



Vaccination for adults

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Learning objects

At the end of this part of panel, student,

- describes the importance and necessity of vaccination in adults
- lists the vaccines recommended for adults.
- lists the vaccines for immunocompromised host (ICH) and healthcare personnel (HCP).

Vaccination = Active immunization

is the **artificial** protection of a person from infectious diseases



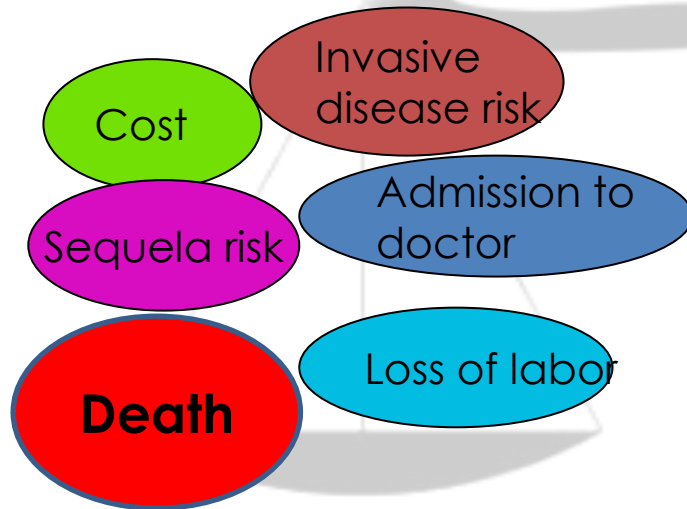
giving **microorganism itself** (live-attenuated, death, or toxoid)
or its **antigenic** structures



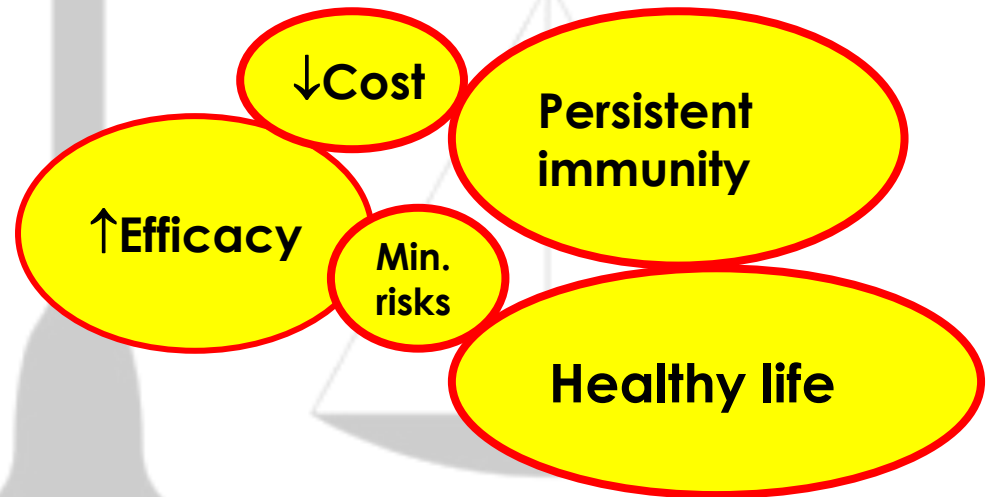
by **stimulating cellular and humoral immunity**

Which one is preferred?

Disease



Vaccination



Louis Pasteur (1822-1895)



**A Vision
to
future of humanity**

Success Smallpox

Edward Jenner

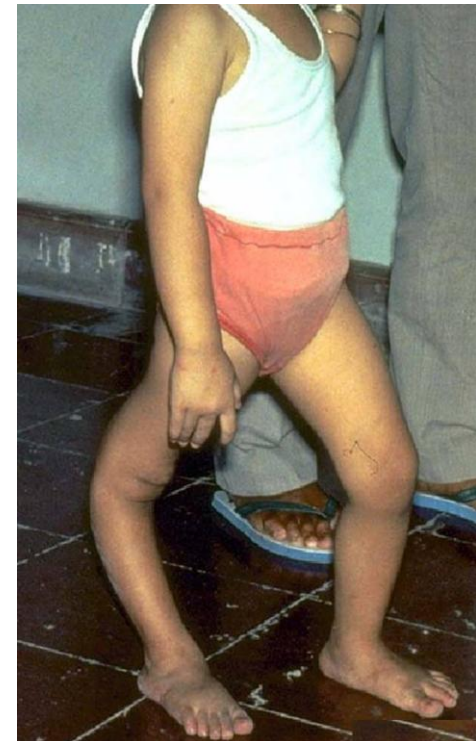
(the pioneer of smallpox vaccination and the father of immunology !)

- 1796** → Found vaccine (named **vacca** in Latin =cow)
→ **Smallpox eradicated in 1977 (180 years later !)**



Poliomyelitis

- Jonas Salk 1953 → Poliomyelitis vaccine, inactivated.
- Albert Sabin 1961 → Poliomyelitis vaccine, live attenuated.
 - **2/3 types of Poliovirus eradicated** worldwide at present.
 - There is no paralytic polio in Turkey since 2002.



Proof of success !

The **incidence** of vaccine-preventable disease (new disease rate detected) **decreased by 99% compared to the 20th century** in USA.

Disease	Annual morbidity, no. of cases		Morbidity decrease, %
	20th century	2007	
Diphtheria	21,053	0	100
Measles	530,217	43	99.9
Mumps	162,344	800	99.5
Pertussis	200,752	10,454	94.8
Polio (paralytic)	16,316	0	100
Rubella	47,745	12	99.9
Congenital rubella syndrome	152	0	99.3
Smallpox	29,005	0	100
Tetanus	580	28	95.2
<i>Haemophilus influenzae</i> (type b and unknown; <5 years)	20,000	202	99

Pickering LK. Clin Infect Dis. 2009 Sep 15;49(6):817-40.


Vaccination is a proven application that is useful in all age groups and risk groups.

Goals

to prevent from infections



by increasing number of immune individuals /
reducing number of susceptible individuals in the community



to reduce the mortality and morbidity caused
infections

Why some adults need vaccines?

Do childhood vaccines protect for life? Generally true but,

Some adults have not been vaccinated as a child.

Newer vaccines were not available when some adults were children

The immunity decreases with aging

Becoming more susceptible to serious disease caused by common infections (flu, pneumococcal infections, etc.)

Rationales for increasing **adult** vaccination

- **Success in child and adolescent vaccination** program.
- **New vaccines** targeted at adults.
- **Recognition of the burden** of adult vaccine-preventable disease.
- **Having risks related to** occupation, life style, pregnancy, travel, DM, ESRD, ...

Disease burden

Death caused by vaccine-preventable diseases in adults

~50.000/year in USA

Influenza:

→ 10-20% / year

→ ~ 200,000 hospitalization

→ ~ **16.000-20.000 death**

Pneumococcal infections occur frequently :

→ 2000-4000 meningitis

→ >40.000 bloodstream infections

→ 150.000-300.000 pneumonia

Generally recommended vaccines for adults:


1. **Hepatitis B (HepB)**
2. **Hepatitis A (HepA)**
3. **Pneumococcal (PCV,PPSV)**
4. **Influenza (Flu)**
5. **Tetanus Diphtheria, +/- Pertussis (Td/ap)**
- 6-8. ***Measles, Mumps, Rubella (MMR)***
9. ***Varisella, Zoster (VAR, ZVL)***
10. ***HPV***
11. ***Meningococcal (Men)***
12. ***Haemophilus (Hib)***


should think separately for each person !


1. Primary vaccine series completed ? Further requirements?
2. Lack documentation of vaccination
3. Lack evidence of past infections?
4. Additional risk factors:
 - Underlying diseases/conditions ?
 - HIV ?
 - ICH ?
 - ESRD/HD, CLD, diabetes, asplenia, MSM, ...
 - Pregnancy ? / breast-feeding ?
 - HCP ?
 - Travel ?
 - Animal contacts ?

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Influenza inactivated (IIV) or Influenza recombinant (RIV) or	1 dose annually			
Influenza live, attenuated (LAIV)				
Tetanus, diphtheria, pertussis (Tdap or Td)	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)			
Varicella (VAR)	2 doses (if born in 1980 or later)		2 doses	
Zoster recombinant (RZV) (<i>preferred</i>) or	2 doses			
Zoster live (ZVL)				
Human papillomavirus (HPV)	2 or 3 doses depending on age at initial vaccination or condition	27 through 45 years		

 Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

 Recommended vaccination for adults with an additional risk factor or another indication

 Recommended vaccination based on shared clinical decision-making


 No recommendation/ Not applicable

Table 1 Recommended Adult Immunization Schedule by Age Group, United States, 2020

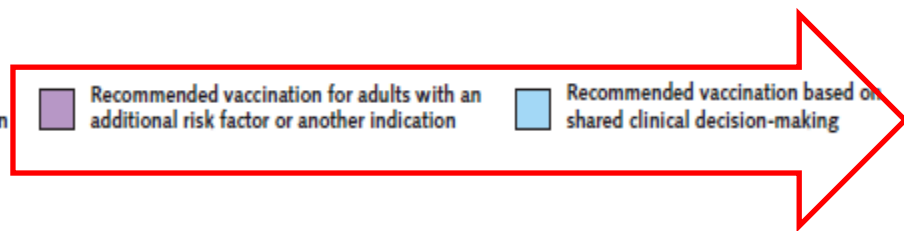
Vaccine	19–26 years	27–49 years	50–64 years	≥65 years
Pneumococcal conjugate (PCV13)	1 dose			65 years and older
Pneumococcal polysaccharide (PPSV23)	1 or 2 doses depending on indication			1 dose
Hepatitis A (HepA)	2 or 3 doses depending on vaccine			
Hepatitis B (HepB)	2 or 3 doses depending on vaccine			
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		
<i>Haemophilus influenzae</i> type b (Hib)	1 or 3 doses depending on indication			

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

Recommended vaccination based on shared clinical decision-making

No recommendation/ Not applicable



should think separately for each person !

1. Primary vaccine series completed ? Further requirements?
2. Lack documentation of vaccination
3. Lack evidence of past infections?
4. Additional risk factors:
 - Underlying diseases/conditions ?
 - HIV ?
 - **ICH?**
 - ESRD/HD, CLD, diabetes, asplenia, MSM, ...
 - Pregnancy ? / breast-feeding ?
 - HCP ?
 - Travel ?
 - Animal contacts ?

Immunocompromised host

1. Stem cell transplant patients

2. Congenital or acquired immunodeficiencies

- **Hematologic neoplasms** (leucemia, lymphoma, multiple myeloma)
- **Asplenia, splenectomy**
- **HIV infection**, severe combined immunodeficiency, ...

3. Immunosuppressive treatments

- **Solid organ transplants** (liver, kidney, lung, pancreas, heart)
- **Chemotherapy, corticosteroids, anti-TNF alfa, ...**

- ❑ **Those with chronic disease and immunosuppression** (diabetes mellitus, ESRD, CLD, etc.)

ID risk, morbidity and mortality ?

When immunity is suppressed, compared with healthy individuals;

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graph TD; A[When immunity is suppressed, compared with healthy individuals;] --> B[The susceptibility to infection has increased and the fight against infection has weakened]; B --> C[Infectious disease risks and the mortality rate rises];
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The susceptibility to infection has increased and the fight against infection has weakened

Infectious disease risks and the mortality rate rises

As a rule, **live vaccines are contraindicated** to immunocompromised host because of virulence and risk of infection
(LAIV, MMR, VAR, ZLV, BCG)

Therefore toxoid, inactivated or recombinant vaccines could be done safely in this population

Recommended vaccines for ICH

1. Tdap:

- **Tetanus** (*Clostridium tetani*) ,
- **Diphtheria** (*Corynebacterium diphtheriae*)
- **Pertussis** (*Bordetella pertussis*)

2. Flu (*Influenzavirus*): Inactivated form (IIV)

3. Pneumococcal (*Streptococcus pneumoniae*) PPSV, PCV

4. HPV (*Human papillomavirus*)

5. Hib (*Haemophilus influenzae type b*) only for Hematopoietic Stem Cell Transplant (HSCT) recipients

Table 2 Recommended Adult Immunization Schedule by Medical Condition and Other Indications 2020

Vaccine	Pregnancy	Immuno-compromised (excluding HIV Infection)	HIV Infection CD4 count		Asplenia, complement deficiencies	End-stage renal disease; or on hemodialysis
			<200	≥200		
IIV or RIV or LAIV						1 dose a
Tdap or Td	1 dose Tdap each pregnancy					1 dose Tdap, then Td
MMR						
VAR						
RZV (preferred) or ZVL						
HPV						
PCV13						1 d
PPSV23						
HepA						
HepB						
MenACWY						
MenB						
Hib						

LIVE !

LIVE !

LIVE !

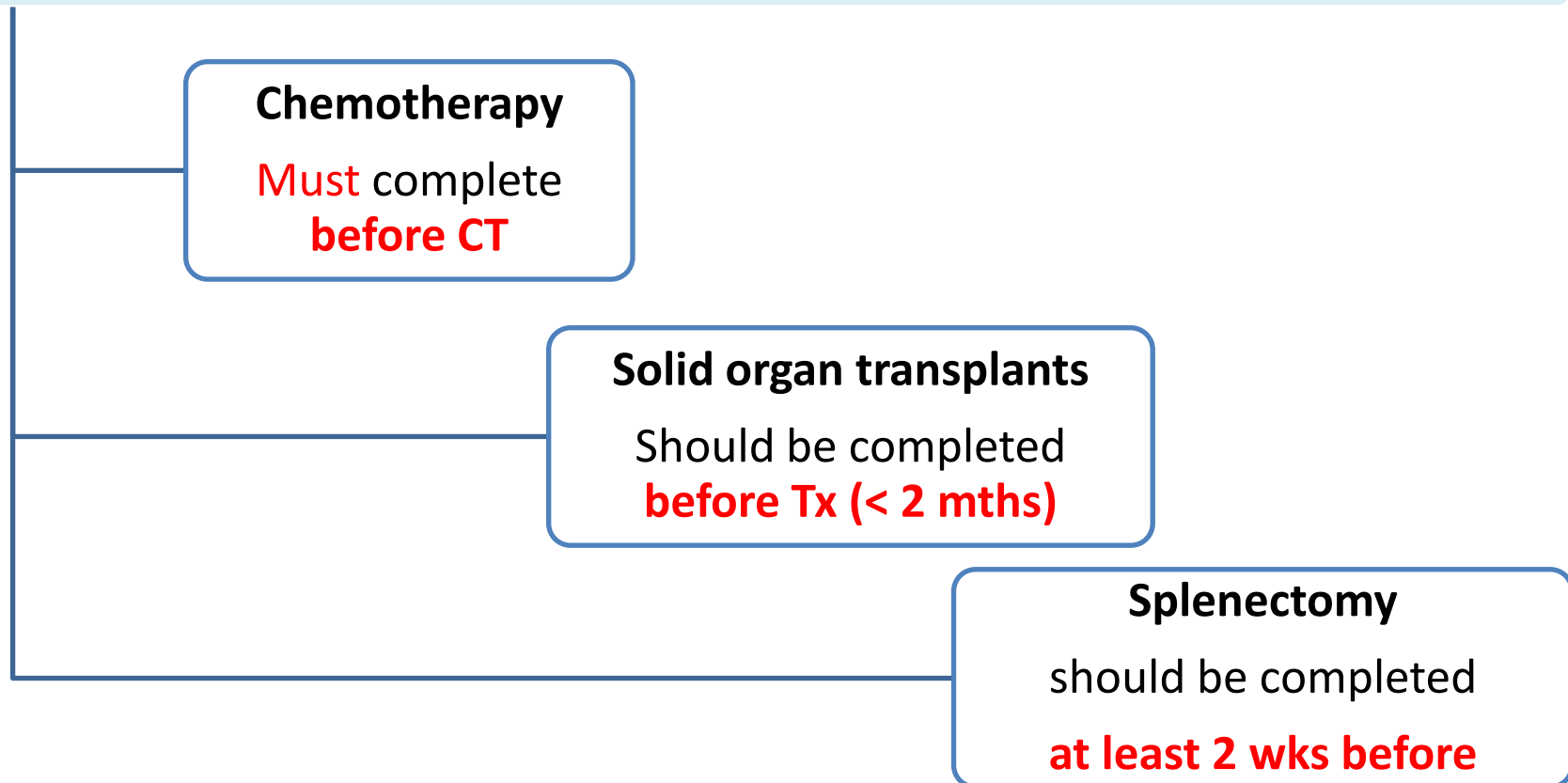
LIVE !

- Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection
- Recommended vaccination for adults with an additional risk factor or another indication
- Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction
- Delay vaccination until after pregnancy if vaccine is indicated
- Not recommended/contraindicated—vaccine should not be administered
- No recommendation/Not applicable

Vaccination timing for ICH

1. Stem cell transplant patients
 2. Congenital or acquired immunodeficiencies
 - Hematologic neoplasms (leucemia, lymphoma, multiple myeloma)
 - Asplenia, splenectomy
 - HIV infection, severe combined immunodeficiency, ...
 3. Immunosuppressive treatments
 - Solid organ (liver, kidney, lung, pancreas, heart) transplants
 - Chemotherapy, corticosteroids, anti-TNF alfa, ...
- Those with chronic disease and immunosuppression (diabetes mellitus, CRD, CHD, etc.)

Possible immune suppression time/condition should be considered:



And also

□ The patient's **environmental sources of infection need to be reduced;**

- 1. Family members**
- 2. Close contacts**
- 3. Healthcare personnel**

should be advised to vaccinate.

should think separately for each person !

1. Primary vaccine series completed ? Further requirements?
2. Lack documentation of vaccination
3. Lack evidence of past infections?
4. Additional risk factors:
 - Underlying diseases/conditions ?
 - HIV ?
 - Immunodeficiency ?
 - ESRD/HD, CLD, diabetes, asplenia, MSM, ...
 - Pregnancy ? / breast-feeding ?
 - **HCP (Healthcare personnel) ?**
 - Travel ?
 - Animal contacts ?

HCP ?

- Doctors
- Nurses
- Dentists
- Medicine, dentistry and nursing students
- Laboratory staff
- Emergency personnel
- Management-related employees

Vaccine	Chronic liver disease	Diabetes	Health care personnel ²	Men who have sex with men
IIV or RIV or LAIV	INDICATION			1 dose annually
Tdap or Td	every 10 years			
MMR	depending on indication			
VAR	2 doses			
RZV (preferred) or ZVL	2 doses at age ≥ 50 years or 1 dose at age ≥ 60 years			
HPV	through age 26 years			
PCV13				
PPSV23	2 doses depending on age and indication			
HepA	1 or 3 doses depending on vaccine			
HepB	1 or 3 doses depending on vaccine			
MenACWY	4 doses			
MenB	See notes for booster recommendations			
Hib				

Recommended vaccination for adults who meet age requirement, lack documentation of vaccination, or lack evidence of past infection

Recommended vaccination for adults with an additional risk factor or another indication

Precaution—vaccination might be indicated if benefit of protection outweighs risk of adverse reaction

Delay vaccination until after pregnancy if vaccine is indicated

Not recommended/contraindicated—vaccine should not be administered

No recommendation/Not applicable

All HCP

1. with potential exposure to blood or body fluids **should be immune to HepB,**
2. should be **offered annual immunization with flu** vaccine.
3. should be **immune to MMR-VAR,**
4. should **receive a one-time dose of Tdap** as soon as possible, unless they are certain that they have received Tdap.

Highly recommended

- 1. HepB**
- 2. Flu**
- 3. MMR**
- 4. Varicella / zoster**
- 5. Tdap /Td**

HepB vaccination

- A significant **risk to HCP 10 times more**
- With occupationally exposed to **blood or other infectious** materials or sharps:
 - **Needle stick Injuries** approximately **70%**
 - The rate **is higher in education hospitals**
 - **Mostly at nurses** working **in the operating room**

Since 1998 all infants vaccinated with HepB vaccine after delivery in Turkey.

HepB vaccination

Hepatitis B
(HepB)
recombinant
vaccine

- 2 doses 4 weeks apart; third dose 5 months after second **(0., 1., 6. months scheme)**
- **booster doses not necessary;**
- all doses should be administered IM in the deltoid

Preexposure: HCP at risk for exposure to **blood or body fluids;** postexposure

Influenza

- **Reduces absenteeism and transmission of infection to hospitalized patients** (air-droplet route).

Flu vaccine (tetraivalent or trivalent IIV)	Annual vaccination with current seasonal vaccine (before Oct, as well to May).	All HCP
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MMR-VAR/VZV

- **Risk of acquiring measles** in hospital personnel is estimated to be **13 times greater**
 - All transmissible by the air-droplet route,
 - Measles and varicella also by the air-borne and person to person !
- **Nosocomial outbreaks !**

Measles-Mumps-Rubella live--virus vaccine	<ul style="list-style-type: none">▪ 2 doses SC; ≥28 days apart	<ul style="list-style-type: none">▪ for all HCP who lack presumptive evidence of immunity,▪ should be considered for those born before 1957.
Varicella vaccine (varicella zoster virus live-virus vaccine)	<ul style="list-style-type: none">• 2 doses SC 4-8 weeks apart	<ul style="list-style-type: none">• all HCP who do not have evidence of immunity

Tdap /Td

- The **immunity for Td decreases with aging.**
- **Pertussis is highly contagious** with secondary attack rates and the **incidence** of pertussis has been **increasing.**

Tetanus and diphtheria (toxoids) and acellular pertussis (Tdap)

- 1 dose IM as soon as feasible if Tdap not already received and regardless of interval from last Td.
- After receipt of Tdap, receive Td for **routine booster every 10 years.**

All HCP, regardless of age.

At-risk


HCP should be offered:

- polio,
- meningococcal,
- pneumococcal,
- Hib,
- BCG,
- rabies,
- typhoid,
- hepA.

Results

All adults should be vaccinated against vaccine-preventable infections

Increased efforts to educate the public as well as HCP are needed

- 
- such as patient reminder/recall systems,
 - healthcare system-based interventions,
 - **ensuring patients' vaccination needs.**

Compliance with the vaccine recommendation

Patient attitude	Physicians' recommendation	Vaccination ratio %
Positive	No	7
Negative	Yes	63
Positive	Yes	84 !!!

Adapted from MMWR 1998;37: 657

Physicians' recommendations influence patients' decision to receive vaccine, regardless of the patients' initial attitude.

References

- *Ann Intern Med.* 2020;172:337-347. doi:10.7326/M20-0046.
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