training before administering vaccines.

17.3 Training, including an observation component, should be integrated into health care professionals' education programs including orientation for new staff and annual continuing education requirements for all staff. In addition, health care professionals

should receive educational updates as needed, such as when vaccine administration recommendations are updated or when new vaccines are added to the facility's inventory.

17.4 Once initial training has been completed, accountability checks should be in place to ensure staff follow all vaccine administration policies and procedures.

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APPENDICIES

APPENDIX 1: NATIONAL IMMUNIZATION SCHEDULE FOR CHILDREN AGED 0 THROUGH 6 YEARS -UAE

Recommended Immunization Program for children Aged 0 through 6 Years	
AT BIRTH	• BCG • Hep.B (1st Dose)
2 MONTHS	• Hexavalent vaccine (DTaP, Hib, IPV (1st Dose) , Hep.B (2nd Dose)) • PCV (Pneumococcal conjugate Vaccine) (1st Dose) • Rota virus vaccine (1st Dose)
4 MONTHS	• Hexavalent vaccine (DTaP, Hib, IPV (2nd Dose), Hep.B (3rd Dose)) • PCV (Pneumococcal conjugate Vaccine) (2nd Dose) • Rota virus vaccine (2nd Dose)
6 MONTHS	• Pentavalent vaccine (DTP, Hib (3rd Dose), Hep.B (4th Dose)) • OPV (Oral Polio Vaccine) • PCV (Pneumococcal conjugate Vaccine) (3rd Dose) • Rota virus vaccine (3rd Dose)
12 MONTHS	• MMR (Mumps, Measles, Rubella) (1st Dose) • Chicken Pox (Varicella vaccine 1st Dose)
18 MONTHS	• Pentaxim vaccine (DTaP, Hib, IPV) (4th Dose) • OPV (Oral Polio Vaccine) (1st Booster Dose) • MMR (Mumps, Measles, Rubella) (2nd Dose)
5-6 years	• DTaP (Diphtheria، acellular Pertussis، Tetanus), IPV) (5th dose) • OPV (Oral Polio Vaccine) (2nd Booster Dose) • Chicken Pox (Varicella vaccine 2nd Dose)

APPENDIX 2: RECOMMENDED MINIMUM AGES AND INTERVALS BETWEEN VACCINE DOSES

Vaccine and dose number	Recommended age for this dose	Minimum age for this dose	Recommended interval to next dose	Minimum interval to next dose
BCG				
	Birth	Birth		
Hepatitis B				
Hep.B-1	Birth	Birth	1-4 months	4 weeks
Hep.B-2	2 months	4 weeks	1-4 months	4 weeks
Hep.B-3[a]	4 months	8 weeks	2-17 months	8 weeks
Hep.B-4[a]	6 months	24 weeks	----------	----------
Diphtheria, Tetanus, Pertussis:				
DTaP1/DPT1	2 months	6 weeks	2months	4 weeks [b]
DTaP2/DPT2	4 months	10 weeks	2months	4 weeks
DTaP3/DPT3	6 months	14 weeks	6-12 months	6 months
DTaP4/DPT4[c]	15-18 months	12 months	3 years	6 months
DTaP5/DPT5	4-6 years	4 years	----------	----------
Haemophilus influenzae type b[d]				
Hib-1	2 months	6 weeks	2 months	4 weeks
Hib-2	4 months	10 weeks	2 months	4 weeks
Hib-3	6 months	14 weeks	6-12 months	8 weeks
Hib-4	12-18 months	12 months	----------	----------
Pneumococcal conjugate vaccine (PCV PCV15 or PCV20) [d]				
PCV dose 1	2 months	6 weeks	----------	4 weeks
PCV dose 2	4 months	10 weeks	2 months	8 weeks
PCV dose 3	6 months	14 weeks	2 months	8 weeks ----------
PCV dose 4	12-18 months	12 months	----------	---------
Poliovirus				
IPV1/OPV1	2 months	6 weeks	2 months	4 weeks
IPV2/OPV2	4 months	10 weeks	2 months	4 weeks
IPV3/OPV3	6 months	14 weeks	6-12 months	6 months
IPV4/OPV4	18 months	12 months	3 years	6 months
IPV5/OPV5 [e]	4-6 years	4 years	----------	----------
Rotavirus (Rotateq) [f]				

RV-1	2 months	6 weeks	2 months	4 weeks
RV-2	4 months	10 weeks	2 months	4 weeks
RV-3	6 months	14 weeks	----------	----------
Measles, Mumps, Rubella				
MMR1	12 months	12 months	6 months	4 weeks
MMR2	4-6 years	13 months	----------	----------
Varicella:				
Var1	12-15 months	12 months	3-5 years	12 weeks
Var2[(g)]	4-6 years	15 months	----------	----------

Note:

- If doses were given out of the recommended schedule, follow the minimum age and minimum intervals to validate/invalidate the given doses
- Consider the minimum intervals when planning for catch-up vaccination until a child is back on schedule for their age.
  a. HepB-4 should be administered at least 8 weeks after HepB-2 and at least 16 weeks after HepB-1 and should not be administered before age 24 weeks.
  b. The minimum recommended interval between DTaP-3 and DTaP-4 is 6 months. However, DTaP-4 need not be repeated if administered at least 4 months after DTaP3. This is a special grace period of 2 months which can be used if evaluating records retrospectively. An additional 4 days should not be added to this grace period prospectively, but can be added retrospectively.
  c. If the 4th dose of DTaP is given on or after the 4th birthday, a fifth dose is not needed if the interval between the third dose and fourth dose is at least 6 months.
  d. Though PCV20 is currently under study for the purpose of approval in children in UAE, US CDC recommends routine administration of pneumococcal conjugate vaccine (PCV15 or PCV20) for all children younger than 2 years of age:
     i. Give PCV15 or PCV20 to infants as a series of 4 doses, one dose at each of these ages: 2 months, 4 months, 6 months, and 12 through 15 months.
     ii. Children who miss their shots or start the series later should still get vaccinated. The number of doses recommended and the intervals between doses will depend on the child's age when vaccination begins. Refer to catch-up guidance for additional information.
     iii. US CDC also recommends PPSV23 for children 2 through 18 years old with certain medical conditions that increase their risk of pneumococcal disease.
     iv. Hemophilis Influenza B vaccine (HiB - ActHIb, Hiberix, Pentacel or Vaxelis) 4 doses, one dose at each of these ages: 2 months, 4 months, 6 months, and 12 through 15 months.
  e. A fifth dose of OPV/IPV is not needed if the fourth dose was administered at ≥4 years and at least 6 months after the previous dose.
  f. The first dose of rotavirus must be administered at age 6 weeks through 14 weeks and 6 days. The vaccine series should not be started for infants aged ≥15 weeks, 0 days. The maximum age for a dose of RotaTeq is 32 weeks and the maximum age for Rotarix is 24 weeks.
  g. For second dose of Varicella vaccine, a special grace period of 2 months, based on expert opinion, can be applied to the minimum interval of 3 months, when evaluating records retrospectively, which results in an acceptable minimum interval of 4 weeks and minimum age of 13 months. An additional 4 days should not be added on to this grace period.

APPENDIX 3: GUIDELINES FOR ADMINISTERING ANTIBODY-CONTAINING PRODUCTS AND VACCINES

Product / Indication	**Dose (mg IgG/kg) and route**	**Interval before MEASLES- or VARICELLA-containing vaccine administration**
Blood transfusion		
• RBCs, washed	10 mL/kg, negligible IgG/kg IV	None
• RBCs, adenine-saline added	10 mL/kg (10 mg IgG/kg) IV	3 months
• Packed RBCs (hematocrit 65%)	10 mL/kg (60 mg IgG/kg) IV	6 months
• Whole blood (hematocrit 35%-50%)	10 mL/kg (80-100 mg IgG/kg) IV	6 months
• Plasma/platelet products	10 mL/kg (160 mg IgG/kg) IV	7 months
Intravenous Immune globulin (IGIV)		
• Replacement therapy for immune deficiencies	300-400 mg/kg IV	8 months
• Immune thrombocytopenic purpura treatment	400 mg/kg IV	8 months
• Postexposure varicella prophylaxis	400 mg/kg IV	8 months
• Postexposure measles prophylaxis for immunocompromised contacts	400 mg/kg IV	8 months
• Immune thrombocytopenic purpura treatment	1000 mg/kg IV	10 months
• Kawasaki disease	2 g/kg IV	11 months
Hepatitis B IG	0.06 mL/kg (10 mg IgG/kg) IM	3 months
Tetanus IG	250 units (10 mg IgG/kg) IM	3 months
Rabies IG	20 IU/kg (22 mg IgG/kg) IM	4 months
Varicella IG	125 units/10 kg (60--200 mg IgG/kg) IM, maximum 625 units	5 months
Measles prophylaxis IG		
• Standard (i.e.,nonimmunocompromised) contact	0.25 mL/kg (40 mg IgG/kg) IM	5 months
• Immunocompromised contact	0.50 mL/kg (80 mg IgG/kg) IM	6 months
Hepatitis A IG		

• Contact prophylaxis	0.02 mL/kg (3.3 mg IgG/kg) IM	3 months
• International travel	0.06 mL/kg (10 mg IgG/kg) IM	3 months
Cytomegalovirus IGIV	150 mg/kg maximum	6 months
Botulinum Immune Globulin Intravenous (Human)	1.0 mL/kg (50 mg IgG/kg) IV	6 months
Monoclonal antibody to respiratory syncytial virus F protein	15 mg/kg IM	None

APPENDIX 4: CATCH-UP IMMUNIZATION SCHEDULE FOR CHILDREN AGED 4 MONTHS THROUGH 6 YEARS

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
Hepatitis B	Birth	**4 weeks**	**8 weeks and at least 16 weeks after first dose.** Minimum age for the final dose is 24 weeks.		
Rotavirus	**6 weeks** Maximum age for first dose is 14 weeks, 6 days.	**4 weeks**	**4 weeks** Maximum age for final dose is 8 months, 0 days.		
Diphtheria, tetanus, and acellular pertussis	6 weeks	**4 weeks**	**4 weeks**	**6 months**	**6 months**
Haemophilus influenzae type b	6 weeks	**No further doses needed** if first dose was administered at age 15 months or older. **4 weeks** if first dose was administered before the 1st birthday. **8 weeks (as final dose)** if first dose was administered at age 12 through 14 months.	**No further doses needed** if previous dose was administered at age 15 months or older. **4 weeks** If current age is younger than 12 months **and** first dose was administered at younger than age 7 months and at least 1 previous dose was PRP-T (ActHib®, Pentacel®, Hiberix®), Vaxelis® or unknown **8 weeks and age 12**	**8 weeks (as final dose)** This dose only necessary for children age 12 through 59 months who received 3 doses before the 1st birthday.	

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
			through 59 months (as final dose) if current age is younger than 12 months ***and*** first dose was administered at age 7 through 11 months; OR if current age is 12 through 59 months ***and*** first dose was administered before the 1st birthday, ***and*** second dose was administered at younger than 15 months; OR if both doses were PedvaxHIB® and were administered before the 1st birthday		
Pneumococcal conjugate	6 weeks	**No further doses needed** for healthy children if first dose was administered at age 24 months or older. **4 weeks**	**No further doses needed** for healthy children if previous dose was administered at age 24 months or older. **4 weeks** if current age is younger than 12	**8 weeks (as final dose)** this dose is only necessary for children aged 12 through 59 months regardless of risk, or age 60 through 71	

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
		if first dose administered before the 1st birthday. **8 weeks (as final dose for healthy children)** if first dose was administered at the 1st birthday or after.	months and previous dose given at <7 months old. **8 weeks (as final dose for healthy children)** if previous dose given between 7-11 months (wait until at least 12 months old); OR if current age is 12 months or older and at least 1 dose was administered before age 12 months.	months with any risk, who received 3 doses before age 12 months.	
Inactivated poliovirus	6 weeks	**4 weeks**	**4 weeks** if current age is <4 years. **6 months** (as final dose) if current age is 4 years or older.	**6 months** (minimum age 4 years for final dose).	
Measles, mumps, rubella	12 months	**4 weeks**			
Varicella	12 months	**3 months**			
Hepatitis A	12 months	**6 months**			
Meningococcal ACWY	• 6 weeks MenACWY-TT (Nimenrix; • 2 months MenACWY-CRM	**8 weeks**	Refer to notes	Refer to notes	

Vaccine	Minimum Age for Dose 1	Minimum Interval Between Doses			
		Dose 1 to Dose 2	Dose 2 to Dose 3	Dose 3 to Dose 4	Dose 4 to Dose 5
	• 9 months MenACWY-DT • 2 Years MenACWY-TT MenQuadfi.				

APPENDIX 5: SCHOOL AGE ROUTINE VACCINATION SCHEDULE

Vaccine	لقاح	5-6 Years	13-14 years	15-18 years
Oral Polio (OPV)	شلل الأطفال الفموي	Booster		
Varicella	الجديري المائي	Second Dose		
DTaP-IPV	الثلاثي اللاخلوي المركب مع شلل الأطفال المعطل	Booster		
HPV (Girls and boys)	لقاح فيروس الورم الحليمي البشري		First dose (The second dose should be given after 6-12 months)	
Tdap	الثلاثي اللاخلوي			Booster
Meningococcal	المكورات السحائية			One dose, Conjugated, ACWY

APPENDIX 6: CATCH UP IMMUNIZATION SCHEDULE

Vaccine		5-6 Years	
Hepatitis B	If not previously administered, three doses should be given, 4 weeks between the first and second, 2-12 months between second and third	HBV 1	HBV 2,3
Oral Polio (OPV)	If the last previous dose is administered before the age of 4 years, and no booster in grade 1		One dose
MMR	If no previous doses were administered, or only one dose is administered, two doses should be given with interval of one month	First dose	Second dose
Varicella	If the first dose was not previously administered, two doses should be given with interval of three months	First dose	Second dose
DTaP-IPV	At least 4 years from the last dose, before the age of 7 years		

HPV (for girls)	Defaulters		First dose (The second dose should be given after 6-12 months)
Tdap	After the age of 7 years		
Meningococcal	Defaulters		

APPENDIX 7: CATCH-UP SCHEDULES AND MINIMUM INTERVALS BETWEEN DOSES FOR CHILDREN WHOSE VACCINATIONS HAVE BEEN DELAYED

PERSONS AGED 7 YEARS THROUGH 18 YEARS		
Vaccine	**Minimum interval Between Doses**	
	Dose 1 to Dose 2	**Dose 2 to Dose 3**
Tetanus, Diphtheria (Td)/ Tetanus , reduced Diphtheria, reduced Pertussis (Tdap)i	4 weeks	6 months first dose administered at 12 months or older
Hepatitis B	4 weeks	2-12 months
Measles, Mumps, Rubella (MMR)	4 weeks	---
Varicella (Var)	Age less than 13 years -12 weeks 13 years or older -4 weeks	---
Poliovirus (IPV/OPV)	4 weeks	4 weeks
Human Papilloma virus (HPV)	For 2 dose series: 6-12 months For 3 dose series: 1 month	4 months

APPENDIX 8: VACCINES IN ADULT IMMUNIZATION RECOMMENDATION

Vaccines	**Abbreviations**
Dengue Vaccine	DV
Haemophilus influenzae type b vaccine	Hib
Hepatitis A vaccine	Hep A
Hepatitis A and hepatitis B vaccine	HepA-HepB
Hepatitis B vaccine	Hep B
Human papillomavirus vaccine	9vHPV
Influenza vaccine (inactivated)	IIV
Influenza vaccine (live, attenuated)	LAIV4
Influenza vaccine (recombinant)	RIV4
Quadrivalent high-dose inactivated influenza vaccine	HDIIV4
Measles, mumps, and rubella vaccine	MMR
Meningococcal serogroups A, C, W, Y vaccine	MenACWY-D MenACWY-CRM MenACWY-TT
Meningococcal serogroup B vaccine	MenB-4C MenB-FHbp
Monkeypox vaccine	Mpox
Pneumococcal 13-valent conjugate vaccine	PCV13
Pneumococcal 15-valent conjugate vaccine	PCV15
Pneumococcal 20-valent conjugate vaccine	PCV20
Pneumococcal 23-valent polysaccharide vaccine	PPSV23
Respiratory Syncytial Virus Vaccine	RSVV
Tetanus and diphtheria toxoids	Td
Tetanus and diphtheria toxoids and acellular pertussis vaccine	Tdap
Varicella vaccine	VAR
Zoster vaccine, recombinant	RZV

APPENDIX 9: RECOMMENDED ADULT IMMUNIZATION SCHEDULE BY AGE GROUP (CDC, 2024)

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2024

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
COVID-19	1 or more doses of updated (2023–2024 Formula) vaccine (See Notes)			
Influenza inactivated (IIV4) or Influenza recombinant (RIV4)	1 dose annually			
or				
Influenza live, attenuated (LAIV4)	1 dose annually			
Respiratory Syncytial Virus (RSV)	Seasonal administration during pregnancy. See Notes.			≥60 years
Tetanus, diphtheria, pertussis (Tdap or Td)	1 dose Tdap each pregnancy; 1 dose Td/Tdap for wound management (see notes)			
	1 dose Tdap, then Td or Tdap booster every 10 years			
Measles, mumps, rubella (MMR)	1 or 2 doses depending on indication (If born in 1957 or later)			For healthcare personnel, see notes
Varicella (VAR)	2 doses (If born in 1980 or later)		2 doses	
Zoster recombinant (RZV)	2 doses for immunocompromising conditions (see notes)		2 doses	
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		
Pneumococcal (PCV15, PCV20, PPSV23)				See Notes
				See Notes
Hepatitis A (HepA)	2, 3, or 4 doses depending on vaccine			
Hepatitis B (HepB)	2, 3, or 4 doses depending on vaccine or condition			
Meningococcal A, C, W, Y (MenACWY)	1 or 2 doses depending on indication, see notes for booster recommendations			
Meningococcal B (MenB)	19 through 23 years	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations		
Haemophilus influenzae type b (Hib)	1 or 3 doses depending on indication			
Mpox				

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of immunity

Recommended vaccination for adults with an additional risk factor or another indication

Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable

APPENDIX 10: RECOMMENDED ADULT IMMUNIZATION SCHEDULE BY MEDICAL CONDITION AND OTHER INDICATIONS. (CDC, 2024)

Table 2 Recommended Adult Immunization Schedule by Medical Condition or Other Indication, United States, 2024

Always use this table in conjunction with Table 1 and the Notes that follow. Medical conditions or indications are often not mutually exclusive. If multiple medical conditions or indications are present, refer to guidance in all relevant columns. See Notes for medical conditions or indications not listed.

VACCINE	Pregnancy	Immunocompromised (excluding HIV infection)	HIV infection CD4 percentage and count		Men who have sex with men	Asplenia, complement deficiency	Heart or lung disease	Kidney failure, End-stage renal disease or on dialysis	Chronic liver disease; alcoholism[a]	Diabetes	Healthcare Personnel[b]
			<15% or <200mm³	≥15% and ≥200mm³							
COVID-19		See Notes									
IIV4 or RIV4	1 dose annually										
LAIV4					1 dose annually if age 19–49 years						1 dose annually if age 19–49 years
RSV	Seasonal administration. See Notes	See Notes				See Notes					
Tdap or Td	Tdap: 1 dose each pregnancy	1 dose Tdap, then Td or Tdap booster every 10 years									
MMR	*										
VAR	*			See Notes							
RZV		See Notes									
HPV	*	3 dose series if indicated									
Pneumococcal											
HepA											
Hep B	See Notes									Age ≥ 60 years	
MenACWY											
MenB											
Hib		HSCT: 3 doses[c]				Asplenia: 1 dose					
Mpox	See Notes				See Notes						See Notes

Recommended for all adults who lack documentation of vaccination, **OR** lack evidence of immunity

Not recommended for all adults, but recommended for some adults based on either age **OR** increased risk for or severe outcomes from disease

Recommended based on shared clinical decision-making

Recommended for all adults, and additional doses may be necessary based on medical condition or other indications. See Notes.

Precaution: Might be indicated if benefit of protection outweighs risk of adverse reaction

Contraindicated or not recommended
*Vaccinate after pregnancy, if indicated

No Guidance/ Not Applicable

a. Precaution for LAIV4 does not apply to alcoholism.

b. See notes for influenza; hepatitis B; measles, mumps, and rubella; and varicella vaccinations.

c. Hematopoietic stem cell transplant.

APPENDIX 11: PNEUMOCOCCAL VACCINE TIMING FOR ADULT

CDC recommends pneumococcal vaccination for

- Adults 65 years old and older
- Adults 19 through 64 years old with certain underlying medical conditions or other risk factors:
  - Alcoholism
  - Cerebrospinal fluid leak
  - Chronic heart/liver/lung disease
  - Chronic renal failure*
  - Cigarette smoking
  - Cochlear implant
  - Congenital or acquired asplenia*
  - Congenital or acquired immunodeficiencies*
  - Diabetes
  - Generalized malignancy*
  - HIV infection*
  - Hodgkin disease*
  - Iatrogenic immunosuppression*
  - Leukemia*
  - Lymphoma*
  - Multiple myeloma*
  - Nephrotic syndrome*
  - Sickle cell disease or other hemoglobinopathies*
  - Solid organ transplants*

* Considered an immunocompromising condition

Pneumococcal vaccines

PCV13: 13-valent pneumococcal conjugate vaccine (Prevnar13®)
PCV15: 15-valent pneumococcal conjugate vaccine (Vaxneuvance™)
PCV20: 20-valent pneumococcal conjugate vaccine (Prevnar20®)
PPSV23: 23-valent pneumococcal polysaccharide vaccine (Pneumovax®)

For those who have never received a pneumococcal vaccine or those with unknown vaccination history

Administer one dose of PCV15 or PCV20.

If **PCV20** is used, their pneumococcal vaccinations are complete.

PCV20

If **PCV15** is used, follow with one dose of PPSV23.

- The recommended interval is at least 1 year.
- The minimum interval is 8 weeks and can be considered in adults with an immunocompromising condition*, cochlear implant, or cerebrospinal fluid leak.
- Their pneumococcal vaccinations are complete.

PCV15 → At least 1 year apart (8 weeks can be considered) → PPSV23

For those who previously received PPSV23 but who have not received any pneumococcal conjugate vaccine (e.g., PCV13, PCV15, PCV20)

You may administer one dose of PCV15 or PCV20.

Regardless of which vaccine is used (PCV15 or PCV20):

- The minimum interval is at least 1 year.
- Their pneumococcal vaccinations are complete.

PPSV23 → At least 1 year apart → PCV15 or PCV20

APPENDIX 12: CONTRAINDICATIONS AND PRECAUTIONS TO VACCINES

Vaccine	Contraindications	Precautions
BCG[1]	Individuals known to be allergic to any component of the vaccine. Individuals who already had a BCG vaccination Individuals with a past history of TB Individuals with a positive tuberculin skin test (Mantoux) *Immunocompromised patients (*congenital cell-mediated or severe combined immunodeficiency, HIV, patients undergoing immunosuppressive treatment, Infants exposed to immunosuppressive treatment in utero or via breastfeeding. Persons with any serious underlying illness, including severe malnutrition.	Neonates in a household where an active TB case is suspected or confirmed. Refer urgently for contact tracing and vaccination as required. Individuals who have a septic skin condition at the site where the injection will be given Babies with generalized septic skin conditions Moderate or severe acute illness with or without fever
Hepatitis B	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Hypersensitivity to yeast	Infant weight <2,000 gm Moderate or severe acute illness with or without fever
DTaP/DPT	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Encephalopathy (e.g., coma, decreased level of consciousness, or prolonged seizures), not attributable to another identifiable cause, within 7 days of administration of previous dose of DTP or DTaP	Progressive neurologic disorder, including infantile spasms, uncontrolled epilepsy, progressive encephalopathy; defer DTaP until neurologic status clarified and stabilized Temperature of ≥105°F (≥40.5°C) within 48 hours after vaccination with a previous dose of DTP or DTaP Collapse or shock-like state (i.e., hypotonic hyporesponsive episode) within 48 hours after receiving a previous dose of DTP/DTaP

		Seizure ≤3 days after receiving a previous dose of DTP/DTaP Persistent, inconsolable crying lasting ≥3 hours within 48 hours after receiving a previous dose of DTP/DTaP Guillain-Barré syndrome (GBS) <6 weeks after previous dose of tetanus toxoid--containing vaccine History of arthus-type hypersensitivity reactions after a previous dose of tetanus toxoid--containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus toxoid--containing vaccine Moderate or severe acute illness with or without fever
DT, Td	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	GBS <6 weeks after previous dose of tetanus toxoid--containing vaccine History of arthus-type hypersensitivity reactions after a previous dose of tetanus toxoid--containing vaccine; defer vaccination until at least 10 years have elapsed since the last tetanus-toxoid-containing vaccine Moderate or severe acute illness with or without fever
IPV	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Pregnancy Moderate or severe acute illness with or without fever
OPV	Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy or	Moderate or severe acute illness with or without fever Pregnancy

	patients with HIV infection who are severely immunocompromised) Immunocompromised house hold contact Severe diarrhea	
PCV	Severe allergic reaction (e.g., anaphylaxis) after a previous dose (of PCV7, PCV13, or any diphtheria toxoid--containing vaccine) or to a component of a vaccine (PCV7, PCV13, or any diphtheria toxoid--containing vaccine)	Moderate or severe acute illness with or without fever
Hib	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Age <6 weeks	Moderate or severe acute illness with or without fever
Rotavirus	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component SCID History of intussusception	Altered immunocompetence other than SCID Chronic gastrointestinal disease Spina bifida or bladder exstrophy (for RV1 not RV5) Moderate or severe acute illness with or without fever
MMR	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Pregnancy Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy[2] or patients with HIV infection who are severely immunocompromised) Family history of altered immunocompetence[3]	Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product. Vaccine should be deferred for the appropriate interval if replacement immune globulin products are being administered) History of thrombocytopenia or thrombocytopenic purpura Need for tuberculin skin testing or interferon-gamma release assay (IGRA) testing[5]

		Moderate or severe acute illness with or without fever
Varicella	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy[2] or patients with HIV infection who are severely immunocompromised) Pregnancy Family history of altered immunocompetence[3]	Recent (≤11 months) receipt of antibody-containing blood product (specific interval depends on product) Moderate or severe acute illness with or without fever Receipt of specific antiviral drugs (acyclovir, famciclovir, or valacyclovir) 24 hours before vaccination (avoid use of these antiviral drugs for 14 days after vaccination) Use of aspirin or aspirin-containing products[4]
IIV	Severe allergic reaction (e.g., anaphylaxis) after previous dose of influenza vaccine or to vaccine component.	GBS <6 weeks after a previous dose of influenza vaccine Moderate or severe acute illness with or without fever Egg allergy other than hives, e.g., angioedema, respiratory distress, lightheadedness, recurrent emesis; or required epinephrine or another emergency medical intervention (IIV may be administered in an inpatient or outpatient medical setting and under the supervision of a health care provider who is able to recognize and manage severe allergic conditions).
HPV	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component, including yeast	Moderate or severe acute illness with or without fever

MenACWY	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component, including yeast	Moderate or severe acute illness with or without fever Preterm birth (MenACWY-CRM)
MenB	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever Pregnancy Latex sensitivity (MenB-4c)
Mpox	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever
MPSV4	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever
PPSV23	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever
RSVV	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever
DV	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component Pregnancy and Breast feeding Known severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency, or long-term immunosuppressive therapy[2] or patients with HIV infection who are severely immunocompromised)	Increased Risk of Severe Dengue Disease Following DENGVAXIA in Persons Younger than 6 Years of Age Regardless of Previous Infection with Dengue Virus Increased Risk of Severe Dengue Disease Following DENGVAXIA in Persons of Any Age Not Previously Infected with Dengue Virus

	Family history of altered immunocompetence[3]	
Zoster	Severe allergic reaction (e.g., anaphylaxis) after a previous dose or to a vaccine component	Moderate or severe acute illness with or without fever

APPENDIX 13: CONDITIONS INCORRECTLY PERCEIEVED AS CONTRAINDICATIONS TO VACCINATION.

- (i.e vaccines may be given under these conditions)

Vaccine	Conditions commonly misperceived as contraindications
DTaP	Fever of <105°F (<40.5°C), fussiness or mild drowsiness after a previous dose of DTP/DTaP Family history of seizures Family history of sudden infant death syndrome Family history of an adverse event after DTP or DTaP administration Stable neurologic conditions (e.g., cerebral palsy, well-controlled seizures, or developmental delay)
IPV	Previous receipt of ≥1 dose of oral polio vaccine
Hepatitis B	Pregnancy Autoimmune disease (e.g., systemic lupus erythematosus or rheumatoid arthritis)
Rotavirus	Prematurity Immunosuppressed household contacts Pregnant household contacts
MMR	Positive tuberculin skin test Simultaneous tuberculin skin or interferon-gamma release assay (IGRA) testing Breastfeeding Pregnancy of recipient's mother or other close or household contact Recipient is female of child-bearing age Immunodeficient family member or household contact Asymptomatic or mildly symptomatic HIV infection Allergy to eggs*
Varicella	Pregnancy of recipient's mother or other close or household contact Immunodeficient family member or household contact[g] Asymptomatic or mildly symptomatic HIV infection Humoral immunodeficiency (e.g., agammaglobulinemia)

* Studies have shown that children who have a history of severe allergy to eggs rarely have reactions to MMR vaccine. This is probably because measles and mumps vaccine viruses are both grown in chick embryo fibroblasts, not actually in eggs. It appears that gelatin, not egg, might be the cause of allergic reactions to MMR. As a result, in 1998, the ACIP removed severe egg allergy as a contraindication to measles and mumps vaccines. Egg-allergic children may be vaccinated with MMR without prior skin testing.

APPENDIX 14: COMMON MINOR VACCINE REACTIONS AND THEIR TREATMENTS

Vaccine	**Local reaction: pain, swelling, redness**	**Fever >38**	**Irritability, malaise, and systemic symptoms**
BCG	90 - 95%	-	-
Hib	5 – 15%	2 – 10%	-
Hep B	Adults 15%, children 5%	1 – 6%	-
MMR/ Measles	10%	5 – 15%	5% (rash)
OPV	-	<1%	<1%
TD/Td	1% (more frequent with booster doses)	10%	25%
DPT (whole cell)	Up to 50%	Up to 50%	Up to 50%
Pneumococcal conjugate	~ 20%	~ 20%	~ 20%
Treatment	Paracetamol	Give extra fluids, Paracetamol, sponge bath	Give extra fluids, Paracetamol,

APPENDIX 15: RARE VACCINE REACTIONS

Vaccine	Reaction	Onset interval	Number of doses per reaction	Reactions per million doses
BCG	Suppurative lymphadenitis	2-6 months	1 in 1-10 000	100- 1000
	BCG otitis	1-12 months	1 in 3 000 to 1 in 100 million	0.01 - 300
	Disseminated BCG infection	1-12 months	~1 in 1 million	0.19-1.56
Hib	None known			
Hepatitis B	Anaphylaxis	0-1 hour	1 in 6-900,000	1-2
MMR/Measles	Febrile seizures	6-12 days	1 in 3000	330
	Thrombocytopenia (low platelets)	15-35 days	1 in 30 000	30
	Anaphylactic (severe allergic) reaction	0-2 hours	~1 in 100 000	~10
	Anaphylaxis	0-1 hour	~1 in 1 000 000	~1
	Encephalopathy	6-12 days	<1 in 1 000 000	<1
OPV	Vaccine associated paralytic poliomyelitis	4-30 days	1 in 2.4-3 million	1 in 750.000 for 1st dose & 1 in 5.1 million for subsequent doses
Tetanus	Brachial neuritis	2-28 days	0.5-1 in 100 000	5-10
	Anaphylaxis	0-1 hour	1 in 100 000 to 1 in 2 500 000	0.4-10
TD/Td	None extra to tetanus reaction			

DTP (whole cell)	Persistent inconsolable screaming (> 3 hours)	0-24 hours	1 in 15 to 1 in 1000	(0.1-6%) 1000-60 000
	Seizures	0-2 days	1 in 1750 to 1 in 12 500	80-570@
	Hypotonic, hypo responsive episode(HHE)	0-24 hours	1 in 1000-33 000	30 - 990
	Anaphylaxis	0-1 hour	1 in 50 000	20
	Encephalopathy (note: risk may be zero)	0-2 days	0-1 in 1 million	0-1

APPENDIX 16: OPERATIONAL PROGRAM ERROR AND ANITICIPATED EVENTS

Operational Program Error	**Anticipated Event**
Non-sterile injection:	
• Use of syringes that do not ensure adequate sterility. • Contaminated vaccine or diluents	• Infection, as a localized abscess at the injection site, sepsis, toxic shock syndrome, or death. • Blood-borne infection, such as hepatitis or HIV.
Reconstitution error:	
• Reconstitution with the wrong diluents. • Replacement of the vaccine or diluents with a drug.	• Adverse effect of a drug--for example, insulin. • Ineffective vaccine.
Injection in the wrong place:	
• BCG administered subcutaneously. • DTP/DT/TT administered too superficially. • Injection in the buttock.	• Reaction or local abscess. • Reaction or local abscess. • Injury to the sciatic nerve.
Improper transport/storage of vaccines	• Ineffective vaccine
Ignoring of contraindications.	• Serious reaction foreseeable

APPENDIX 17: OVERVIEW OF EMERGENT MANAGEMENT OF ANAPHYLAXIS IN INFANTS AND CHILDREN

Diagnosis	**Overview**
Diagnosis is made clinically:	The most common signs and symptoms are cutaneous (eg, sudden onset of generalized urticaria, angioedema, flushing, pruritus). However, 10 to 20% of patients have no skin findings.
	Danger signs: Rapid progression of symptoms, evidence of respiratory distress (e.g., stridor, wheezing, dyspnea, increased work of breathing, retractions, persistent cough, cyanosis), signs of poor perfusion, abdominal pain, vomiting, dysrhythmia, hypotension, collapse.
Acute management:	The first and most important therapy in anaphylaxis is **epinephrine**. There are NO absolute contraindications to epinephrine in the setting of anaphylaxis
	Airway: Immediate intubation if evidence of impending airway obstruction from angioedema. Delay may lead to complete obstruction. Intubation can be difficult and should be performed by the most experienced clinician available. Cricothyrotomy may be necessary.
	IM epinephrine (1 mg/mL preparation): Epinephrine 0.01 mg/kg should be injected intramuscularly in the midouter thigh. For large children (>50 kg), the maximum is 0.5 mg per dose. If there is no response or the response is inadequate, the injection can be repeated in 5 to 15 minutes (or more frequently). If epinephrine is injected promptly IM, patients respond to one, two, or at most, three injections. If signs of poor perfusion are present or symptoms are not responding to epinephrine injections, prepare IV epinephrine for infusion (see below).
	Place patient in recumbent position, if tolerated, and elevate lower extremities.
	Oxygen: Give 8 to 10 L/minute via facemask or up to 100% oxygen, as needed.

	Normal saline rapid bolus: Treat poor perfusion with rapid infusion of 20 mL/kg. Reevaluate and repeat fluid boluses (20 mL/kg), as needed. Massive fluid shifts with severe loss of intravascular volume can occur. Monitor urine output.
	Albuterol: For bronchospasm resistant to IM epinephrine, give albuterol 0.15 mg/kg (minimum dose: 2.5 mg) in 3 mL saline inhaled via nebulizer. Repeat, as needed.
	H1 antihistamine: Consider giving diphenhydramine 1 mg/kg (max 40 mg) IV.
	H2 antihistamine: Consider giving ranitidine 1 mg/kg (max 50 mg) IV.
	Glucocorticoid: Consider giving methylprednisolone 1 mg/kg (max 125 mg) IV.
	Monitoring: Continuous noninvasive hemodynamic monitoring and pulse oximetry monitoring should be performed. Urine output should be monitored in patients receiving IV fluid resuscitation for severe hypotension or shock.
Treatment of refractory symptoms:	Epinephrine infusion:[(b)] In patients with inadequate response to IM epinephrine and IV saline, give epinephrine continuous infusion at 0.1 to 1 mcg/kg/minute, titrated to effect.
	Vasopressors:[(b)] Patients may require large amounts of IV crystalloid to maintain blood pressure. Some patients may require a second vasopressor (in addition to epinephrine). All vasopressors should be given by infusion pump, with the doses titrated continuously according to blood pressure and cardiac rate/function monitored continuously and oxygenation monitored by pulse oximetry

APPENDIX 18: DIFFERENCE BETWEEN ANAPHYLAXIS AND FAINTING (VASOVAGAL REACTION)

	Fainting	**Anaphylaxis**
Onset	Usually at the time or soon after injection	Usually some delay between 5–30 minutes after injection
Symptoms		
Skin	Pale, sweaty, cold and clammy	Red, raised, and itchy rash; swollen eyes, face; generalized rash.
Respiratory	Normal to deep breaths	Noisy breathing from airways obstruction (wheeze or stridor
Cardiovascular	Bradycardia	Tachycardia
	Transient hypotension	Hypotension
Gastrointestinal	Nausea/Vomiting	Abdominal cramps
Neurological	Transient loss of consciousness, good response once prone	Loss of consciousness, little response once prone

APPENDIX 19: IMMUNIZATION RECOMMENDATIONS FOR OCCUPATIONAL HEALTH AND MEDICAL FITNESS

OHC/ MF COMBINATION TEST	
PROFESSION/ CATEGORY	**Recommended vaccination**
Agriculture Industries	
Farmers	Tetanus COVID-19 influenza rabies MMR Meningococcal Conjugate Vaccine ACWY
Gardeners	
Flower Shop Worker / Manager / Sales & supervisors	
Irrigation Workers & Engineer	
Landscaping Workers & Supervisors	
Fruit Packing workers & Supervisors	
Crop Collection workers	
Plantation Workers	
Cereal & Grain Worker	
Equestrian Profession	
Poultry Farm Workers & Supervisors	
Fish Farm workers	
Beauticians & related services / Spa Workers	
Barber Men	influenza
Beautician	COVID-19
Beauty Consultant	varicella
Body Masseur	MMR
Salon Cleaner	Meningococcal Conjugate Vaccine ACWY
Salon Cashier	
Hair dresser & Stylist	
Makeup Artist	
Nail Specialist	
Salon Supervisor	
Salon Trainee	
Spa Therapist	
Laser Technician	
Car Workshops & Service centers	
Car Service Worker	influenza
Mechanics	COVID-19
Car Electric Worker	tetanus
Garage Workers	MMR
Galvanizing Workers	Meningococcal Conjugate Vaccine ACWY
Carpenter & Noise Producing Industries	
Carpenter	influenza
Smelt Worker	COVID-19
Stone Cutter Worker	tetanus
Metal Worker (Fabrication, Cutting…etc)	MMR
Machine Operator	Meningococcal Conjugate Vaccine ACWY

Blacksmith	
Welder	
Sand Blaster	
Engineers working this type of industry	
Lamp Manufacturer	
Tinsmith Worker	
Cement, Ceramic, Concrete, Tissue & Textile Industries	
Cement Workers	influenza
Ceramic Worker	COVID-19
Gypsum Worker	tetanus
Textile Worker	MMR
Tile Worker	Meningococcal Conjugate Vaccine ACWY
Tissue Factories Worker	
Engineers working this industries	
Construction Industries	
Construction Site Workers	influenza
Heavy Equipment Operator	COVID-19
Civil Engineers	tetanus
Builders	MMR
Steel Fitters	Meningococcal Conjugate Vaccine ACWY
Plumber	
Mason	
Glass Fitters	
DHA LICENSING SERVICES	
DHA License For Doctors & Other Health Care Workers	vaccination
Extension of Service for all DHA staff who is 60 Years & above	HB vaccine
	Varecella
	MMR
	COVID-19
	influenza
	tetanus
	Meningococcal Conjugate Vaccine ACWY
Electric Services	
Electrician	influenza
Electric Engineer	COVID-19
Electroplating Technician	tetanus
Electric Furnace Worker	MMR
Electricity Supervisor	Meningococcal Conjugate Vaccine ACWY
Glass Industries	
Glass Worker	influenza
Glass Blower	COVID-19
Glass Installer	tetanus
Glass Aluminum Worker	MMR
Blast Operator	
Glass Production Line Labors & supervisors	

Health Care Workers	
Doctors	vaccination
Nurses	HB vaccine
Lab Technicians	Varicella
Hospital & Health Centers Admin Staff	MMR
X-Ray Technicians	COVID-19
Medicine Manufacturer	influenza
	tetanus
Dietitian	Meningococcal Conjugate Vaccine ACWY
Ionizing Radiation	
Ion Radiation Worker	HB vaccine
X-Ray Workers	Varicella
Spectrophotometer Worker	MMR
Radio Isotope Manufacturers for diagnostic use	COVID-19
Workers in Production lines	influenza
	tetanus
	Meningococcal Conjugate Vaccine ACWY
Oil Refining, Plastic & Chemical Industries	
Laundry Workers	influenza COVID-19 tetanus MMR
Chemical Workers	
Painters	
Printing Press Worker	
Plastic industries Workers	
Petrochemicals Workers	
Petrol Station Workers	
Perfume & Cosmetics Makers	
Refrigerator & A/C Workers	
Leather Industries	
Leather Tannery Worker	influenza COVID-19 tetanus MMR Meningococcal Conjugate Vaccine ACWY
Leather Industries Labors	
Leather Products Handlers	
Wet Hyde Handlers	
Supervisors & Managers in Leather Industries	
Veterinary Services	
Animal Handler	influenza COVID-19 tetanus MMR rabies Meningococcal Conjugate Vaccine ACWY
Animal Keeper	
Stock Man	
Calf Handler (Milker)	
Milk Parlor Supervisor	
Groomer	
Pet Handler	
Pet Care Giver	
Pet Trainer	
Vet Doctor & Surgeon	
Vet Assistant & Nurse	

Vet Lab Doctor & Technician	
Waste Management & Hygiene Service Industries	
Drainage Workers	influenza
Septic Tank Worker	COVID-19
Garbage Collector	tetanus
Garbage Lory Driver	MMR
Damping Site Workers	hepatitis B
Waste Treatment Plant	Meningococcal Conjugate Vaccine ACWY
Fumigating Officer & Pest Control	Polio
	Typhoid
Education Establishment	
KG Teacher	Recommended vaccines for new applicants HB vaccine Varicella MMR COVID-19 influenza tetanus Meningococcal Conjugate Vaccine ACWY
KG Assistant Teacher	
KG Supervisor & Manager	
Baby Sitter	
Nany	
Kid Club Attendent	
Specialist Educator	
Special Need Workers	
Behaviour Therapist	
Teacher Grade 1 and above	
Speech Therapist	
RTA Driver's Screening	
VEHICLE DRIVER	influenza COVID-19 tetanus MMR Meningococcal Conjugate Vaccine ACWY
SECURITY GUARD	
LIFEGUARD	
TRAINORS	
Food Handlers	
Chef & Cooks	influenza COVID-19 tetanus MMR hepatitis B Meningococcal Conjugate Vaccine ACWY
Waiter & Waitress	
Steward	
Food & Beverage Attendant	
Baker, bread & Pastry worker	
Chocolate maker	
Confectioner	
Ice cream Maker	
Juice Maker	
Sandwich Maker	
Coffee & Tea Maker	
Bar Attendant	
Butcher	
Fisherman	
Meat, Poultry & Pork Handler	
Catering Workers & Supervisor	

Dish Washers	
Cashier (restaurants & Cafes)	
Food Assistant	
Grocery	
Hostess	
Merchandiser	
Food Quality Officer	
Food Sales Representatives	
Food Shop Supervisor	
Food Handler Trainee	
Special Category Workers	
Workers employed in sensitive areas	vaccination
Workers dealing with VIPs	HB vaccine
Workers in high importance venues/ areas	Varecella
	MMR
	COVID-19
	influenza
	tetanus
	rabies
	Meningococcal Conjugate Vaccine ACWY
Domestic/ household staff	
Housemaids	Varicella
Private Drivers	MMR
Private Teachers	COVID-19
Cook	influenza
	tetanus
	Meningococcal Conjugate Vaccine ACWY

APPENDIX 20: INFLUENZA VACCINES BY AGE INDICATION, UNITED STATES, 2023–2024 INFLUENZA SEASON

Influenza Vaccines by Age Indication, United States, 2023–2024 Influenza Season

Vaccine type		0 through 6 months	6 through 23 months	2 through 17 years	18 through 49 years	50 through 64 years	≥65 years
IIV4s	Standard-dose unadjuvanted inactivated (IIV4)		Afluria Quadrivalent Fluarix Quadrivalent FluLaval Quadrivalent Fluzone Quadrivalent				
	Standard-dose Cell culture-based inactivated (ccIIV4)		Flucelvax Quadrivalent				
	Standard-dose adjuvanted inactivated (aIIV4)						Fluad Quadrivalent*
	High-dose inactivated (HD-IIV4)						Fluzone High-Dose Quadrivalent*
RIV4	Recombinant (RIV4)				Flublok Quadrivalent*		
LAIV4	Live attenuated (LAIV4)			FluMist Quadrivalent			

IIV4=quadrivalent inactivated influenza vaccine **RIV4**=quadrivalent recombinant influenza vaccine **LAIV4**=quadrivalent live attenuated influenza vaccine

Not approved for age group *Egg-based* *Not egg-based*

* Preferred for those aged ≥65 years