Thank you for joining

The presentation will
begin shortly

Rise to Immunize™ Monthly Webinar

Vaccinations and Chronic Conditions

Alejandro Granillo, MD, *Houston Methodist Physician Organization*

Today's Webinar

Campaign Updates

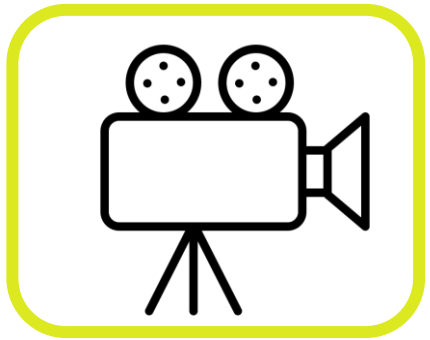
- Annual Conference
- RIZE Casts
- GSK's Vaccine Track
- Bonus Webinar

Vaccinations and Chronic Conditions

- Alejandro Granillo, MD

Q&A Session

Webinar Reminders



Today's webinar recording will be available the week of **04/24**

- Will be sent via email
- Will be available on website

(RiseToImmunize.org → "Resources" → "Webinars")

Ask questions during the webinar using the **Q&A feature**

- Questions will be answered at the end of the presentation

Annual Conference 2023

The RIZE team hosted a meet & greet breakfast for campaign participants

Member groups discussing the rising complexities in adult immunizations and how to improve care to high-risk patients during a focus group with Pfizer

Founding sponsor remarks from Pfizer representative Mary Beth Freeman at the Foundation Celebration Reception

Available at **RiseToImmunize.org/RIZEVideos**

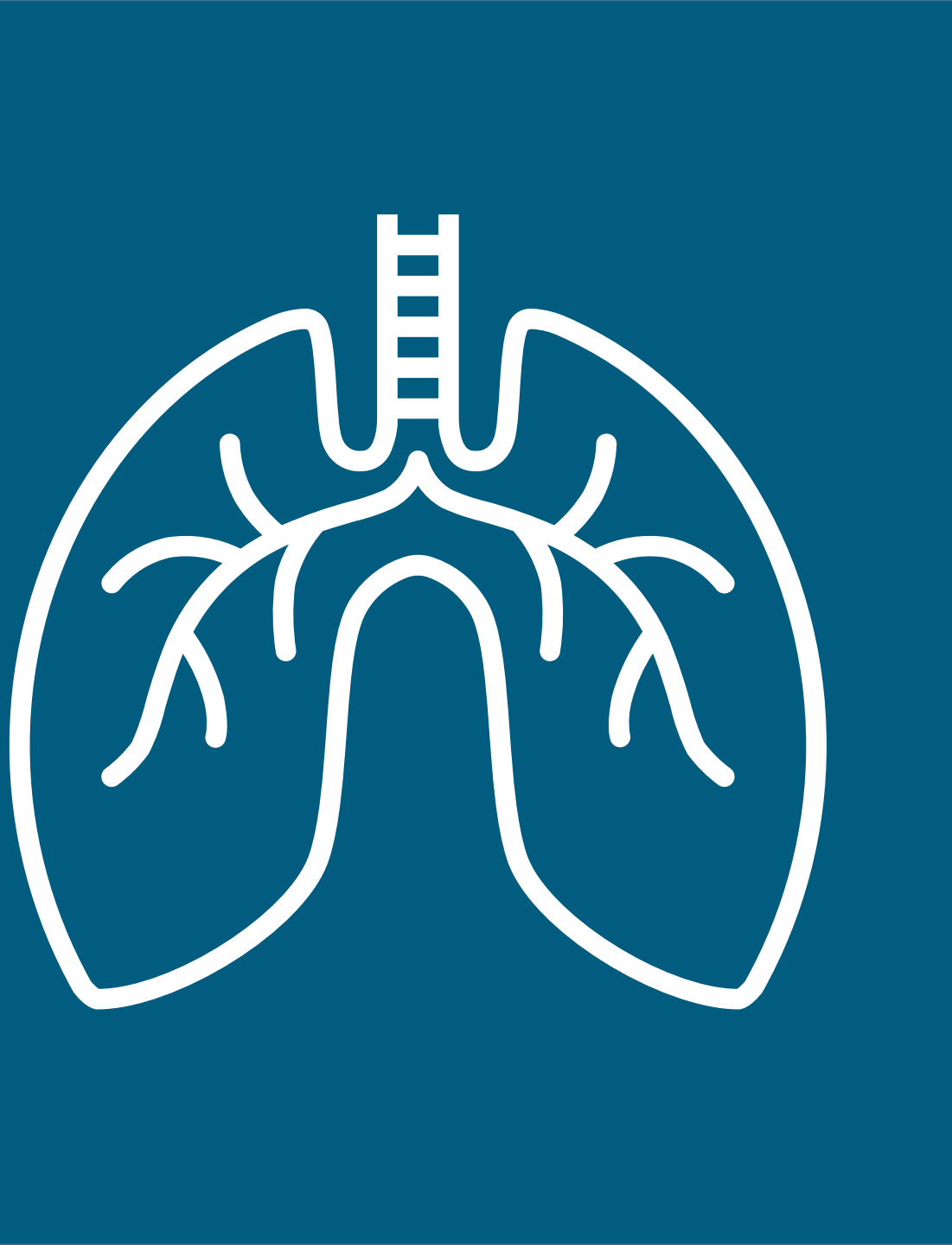
Spotlight: GSK's Vaccine Track

Bonus Webinar

“Prioritizing Respiratory Health in Your Adult Patients”

Featuring Dr. Ryan Haumschild from Emory HealthCare and Winship Cancer Institute

Thurs., April 27 from 2-3pm ET



Today's Speakers

Alejandro Granillo, MD

Assistant Professor of Clinical Medicine,
Houston Methodist Physician Organization

Rise to Immunize
“Vaccines and Chronic Conditions”

Alejandro Granillo, MD
Assistant Professor of Clinical Medicine

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No conflicts of interest to disclose

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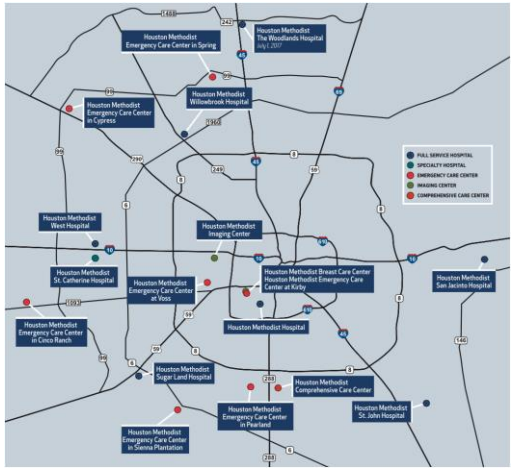
ASSISTANT PROFESSOR OF CLINICAL MEDICINE
-Weil Cornell Medical College
-Houston Methodist Academic Institute

FELLOWSHIP
Infectious Diseases | University of Texas Health Science Center at Houston, MD Anderson Cancer Center | 2022

RESIDENCY PROGRAM
Internal Medicine | Houston Methodist Hospital | 2020

MEDICAL SCHOOL
Instituto Tecnologico y de Estudios Superiores de Monterrey (ITESM) | 2016



Talking Points

1. Overview of vaccines
2. Importance of vaccines for people with chronic conditions.
3. Vaccination recommendations for people with chronic conditions.
4. Safety of vaccines
5. Side effects of vaccines
6. Strategies for encouraging people with chronic conditions to get vaccinated
7. Take home points

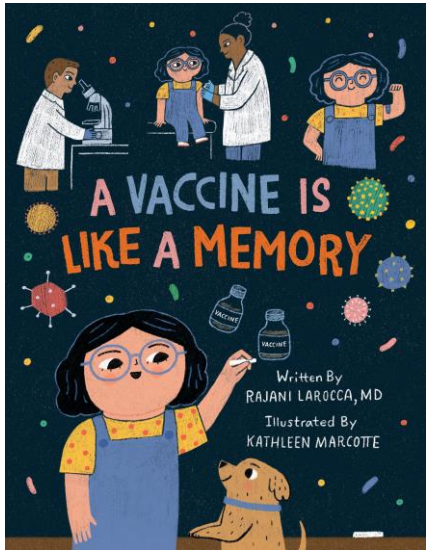
What is a vaccine?

- A vaccine is a biological product that can be used to safely induce an immune response that confers protection against infection and/or disease on subsequent exposure to a pathogen.

Vaccines work by stimulating a response from the immune system to a virus or bacteria.

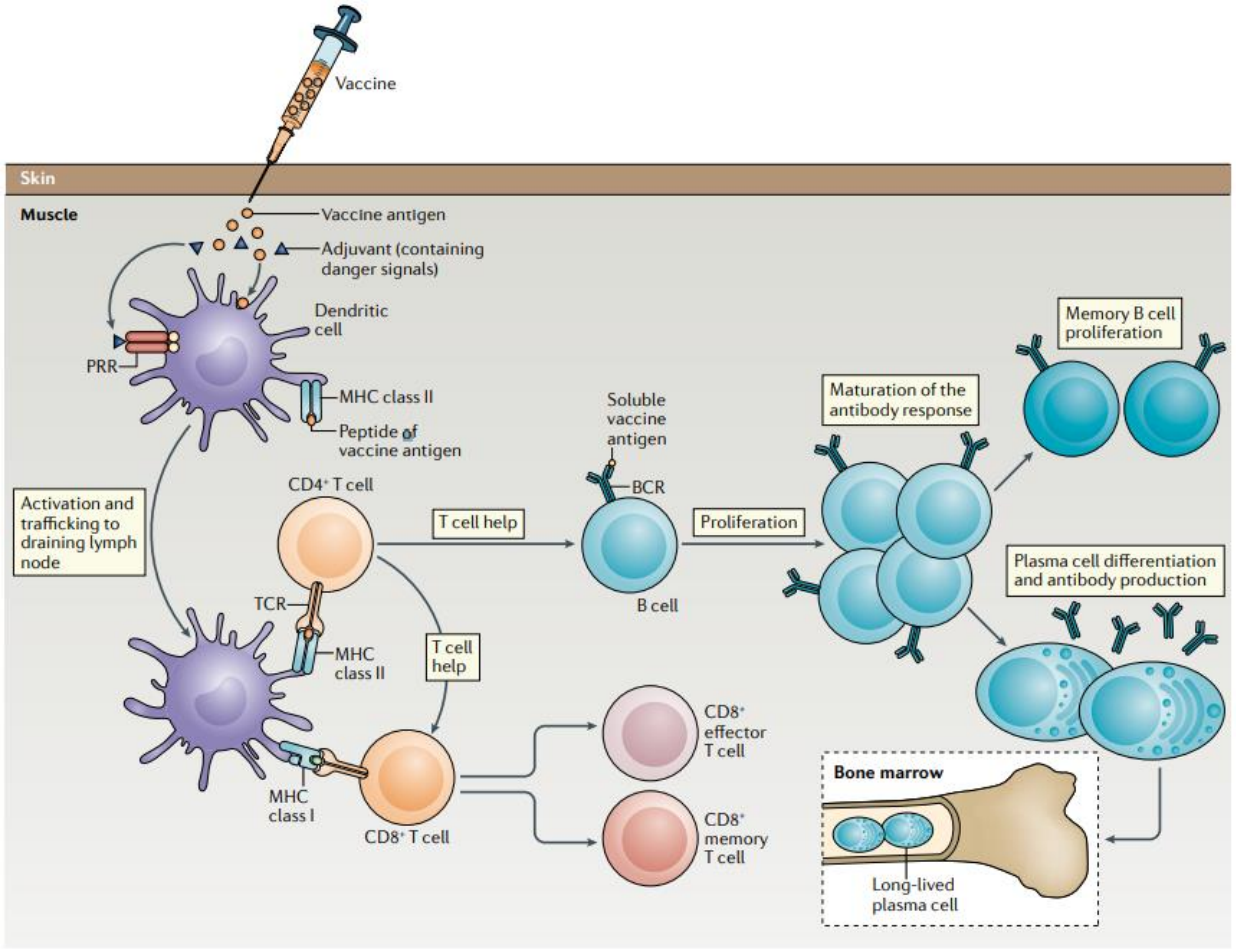
This creates a ‘memory’ in the immune system.

This immune memory allows the body to ‘remember’ a specific virus or bacterium, so that it can protect itself against this virus or bacterium and prevent disease that it causes.



Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

The generation of an immune response to a vaccine



Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

Types of vaccines

- Vaccines are generally classified as live or non-live (sometimes referred to as ‘inactivated’)

- The above allows to **distinguish those vaccines that contain attenuated replicating strains** of the relevant pathogenic organism **from those that contain only components** of a pathogen or killed whole organisms.

1. Live-attenuated
2. Inactivated

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

1. Live-attenuated

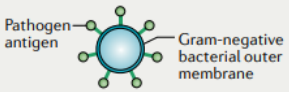
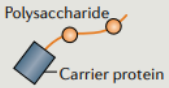
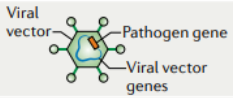
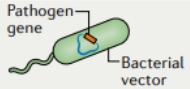
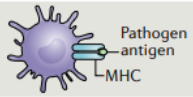
- Live vaccines are developed so that, in an immunocompetent host, they replicate sufficiently to produce a strong immune response, but not so much as to cause significant disease manifestations.

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

2. Inactivated

- These vaccines use only parts of the pathogen, rather than the entire organism.
  - **Subunit vaccines:** use proteins from the pathogen.
  - **Recombinant vaccines:** use genetically engineered components of the pathogen.
  - **Conjugate vaccines:** use a combination of the pathogen and a carrier protein to stimulate the immune system.
  - **Most recently mRNA**.
  - **Other** vectors

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

Type of vaccine		Licensed vaccines using this technology	First introduced
Live attenuated (weakened or inactivated)		Measles, mumps, rubella, yellow fever, influenza, oral polio, typhoid, Japanese encephalitis, rotavirus, BCG, varicella zoster	1798 (smallpox)
Killed whole organism		Whole-cell pertussis, polio, influenza, Japanese encephalitis, hepatitis A, rabies	1896 (typhoid)
Toxoid		Diphtheria, tetanus	1923 (diphtheria)
Subunit (purified protein, recombinant protein, polysaccharide, peptide)		Pertussis, influenza, hepatitis B, meningococcal, pneumococcal, typhoid, hepatitis A	1970 (anthrax)
Virus-like particle		Human papillomavirus	1986 (hepatitis B)
Outer membrane vesicle		Group B meningococcal	1987 (group B meningococcal)
Protein–polysaccharide conjugate		*Haemophilus influenzae* type B, pneumococcal, meningococcal, typhoid	1987 (*H. influenzae* type b)
Viral vectored		Ebola	2019 (Ebola)
Nucleic acid vaccine		SARS-CoV-2	2020 (SARS-CoV-2)
Bacterial vectored		Experimental	–
Antigen-presenting cell		Experimental	–

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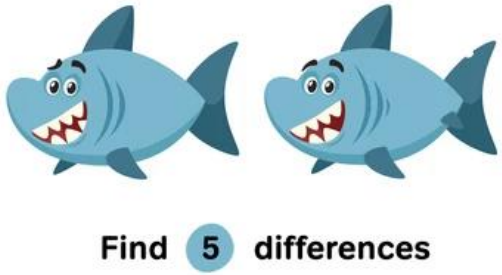
Live vs non-live vaccines

- The distinction between live and non-live vaccines is important.



Live vaccines have the potential to replicate in an uncontrolled manner in immunocompromised individuals leading to some restrictions to their use.

Non-live vaccines pose no risk to immunocompromised individuals.

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

Other vaccine components

- Vaccines contain other components that function as preservatives, emulsifiers or stabilizers.
- Various products used in the manufacture of vaccines could theoretically also be carried over to the final product and are included as potential trace components of a vaccine, including antibiotics, egg or yeast proteins, latex, formaldehyde, sodium salts.
- Except in the case of allergy to any of these components, there is no evidence of risk to human health from these trace components.

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

What are the benefits?

- A brief history of vaccination:

Epidemics of smallpox swept across Europe in the 17th and 18th centuries, accounting for as much as 29% of the death rate of children in London.

Initial efforts to control the disease led to the practice of variolation, which was introduced to England by Lady Mary Wortley Montagu in 1722, having been used in the Far East since the mid-1500s . In variolation, material from the scabs of smallpox lesions was scratched into the skin in an attempt to provide protection against the disease.

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

- It was in this context that Edward Jenner wrote '*An Inquiry into the Causes and Effects of the Variole Vaccinae…*' in 1798.

- Jenner's contribution to medicine was thus not the technique of inoculation but his startling observation that milkmaids who had had mild cowpox infections did not contract smallpox, and the serendipitous assumption that material from cowpox lesions might immunize against smallpox.

- Jenner brilliantly predicted that vaccination could lead to the eradication of smallpox; in 1980, the World Health Assembly declared the world free of naturally occurring smallpox.

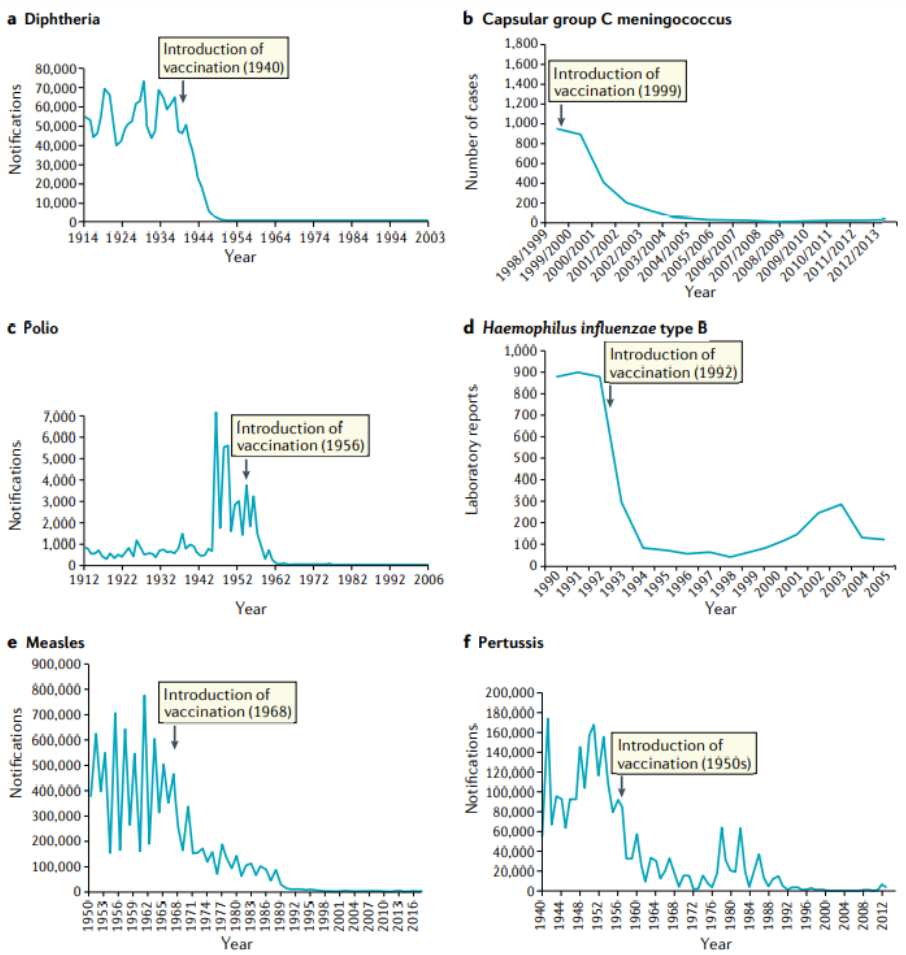
Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

- Almost 100 years after Jenner, the work of Louis Pasteur on rabies vaccine in the 1880's heralded the beginning of a frenetic period of development of new vaccines, so that by the middle of the 20th century, vaccines for many different diseases had been developed.

- However, it was the coordination of immunization as a major public health tool from the 1950's onwards that led to the introduction of comprehensive vaccine programs and their remarkable impact on child health that we enjoy today.

World Health Organization. Immunization coverage. WHO https://www.who.int/news-room/fact-sheets/ detail/immunization-coverage (2020)

The impact of vaccination on selected diseases in the UK



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- In 1974, the World Health Organization launched the Expanded Program on Immunization and a goal was set in 1977 to reach every child in the world with vaccines for diphtheria, pertussis, tetanus, poliomyelitis, measles and tuberculosis by 1990.

- Unfortunately, that goal has still not been reached… there are still more than 19million children who did not receive basic vaccinations in 2019.

Benefits of vaccination

- The benefits of these vaccines include:

  - Safe and effective protection against disease
  - Reduction of disease transmission and spread in the community
  - Prevention of long-term health consequences, such as permanent disability or death
  - Cost savings, as vaccines are often less expensive than the cost of treating the disease
  - **Protection of vulnerable populations**, such as young children, older adults, people with weakened immune systems, and people living with chronic conditions.

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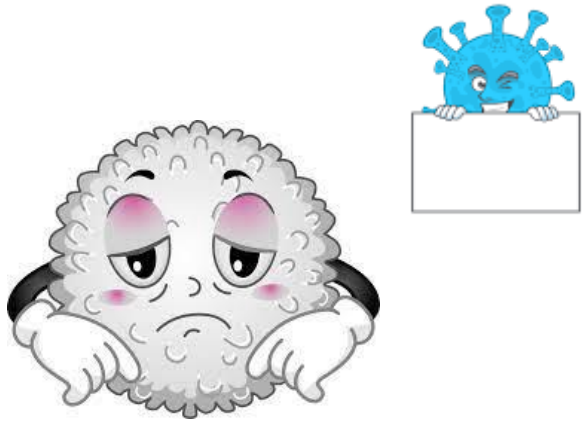
Patients with chronic conditions

- People with chronic conditions are at higher risk of severe illness from vaccine-preventable diseases due to their weakened immune systems.
- Chronic conditions such as diabetes, heart disease, and lung disease can weaken the immune system and make it more difficult for the body to fight off infections.
- This means that people with chronic conditions are more susceptible to serious and life-threatening illnesses.



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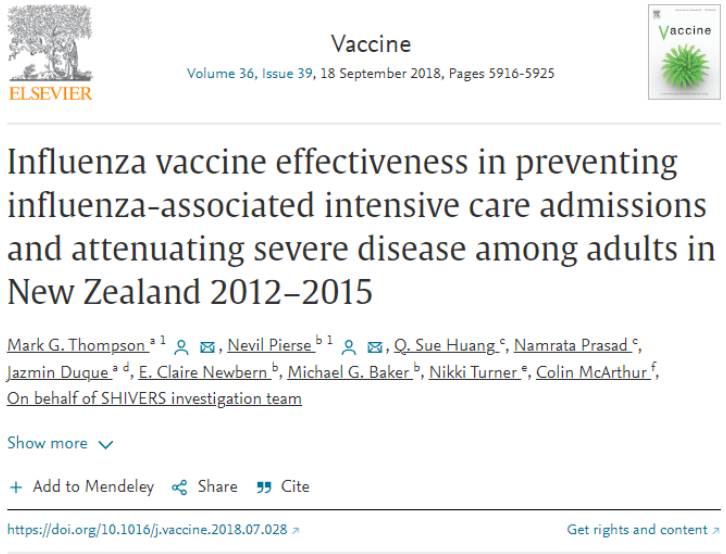

Vaccine

Volume 36, Issue 39, 18 September 2018, Pages 5916-5925

Influenza vaccine effectiveness in preventing influenza-associated intensive care admissions and attenuating severe disease among adults in New Zealand 2012–2015

Mark G. Thompson [a 1], Nevil Pierse [b 1], Q. Sue Huang [c], Namrata Prasad [c], Jazmin Duque [a d], E. Claire Newbern [b], Michael G. Baker [b], Nikki Turner [e], Colin McArthur [f], On behalf of SHIVERS investigation team

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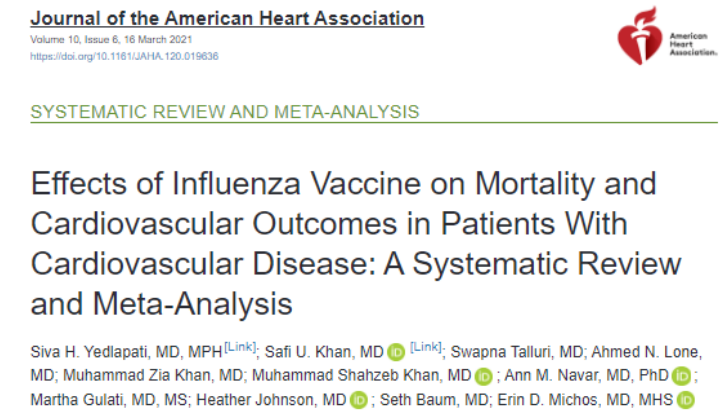
https://doi.org/10.1016/j.vaccine.2018.07.028 Get rights and content

- Adults who received the vaccine were 37% less likely to be hospitalized for the flu and 82% less likely to be admitted to the ICU because of it.
- Among people admitted to the hospital with the flu, those vaccinated were 59% less likely to be admitted to the ICU.
- Vaccinated patients admitted to the ICU spent 4 fewer days in the ICU than unvaccinated patients.



Journal of the American Heart Association

Volume 10, Issue 6, 16 March 2021

https://doi.org/10.1161/JAHA.120.019836

SYSTEMATIC REVIEW AND META-ANALYSIS

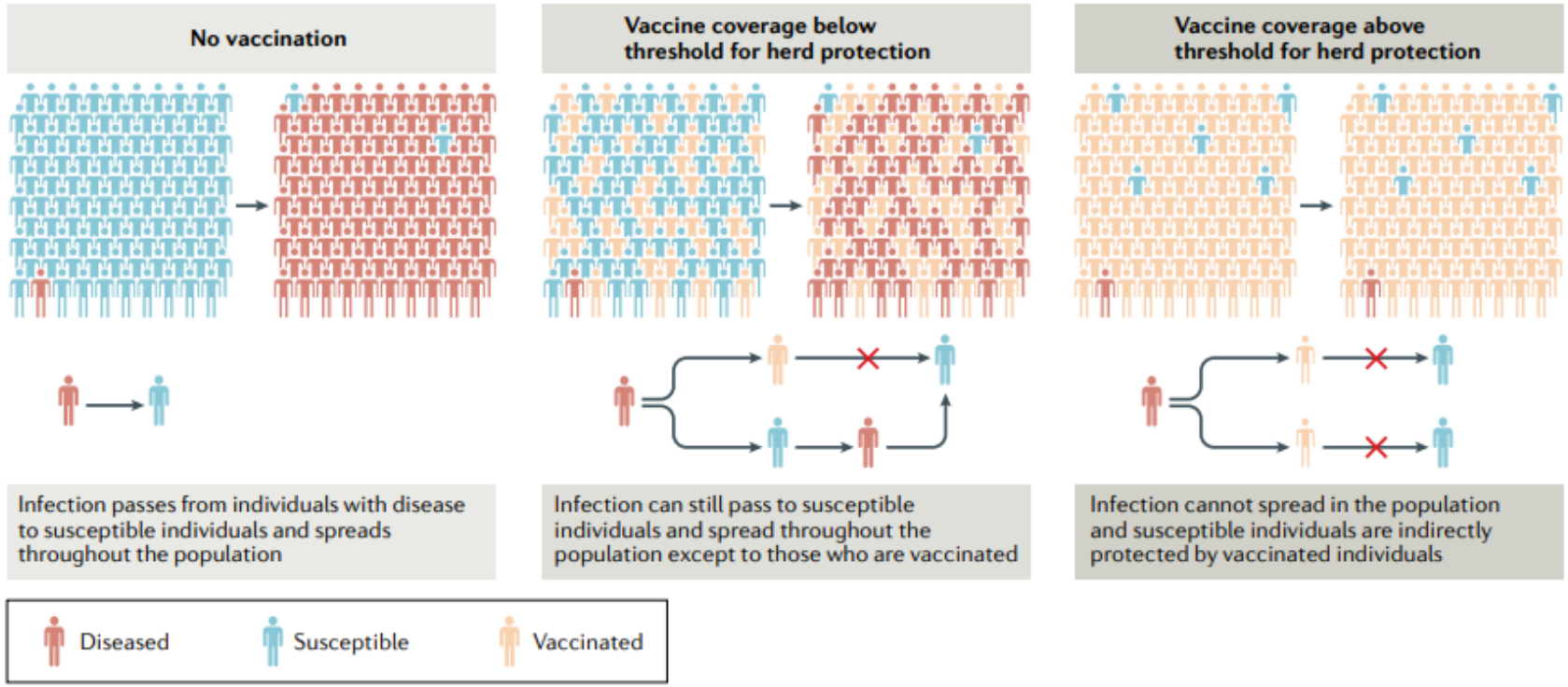
Effects of Influenza Vaccine on Mortality and Cardiovascular Outcomes in Patients With Cardiovascular Disease: A Systematic Review and Meta-Analysis

Siva H. Yedlapati, MD, MPH[Link]; Safi U. Khan, MD [Link]; Swapna Talluri, MD; Ahmed N. Lone, MD; Muhammad Zia Khan, MD; Muhammad Shahzeb Khan, MD ; Ann M. Navar, MD, PhD ; Martha Gulati, MD, MS; Heather Johnson, MD ; Seth Baum, MD; Erin D. Michos, MD, MHS

- Vaccination was associated with a lower risk of cardiovascular events (2.9% vs 4.7%) if the patient got the flu.
- Among the highest-risk patients with more active coronary disease, vaccination was associated with considerably better outcomes.

Herd immunity

- Vaccines not only protect the individual from getting sick, but they also help to prevent the spread of disease to others in the community.



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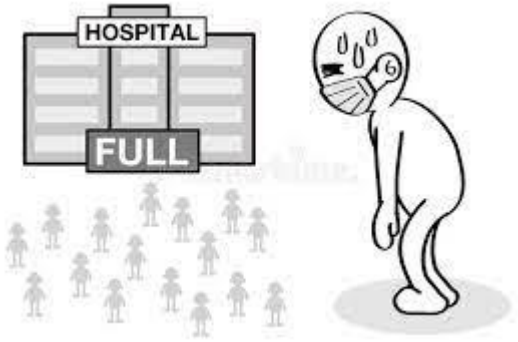
Access

- Getting vaccinated also helps protect the health system from becoming overwhelmed and ensures that people with chronic conditions have access to the care they need.

- This helps prevent further health complications and ensures that people with chronic conditions can continue to manage their conditions effectively.



Does all these work?

World Health Organization. Child mortality and causes of death. WHO https://www.who.int/gho/child_health/mortality/mortality_under_five_text/en/ (2020)

- The World Health Organization (WHO) estimates that 2–3million lives are saved each year by current immunization programs.

Vaccine protection

- There is a difference between different levels of protection provided by vaccines **ranging from prevention of infection to prevention of severe disease.**

- Factors affecting vaccine protection:
  - Age
  - Prior antigen exposure
  - Vaccine schedule
  - Vaccine dose

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Vaccination recommendations

HOUSTON Methodist LEADING MEDICINE

Table 2 Recommended Adult Immunization Schedule by Medical Condition or Other Indication, United States, 2023

Vaccine	Pregnancy	Immuno-compromised (excluding HIV infection)	HIV infection CD4 percentage and count		Asplenia, complement deficiencies	End-stage renal disease, or on hemodialysis	Heart or lung disease; alcoholism[a]	Chronic liver disease	Diabetes	Health care personnel[b]	Men who have sex with men
			<15% or <200 mm³	≥15% and ≥200 mm³							
COVID-19		See Notes									
IIV4 or RIV4	1 dose annually										
or										or	
LAIV4	Contraindicated					Precaution				1 dose annually	
Tdap or Td	1 dose Tdap each pregnancy	1 dose Tdap, then Td or Tdap booster every 10 years									
MMR	Contraindicated*	Contraindicated		1 or 2 doses depending on indication							
VAR	Contraindicated*	Contraindicated			2 doses						
RZV		2 doses at age ≥19 years			2 doses at age ≥50 years						
HPV	Not Recommended*	3 doses through age 26 years			2 or 3 doses through age 26 years depending on age at initial vaccination or condition						
Pneumococcal (PCV15, PCV20, PPSV23)		1 dose PCV15 followed by PPSV23 OR 1 dose PCV20 (see notes)									
HepA					2, 3, or 4 doses depending on vaccine						
HepB	3 doses (see notes)	2, 3, or 4 doses depending on vaccine or condition									
MenACWY		1 or 2 doses depending on indication, see notes for booster recommendations									
MenB	Precaution	2 or 3 doses depending on vaccine and indication, see notes for booster recommendations									
Hib		3 doses HSCT[c] recipients only			1 dose						

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

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

Contraindicated or not recommended–vaccine should not be administered.

*Vaccinate after pregnancy.

No recommendation/ 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.

https://www.cdc.gov/vaccines/schedules/hcp/imz/adult-conditions.html

Vaccine safety

- Vaccines are rigorously tested and monitored for safety before and after approval.
- The process of vaccine development and approval involves multiple stages of clinical trials, involving thousands of participants, to assess the vaccine's efficacy and safety.
- Once a vaccine is approved and put into widespread use, ongoing monitoring continues to ensure its continued safety.
  - This includes monitoring by vaccine manufacturers, healthcare providers, and public health agencies, who collect and assess data on adverse events.

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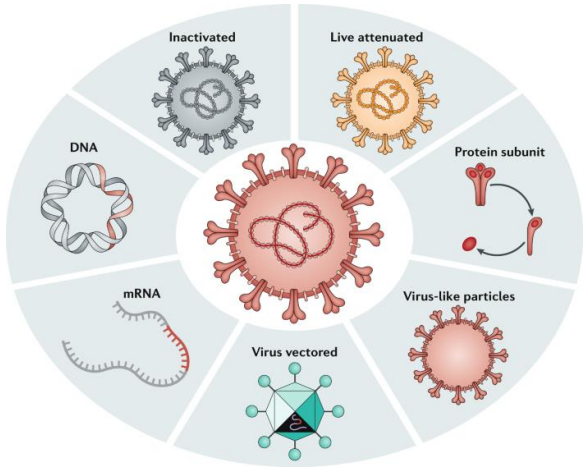
Vaccine Safety

- Perhaps because **vaccines work so well and the diseases that they prevent are no longer common**, there have been several misconceptions/erroneous associations made between vaccines and various unrelated health conditions that occur naturally in the population.

- It's important to note that like any medical intervention, **vaccines can have side effects**. However, serious adverse reactions are rare and the benefits of vaccination greatly outweigh the risks.

Side effects

- Most vaccines in current use are inactivated, purified or killed organisms or protein and/or polysaccharide components of a pathogen; as they cannot replicate in the vaccine recipient, they are thus not capable of causing any significant side effects, resulting in very few contraindications for their use.



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Side effects

- Vaccines can cause side effects, but these are generally mild and short-lived. The most common side effects of vaccines include pain or swelling at the injection site, low-grade fever, headache, and muscle aches.
  - These reflect the inflammatory and immune responses that lead to the successful development of vaccine-induced protection.
- Serious side effects from vaccines are very rare, with anaphylaxis being the most common of these rare side effects for parenteral vaccines, occurring after fewer than one in a million doses.

Bohlke, K. et al. Risk of anaphylaxis after vaccination of children and adolescents. Pediatrics 112, 815–820 (2003).

Myths

- Despite widespread misleading reporting about links between the measles–mumps–rubella vaccine and autism from the end of the 1990s, there is no evidence that any vaccines or their components cause autism.

- Thiomersal (also known as thimerosal) is an ethyl mercury-containing preservative that has been used widely in vaccines since the 1930s without any evidence of adverse events associated with it, and there is also no scientific evidence of any link between thiomersal and autism despite spurious claims about this.

- Thiomersal has been voluntarily withdrawn from most vaccines by manufacturers as a precautionary measure rather than because of any scientific evidence of lack of safety.

DeStefano, F. & Shimabukuro, T. T. The MMR vaccine and autism. Annu. Rev. Virol. 6, 585–600 (2019).
DeStefano, F., Bodenstab, H. M. & Offit, P. A. Principal controversies in vaccine safety in the United States. Clin. Infect. Dis. 69, 726–731 (2019).

The myth of antigenic overload

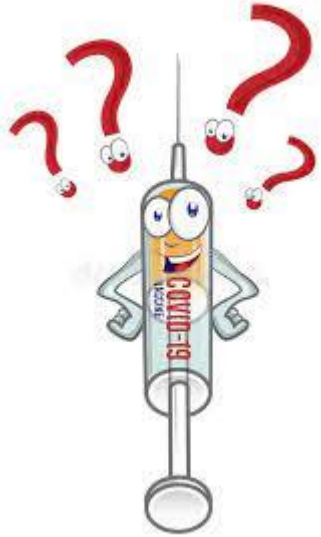
- A telephone survey in the United States with a nationally representative sample (n = 1600) of parents with children </=6 years of age, and expectant parents was conducted in April and May 1999.

Gellin, B. G., Maibach, E. W. & Marcuse, E. K. Do parents understand immunizations? A national telephone survey. Pediatrics 106, 1097–1102 (2000).

- 87% of respondents deemed immunization an extremely important action that parents can take to keep their children well.
- 25% believed that their child's immune system could become weakened as a result of too many immunizations
- 23% believed that children get more immunizations than are good for them.
- Children's health care providers were cited as the most important source of information on immunizations.

Gellin, B. G., Maibach, E. W. & Marcuse, E. K. Do parents understand immunizations? A national telephone survey. Pediatrics 106, 1097–1102 (2000).

- Although the majority of parents understand the benefits of immunization and support its use, many parents have important misconceptions that could erode their confidence in vaccines.



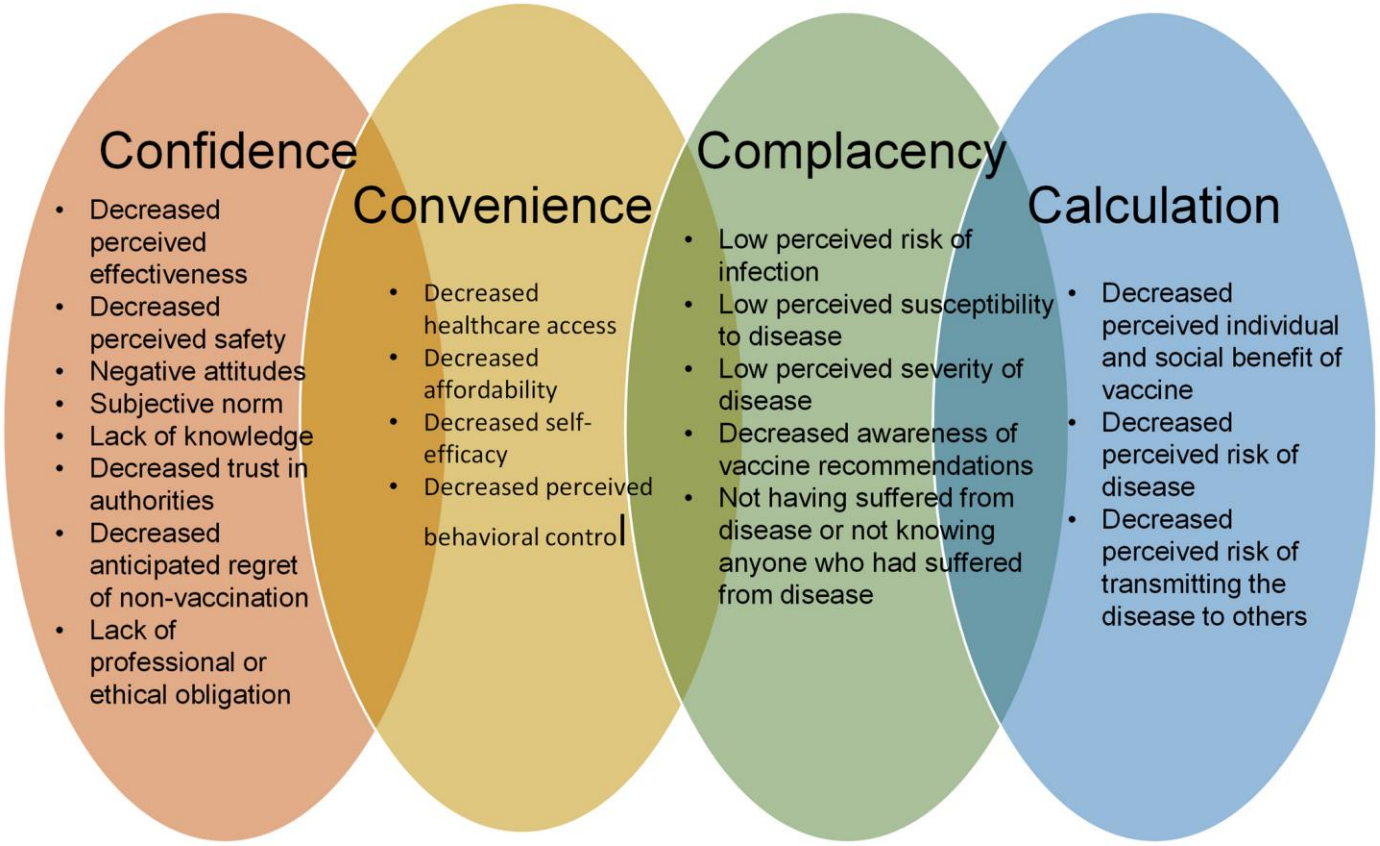
Centers for Disease Control and Prevention. Multiple vaccinations at once. CDC https://www.cdc.gov/ vaccinesafety/concerns/multiple-vaccines-immunity. html (2020).

Challenges to vaccination

- Access to vaccines
  - Healthcare infrastructure
  - Financial resources
  - Marginalization of communities
  - Refrigeration requirements
- Commercial viability
  - No commercial incentive
- Immunological challenges
- Misinformation/anti-vaccination movements

Pollard, A.J., Bijker, E.M. A guide to vaccinology: from basic principles to new developments. *Nat Rev Immunol* **21**, 83–100 (2021). https://doi.org/10.1038/s41577-020-00479-7

Vaccine Hesitancy: 4C model



Determinants of Influenza Vaccine Uptake in Patients With Cardiovascular Disease and Strategies for Improvement

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Future of vaccine development

- Traditionally, vaccine development takes more than 10 years, but the COVID-19 pandemic has demonstrated the urgency for vaccine technologies that are flexible and facilitate rapid development, production and upscaling.

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Future of vaccines

Whereas classic whole-organism vaccine platforms require the cultivation of the pathogen…

…Next-generation viral vectored or nucleic acid-based vaccines can be constructed using the pathogen genetic sequence only, thereby significantly increasing the speed of development and manufacturing processes.

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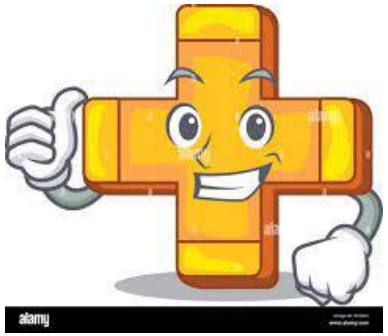
Future of vaccines: advantages

- Nucleic acid-based vaccines consist of either DNA or RNA encoding the target antigen, which potentially allows for the induction of both humoral and cellular immune responses.

- A huge advantage of these vaccines is that they are highly versatile and quick and easy to adapt and produce in the case of an emerging pathogen.



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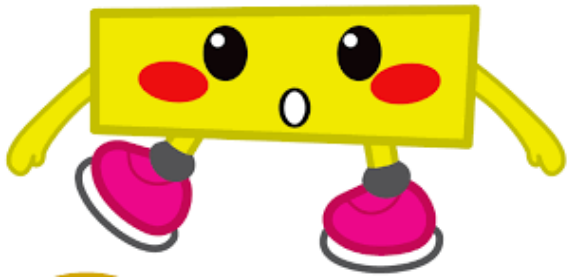
Future of vaccines: disadvantages

- A potential disadvantage of viral vectored vaccines is the presence of pre-existing immunity when a vector such as human adenovirus is used.

- Can be limited by their lack of stability and requirement for a cold chain.



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Strategies for vaccination

Encouraging people with chronic conditions to get vaccinated is crucial for protecting their health and preventing the spread of disease.

Education:

- Providing accurate information about the safety and efficacy of vaccines, as well as the risks of the diseases they prevent, is essential.
  - This information should be tailored to the specific needs of individuals with chronic conditions, taking into account their medical history and potential contraindications to certain vaccines.

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Strategies for vaccination

Role of healthcare providers:

- Healthcare providers play a crucial role in promoting vaccination and providing accurate information to their patients.
- They can educate their patients about the benefits of vaccines and address concerns they may have.
- Providers can also assist their patients in scheduling and obtaining vaccines and provide information about available resources.

Strategies for vaccination

Access to vaccines:

- Making vaccines easily accessible to people with chronic conditions is critical.
- This may involve working with healthcare providers to ensure that vaccines are available onsite or through community-based programs.
- It may also involve ensuring that people with chronic conditions have transportation to vaccine clinics or are able to receive vaccines at home.

Strategies for vaccination

Promoting vaccination through media campaigns:

- Using mass media campaigns to promote vaccination can help reach a wider audience and increase awareness about the importance of vaccination for people with chronic conditions.

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Strategies for vaccination

Partnering with community organizations:

- Collaborating with community organizations can help reach individuals with chronic conditions who may not regularly see a healthcare provider. These organizations can provide education and resources to help individuals make informed decisions about vaccination.

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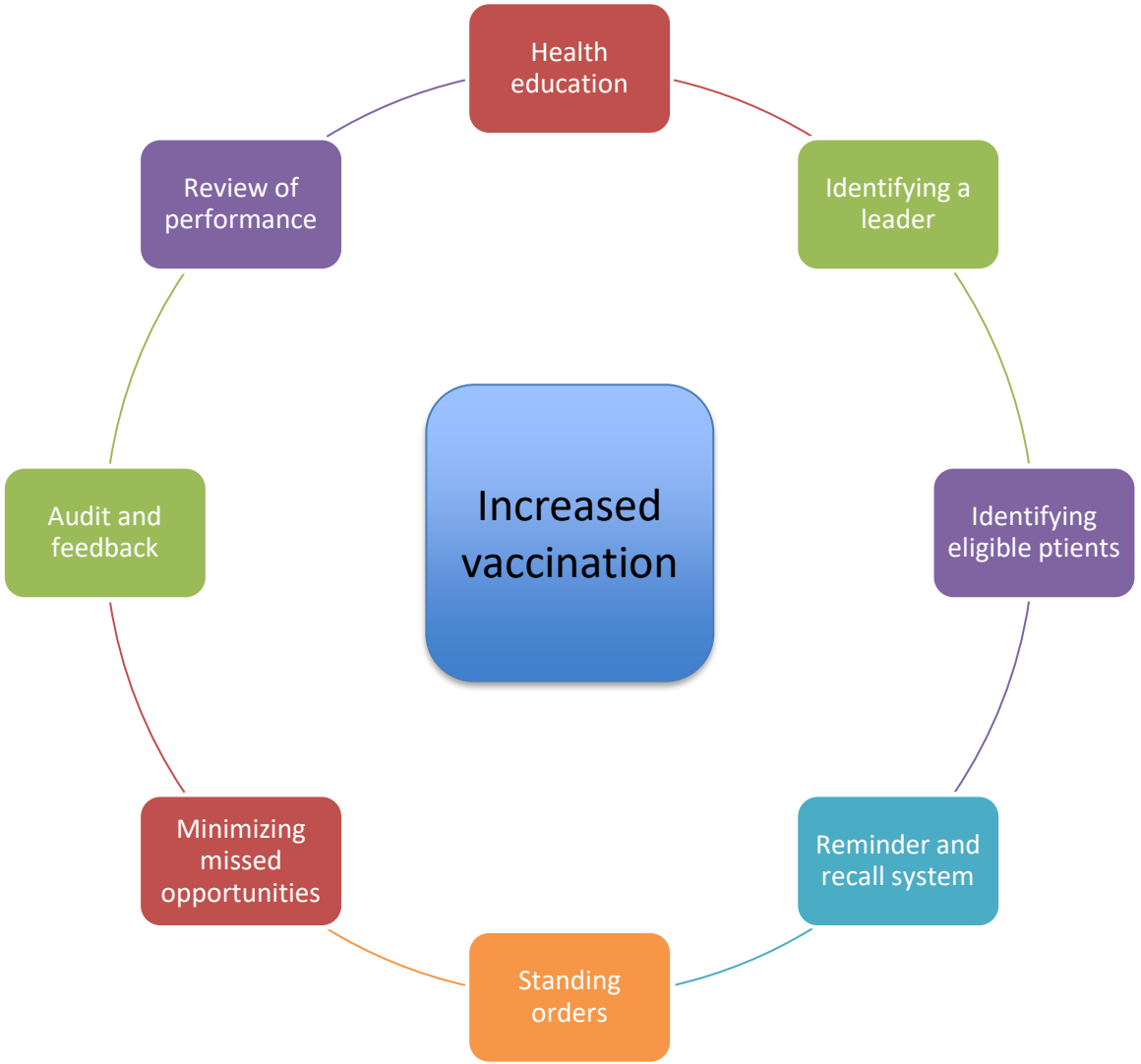
Tips and strategies



Take home points

- ✓ Vaccines are a safe and effective strategy against disease and its associated long term health consequences.
- ✓ They are particularly crucial in the protection of vulnerable populations, such as young children, older adults, people with weakened immune systems, and people living with chronic conditions given that these populations are at higher risk of severe illness from vaccine-preventable diseases
- ✓ Education, improving access to vaccines, and the promotion of vaccination are strategies that can be used to encourage people with chronic conditions to get vaccinated and preventing the spread of disease.

Thank you

HOUSTON Methodist
LEADING MEDICINE

Upcoming Webinars

- Topic: Prioritizing Respiratory Health in Your Adult Patients
- Date/ Time: **Thursday, April 27 at 2pm ET**
- Presenters: Ryan Haumschild, PharmD, MS, MBA

- Topic: Closing Care Gaps Through Patient Outreach
- Date/ Time: **Thursday, May 18 at 2pm ET**
- Presenters: Andrea Giamalva, MD, and Jennifer Kuroda

Questions?

Submit your questions using the **Q&A feature** at the bottom of the screen