

PEDIATRICS RESIDENCY PROGRAM

Pediatric Vaccination & Immunization Handbook

2026-2027

Prepared by the Resident Vaccine Curriculum Committee (ReVaCC)



Children's Hospital Colorado



Anschutz

Foreword

This handbook was created by pediatric residents and medical students at the University of Colorado Anschutz School of Medicine in collaboration with faculty editors. It is intended to serve as a quick reference guide for learners and rotators on key immunization topics essential to routine and preventive pediatric care. Beyond the general pediatric clinic, this handbook may be useful in a variety of contexts, as missed opportunities for vaccination present in the inpatient, emergency, and subspecialty settings.

Our goal is to build confidence in vaccine communication during pediatric presentations to care. Because information about vaccines and public health recommendations continue to evolve, we prioritize including the most current, evidence-based guidance available. Please ensure that you are using the latest version of this handbook for the most up-to-date information.

As always, consult your preceptor with questions and guidance on new developments that emerge between publication cycles.

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Colorado Chapter

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Disclaimers

This handbook was developed by pediatric resident and medical student authors of the University of Colorado Anschutz School of Medicine Pediatrics Residency Program, in collaboration with faculty editors, as an independent educational resource for resident and medical student trainees at the University of Colorado School of Medicine and does not constitute an official clinical protocol, policy, or guideline of Children's Hospital Colorado, the University of Colorado Anschutz Medical Campus, or any affiliated institution. It is intended for internal educational use by residents, students, and rotators only, and is not intended for distribution to patients, families, or the public. This version reflects guidance current as of July 1, 2026. Because vaccine recommendations can change between publication cycles, users should verify current guidance against official CDC, ACIP, and AAP sources and institutional protocols before applying it to patient care.

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Vaccine Schedules

The American Academy of Pediatrics (AAP) strongly recommends following its evidence-based immunization schedule to help protect children, adolescents, and communities from vaccine-preventable diseases. Designed to align with normal immune system development, the schedule provides routine protection against more than 18 diseases. The AAP advises against delaying or skipping vaccines, as doing so can leave children at greater risk for serious illness.

Official AAP Immunization Schedule

Please reference the most updated AAP Immunization Schedule for the latest recommendations, downloads.aap.org/AAP/PDF/AAP-Immunization-Schedule.pdf

Table 1 Recommended Child and Adolescent Immunization Schedule for Ages 18 Years or Younger, United States, 2026

American Academy of Pediatrics
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These recommendations must be read with the Notes that follow. For those who fall behind or start late, provide catch-up vaccination at the earliest opportunity as indicated by the outlined purple bars. To determine minimum intervals between doses, see the catch-up schedule (Table 2).

Vaccine and other immunizing agents	Birth	1 mos	2 mos	4 mos	6 mos	8 mos	9 mos	12 mos	15 mos	18 mos	19–23 mos	2–3 yrs	4–6 yrs	7–10 yrs	11–12 yrs	13–15 yrs	16 yrs	17–18 yrs
Respiratory syncytial virus (RSV-mAb [nirsevimab, clesrovimab])	1 dose during RSV season depending on maternal RSV vaccination status (See Notes)		1 dose nirsevimab during RSV season (See Notes)															
Hepatitis B (HepB)	1 st dose	2 nd dose						3 rd dose										
Rotavirus (RV): RV1 (2-dose series), RVS (3-dose series)			1 st dose	2 nd dose	See Notes													
Diphtheria, tetanus, and acellular pertussis (DTaP <7 yrs)			1 st dose	2 nd dose	3 rd dose				4 th dose				5 th dose					
Haemophilus influenzae type b (Hib)			1 st dose	2 nd dose	See Notes			3 rd or 4 th dose (See Notes)										
Pneumococcal conjugate (PCV15, PCV20)			1 st dose	2 nd dose	3 rd dose			4 th dose										
Inactivated poliovirus (IPV)			1 st dose	2 nd dose				3 rd dose					4 th dose					See Notes
COVID-19 (1vCOV-mRNA, 1vCOV-aPS)								1 or more doses of 2025–2026 vaccine (See Notes)					1 or more doses of 2025–2026 vaccine (See Notes)					
Influenza								1 or 2 doses annually (See Notes)							1 dose annually (See Notes)			
Measles, mumps, and rubella (MMR)						See Notes		1 st dose				2 nd dose						
Varicella (VAR)								1 st dose				2 nd dose						
Hepatitis A (HepA)						See Notes		2-dose series (See Notes)										
Tetanus, diphtheria, and acellular pertussis (Tdap ≥7 yrs)															1 dose			
Human papillomavirus (HPV)															2-dose series		See Notes	
Meningococcal (MenACWY-CRM ≥2 mos, MenACWY-TT ≥2 years)															1 st dose		2 nd dose	
Meningococcal B (MenB-4C, MenB-FHbp)																		See Notes
Respiratory syncytial virus vaccine (RSV [Abrysvo])																		Seasonal administration during pregnancy if not previously vaccinated
Dengue (DEN4CYD: 9–16 yrs)																		Seropositive in areas with endemic dengue (See Notes)
Mpox																		

Range of recommended ages for all children
 Range of recommended ages for catch-up vaccination
 Range of recommended ages for certain high-risk groups or populations
 Recommended vaccination for those who desire protection
 Recommended vaccination based on shared clinical decision-making

Parent-Friendly Version of Official AAP Immunization Schedule

There is also a parent-friendly version of the American Academy of Pediatrics immunization schedule, organized into two easy-to-follow age groups: birth through 6 years and 7 through 18 years. www.healthychildren.org/English/safety-prevention/immunizations/Pages/Recommended-Immunization-Schedules.aspx

AAP Recommended Immunization Schedule — 2026

Children Birth Through 6 Years Old

	Birth	1 month	2 months	4 months	6 months	8 months	12 months	15 months	18 months	19-23 months	2-3 years	4-6 years
RSV	✓	1 dose during RSV season				✓	1 dose during RSV season for those at high risk*					
HepB	✓	✓			✓							
RV			✓	✓	✓							
DTaP			✓	✓	✓			✓				✓
Hib			✓	✓	✓		✓					
PCV			✓	✓	✓		✓					
IPV			✓	✓	✓							✓
COVID-19					✓		Recommended for age group				✓	As recommended**
Influenza					✓		Yearly					
MMR							✓					✓
Varicella							✓					✓
HepA							✓	Dose 2: 6 months after dose 1				

For more information, visit healthychildren.org/immunizationschedules.

*<https://www.healthychildren.org/rsv>
 **<https://www.healthychildren.org/covid-19>

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AAP Recommended Immunization Schedule — 2026

Adolescents 7 Through 18 Years Old

	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years	18 years
MenACWY					✓					✓		
MenB							Recommended for some teens			✓		
Flu	✓	Yearly										
HPV (3 doses if given after age 15)			✓ 2 doses recommended									
Tdap					✓							
COVID-19	✓ As recommended for age group											

For more information, visit healthychildren.org/immunizationschedules.

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Common Vaccine Administration Sequences that Follow the AAP Immunization Schedule

A common vaccine administration sequence is often used across University of Colorado Anschutz School of Medicine resident continuity clinics. It is helpful to recognize that while all clinics follow the same AAP immunization schedule, there can be some flexibility and small workflow differences between clinic sites. Clinics should not create their own vaccine schedule separate from AAP recommendations, but they may develop standard practices for when vaccines are commonly given in ways that align with the recommended AAP schedule.

For example, at the 2-month visit, the six recommended routine vaccines (not including seasonal) may be given as three injections plus oral rotavirus vaccine, rather than six separate shots. The picture below shows the vaccine administration sequence as of April 2026 in the Child Health Clinic at Children's Hospital Colorado.

BIRTH	2 MONTHS	4 MONTHS	6 MONTHS
HepB RSV*	HiB DTaP-IPV-HepB PCV Rotavirus	HiB* DTaP-IPV-HepB PCV Rotavirus*	DTaP-IPV-HepB PCV
12 MONTHS	15 MOS	18 MOS-2 YRS	4 YRS
PCV MMR Varicella HepA HiB	DTaP	HepA	MMRV DTaP-IPV
9-10 YRS	11 YRS	16 YRS	YEARLY
HPV*	MenACWY Tdap	MenACWY MenB*	Influenza* Covid-19*

*RSV: 1 dose, < 8 months of age, during RSV season, depends on maternal vaccination status

Rotavirus: 2-3 doses depending on brand

HiB: 3-4 doses depending on brand

HPV: 2 doses between 9-12 yo

MenB: 2 doses between 16-18 yo

Influenza: > 6 months of age, 1st time x 2 doses

Covid-19: > 6 months of age, 1-2 doses depending on age/immunocompromised state



Seasonal Vaccines

Influenza: Annual for patients ≥ 6 months old

- ≥ 6 months old to 8 years old: Two doses, separated by 28 days, in first flu season.
 - If ≥ 9 years old, one shot is sufficient for first and subsequent flu seasons.
- Different types: intranasal (IN) live attenuated, intramuscular (IM) inactivated
 - IM vaccine most common, though both are used depending on practice.
 - Most commonly predicted strains for the upcoming flu season.
 - Important even if previously ill with flu in the current flu season.
 - Egg allergy is not a contraindication.

COVID-19:

- Recommended for all patients 6 months - 2 years of age and for children >2 years with risk factors for severe disease as well as children >2 years without risk factors if they have never been vaccinated or if their parent or guardian desires protection.

Infants & Children 6–23 months:

- Unvaccinated: Start series with 2 doses 4-8 weeks apart
 - Moderna's Spikevax (red label).
 - Received 1 dose: Give second dose 8 weeks after previous dose.
 - Series completed: Give 1 additional dose.
- Immunocompromised (6 months-18 years):
 - Should receive 2 doses 8 weeks apart.

Children 2–18 years with risk factors for severe disease:

- At risk if: residents of long-term care, limited mobility, intellectual disability, congenital heart disease, asthma or otherwise compromised pulmonary function, tube dependence, inflammatory bowel disease (IBD), chronic liver disease, sickle cell disease, diabetes, epilepsy, cerebral palsy, systemic lupus erythematosus (SLE), juvenile idiopathic arthritis (JIA), immunosuppressed status.
- Also at risk if living with someone at risk of severe disease.
 - Give 1 dose, regardless of prior vaccination status.

Previously unvaccinated:

- Children 2-4 years: 1 dose of Moderna Spikevax (red label)
- Children 5-11 years: 1 dose of Moderna Spikevax (red label) or 1 dose of Pfizer-BioNTech's Comirnaty (blue label) vaccine.
- Children 12 years+: 1 dose of any vaccine formulation including: mNEXSPIKE (teal label) and Nuvavaxid (dary cyan label).
- For further nuances and guidance: Pediatric COVID-19 Vaccine Dosing Quick Reference Guide. Published: November 21, 2025. Available at, downloads.aap.org/AAP/PDF/COVID%20Vaccine%20Dosing_Quick%20Reference.pdf

RSV:**Maternal vaccination and infant monoclonal antibodies**

- RSV vaccine in birthing parent during pregnancy (Abrysvo) considered protective if:
 1. Given at 32 to <37 weeksAND
 2. Received ≥ 14 days before delivery
- If no maternal vaccine (or maternal RSV vaccination status is unknown), then all infants age <8 months should receive long-acting monoclonal antibody (nirsevimab or clesrovimab).
- For higher risk children (age 8-19 months old), patients should receive nirsevimab before their second RSV season if meet the following criteria:
 - Higher risk children include lung disease of prematurity, severe immunocompromised status, cystic fibrosis with significant lung disease, or very low weight-for-length. American Indian or Alaska Native children are also included due to social determinants of health associated with RSV infection and time to presentation (versus being a certain race or ethnicity and therefore being at high risk).

Travel Vaccines

The CDC Travelers' Health website, wwwnc.cdc.gov/travel, is an excellent resource for both patients and clinicians. Clinicians can use the site to quickly assess travel-related needs and review destination-specific recommendations. The site also allows users to look up any international destination to find guidance on required and recommended vaccines, health precautions, and travel advisories. General recommendations are included below:

- **MMR:** Infants 6-11 months traveling internationally get one early dose, which does *not* count toward routine series. Ideally given 2 weeks before travel.
- **COVID-19 and Influenza:** For patients ≥ 6 months old for all domestic and international travel
- **Hepatitis B:** Ideally completed before travel. Can consider catch-up or accelerated schedule.
- **Hepatitis A:** Infants 6-11 months old traveling to at-risk regions get one early dose, which does *not* count toward routine series. Infants 0-6 months old are recommended to receive immune globulin for hepatitis A prevention. Ideally given 2 weeks before travel.
- **Typhoid:** Injectable (≥ 2 years old) or oral (≥ 6 years old).
- **Yellow Fever:** ≥ 9 months old if indicated by travel destination.
- **Cholera, Japanese Encephalitis, Meningococcus, Rabies, Tick-Borne Encephalitis** if indicated by travel destination and itinerary.

Travel Clinics

Special travel clinics at Denver Health and the University of Colorado Anschutz are excellent resources for families preparing for international travel. They help ensure that patients receive the most up-to-date vaccinations and tailored travel health advice before leaving. Each clinic is staffed by providers with extensive experience in travel medicine and immunizations. Their services are designed to keep travelers healthy and safe by offering comprehensive pre-travel consultations, recommended vaccinations, and individualized guidance.

Below is information you can provide to families:

Denver Health Travel Clinic

- The clinic does not accept health insurance; payment is due at the time of service. Costs are specific to each vaccine provided. For costs, see: www.phidenverhealth.org/clinics-services/travel/vaccine-costs.
- Appointments are required for all immunization and travel services.
- **Location:** 660 N. Bannock St., Pavilion L, 2nd Floor, Denver, CO 80204
- To schedule a travel consultation or vaccine-only appointment, call **303-602-3520**.
- For questions or additional information, email travelclinic@dhha.org.
- **Website:** phidenverhealth.org/clinics-services/travel

UCHealth Infectious Disease / Travel (TEAM) Clinic – Anschutz Medical Campus

- The clinic does accept health insurance. Families will be billed for costs of travel-specific vaccines (Yellow fever, typhoid are out-of-pocket cost; MMR, meningococcal and other vaccines in routine immunization schedule are covered by insurance) and for other co-pays.
- Appointments are required. Pediatric patients are seen by pediatric infectious diseases physicians from University of Colorado Anschutz and Children's Hospital Colorado. Clinic is located at UCHealth Anschutz.
- **Location:** 1635 Aurora Court, Anschutz Outpatient Pavilion, 7th Floor, Aurora, CO 80045
- **Phone:** 720-848-0191
- For questions about pediatric travel clinic at UCHealth, clinicians can contact Jessica Cataldi, MD, or the pediatric infectious diseases group at Children's Hospital Colorado.
- **Website:** www.uchealth.org/locations/uchealth-infectious-disease-travel-team-clinic-anschutz/

Contraindications & Precautions

It is important to be aware of contraindications that few patients may have to receiving certain vaccines. These are rare and are unlikely to come up in your standard well-child check patient; however, please familiarize yourself with being able to look up contraindications for each vaccine, available at the following website: www.cdc.gov/vaccines/hcp/imz-best-practices/contraindications-precautions.html

- AAP Redbook chapter accessible at: publications.aap.org/redbook/book/755/chapter-abstract/14084193/Guide-to-Contraindications-and-Precautions-to?redirectedFrom=fulltext

Contraindications you should be aware of: These are circumstances when specific vaccines should not be given due to concerns about safety.

- History of anaphylaxis to vaccine/component to specific vaccine (except egg): avoid that vaccine or ingredient
- Severe immunodeficiency (e.g., from hematologic and solid tumors, receipt of chemotherapy, congenital immunodeficiency including SCID, long-term immunosuppressive therapy, or patients with HIV infection who are severely immunocompromised): avoid live, attenuated vaccines (MMR, Varicella)
- Pregnancy: avoid live, attenuated vaccines (MMR, Varicella)
- Severe combined immunodeficiency (SCID) or history of intussusception: avoid Rotavirus, also avoid live vaccines for SCID



Precautions:

These are circumstances that are not definitive reasons to avoid vaccination but require more in depth consideration of risks and benefits with shared decision making prior to administration. Shared decision-making with families is an important part of consent in these situations.

- Mild illness (e.g., viral upper respiratory symptoms) is not a contraindication to vaccination and generally not a precaution either; vaccines are safe and effective in these patients.
- It is safe to vaccinate children who have a minor illness or are currently being treated with antibiotics.¹
- For persons with moderate or severe acute illness (e.g., severe croup/stridor, diffuse skin rash requiring treatment), parents and providers can discuss deferring vaccination until resolution of illness.
 - This may prevent diagnostic confusion between manifestations of the underlying illness and possible adverse effects of vaccination (fever, fatigue, malaise) or superimposing adverse effects of the vaccine on the underlying illness.
 - If deferred, persons with moderate or severe acute illness should be vaccinated as soon as the acute illness has improved.

Observation: all patients, regardless of age, should be seated and observed for 15 minutes after vaccination to monitor for immediate allergic reaction or syncope, www.cdc.gov/vaccines/hcp/administration/after.html

Note: Adolescents are just as likely to experience syncope from vaccine than blood draw. Read more on the study below! ²

¹ Lapphra K, Scheifele D. Can children with minor illnesses be safely immunized?. *Pediatric Child Health*. 2011;16(8):463. doi:10.1093/pch/16.8.463

² Groom HC, Brooks NB, Weintraub ES, Slaughter MT, Mittendorf KF, Naleway AL. Incidence of Adolescent Syncope and Related Injuries Following Vaccination and Routine Venipuncture. *J Adolesc Health*. 2024;74(4):696-702. doi:10.1016/j.jadohealth.2023.11.005

Common and Rare Adverse Events Following Immunization

Common Vaccine-Specific Side Effects: Soreness, low-grade fever, fussiness (hours-2 days).

- These common side effects are signs that your child's immune system was activated and is responding to the vaccine. If symptoms last longer than 2 days, something else may be going on and you should return to your pediatrician.

Rare Side Effects:

- Any vaccine
 - Anaphylaxis (~1 per 100,000-1,000,000 doses).
- Influenza
 - Guillain-Barre syndrome 1-3 per 1,000,000
- Rotavirus
 - Intussusception risk 1/20,000-100,000 within a week after dose 1 or 2.
- MMR
 - Febrile Seizure Risk:
 - Higher in children 12 to 23 months than in older children. No increased MMRV risk is seen at ages 4 to 6.
 - About 8 per 10,000 after MMRV at 12 to 23 months, roughly double the risk.
 - About 4 per 10,000 after MMR and varicella given separately at 12 to 23 months.
 - This is about 1 additional febrile seizure per 2,300 to 2,600 children given MMRV instead of separate injections. The risk window is roughly 5 to 12 days after vaccination.
 - Immune Thrombocytopenia Purpura
 - 1-3 per 100,000

The risk of serious adverse events from vaccination is substantially lower than the risk from natural infection.³

³ Dudley MZ, Halsey NA, Omer SB, et al. The state of vaccine safety science: systematic reviews of the evidence. Lancet Infect Dis. 2020;20(5):e80-e89. doi:10.1016/S1473-3099(20)30130-4

Vaccine Communication

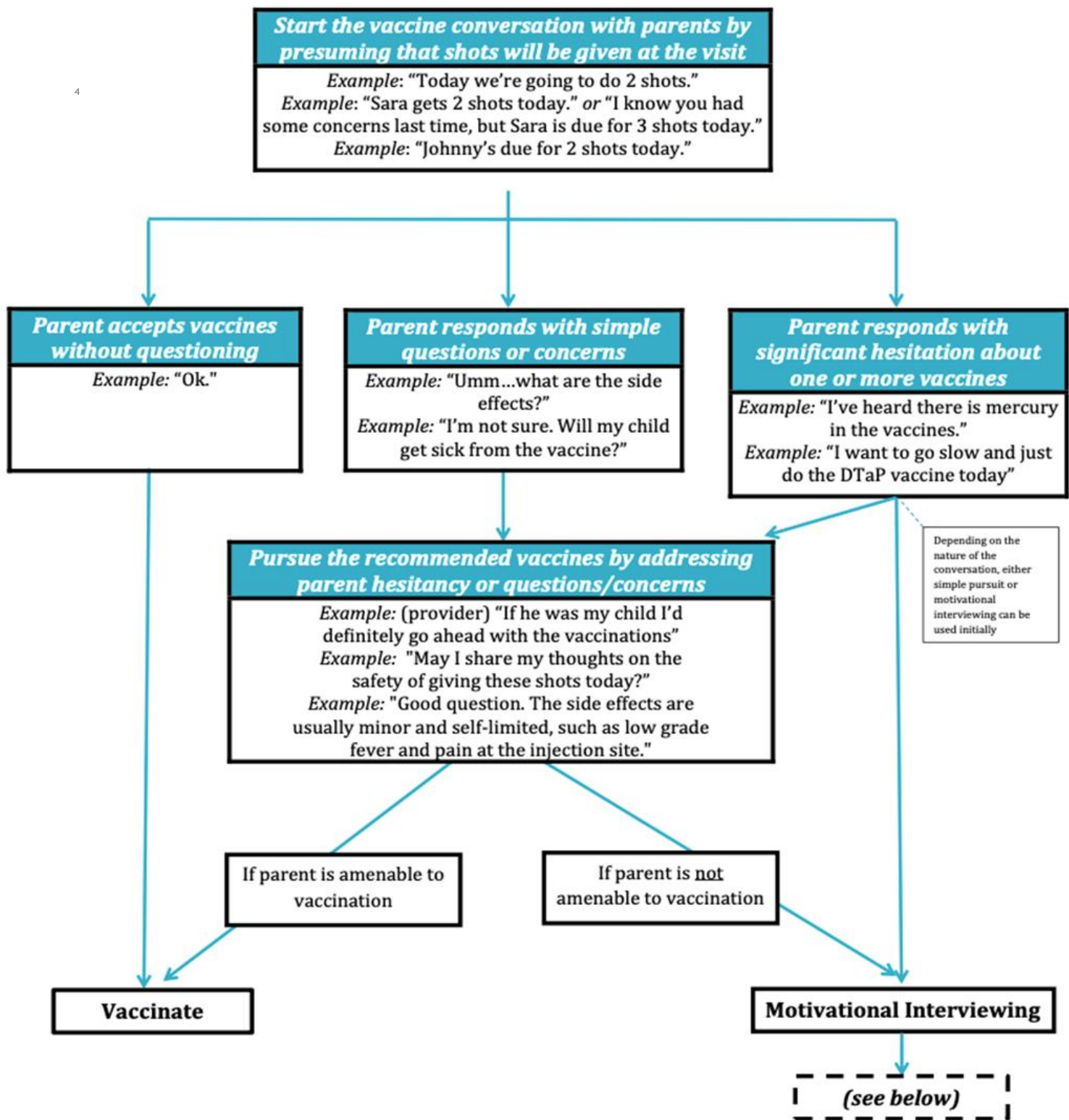
Clinicians can strengthen vaccine communication by using a clear, **confident presumptive or announcement style** (e.g., “Today we’ll give MMR and Varicella”), offering **Vaccine Information Statements (VIS)** at every visit as required by federal law, and using **motivational interviewing** when parents show persistent hesitancy.

VIS sheets, produced by the CDC, give families concise information about the benefits and risks of each vaccine, and must be provided **before every dose** to parents or guardians of children under 18. These strategies help set a collaborative, informed tone in vaccine discussions.

When myths or misinformation arise, effective communication matters just as much as having the correct facts. After hearing a myth, ask permission to respond, then use a simple structure: **state the truth, briefly note why the myth is false, and repeat the true message**—a technique known as the “**truth sandwich**.” Keeping refutations concise prevents accidental reinforcement of the myth. By focusing on clear, respectful, and evidence-based messaging, providers can help families remember accurate information and make confident vaccination decisions.

Please consider using the following algorithms to guide conversations around vaccines:





⁴ O'Leary ST, Opel DJ, Cataldi JR, et al. Strategies for Improving Vaccine Communication and Uptake. Pediatrics. 2024;153(3):e2023065483. doi:10.1542/peds.2023-065483

Motivational Interviewing Skills

Open-ended Questions: helps explore and understand a parent's stance on vaccination

Examples:

- "Tell me more about what you already know?"
- "What might be one good reason to vaccinate your child today?"
- "In your mind, what is the harm if you choose *not* to vaccinate her today?"
- "What are some reasons for getting the vaccination?"

Affirmations: improves parent engagement in an open discussion with you by helping them feel supported, appreciated, and understood

Examples:

- "You are a good parent. Your concern shows how much you care about your child's safety."
- "You are a good mom and you care about your daughter's health."
- "You've always tried to be a good role model for your kids."
- "If you thought the vaccine was safe, you would not hesitate because you want what's best for your daughter."
- "It sounds like you're comfortable with the other vaccines."

Reflections: encourages partnerships, deepens rapport, and allows a parent to understand themselves and their motivations on a deeper level; reflections are particularly useful when encountering strong emotion or hesitancy

Examples:

- "You're frightened by what you've read on the Internet."
- "You're really worried and you want to make the best decision."
- "You're the type of person who really likes to do her research."
- "So it sounds like you're worried about the possibility that the MMR vaccine might cause autism."

Ask Permission to Share: puts parents in a less defensive posture and makes them more receptive to the information you'd like to share

Examples:

- "Could I provide you with some information based on what you just shared?"
- "Would you mind if I shared with you why I think this is such an important vaccine?"
- "May I share what I know about...?"
- "I have a different view, may I share it with you?"

- **Autonomy Support:** enhances a parent's sense of control and makes them feel more at ease with the conversation

Examples:

- "That said, this is a decision only you can make."
- "Only you can choose what is best for your child."

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⁵ O'Leary ST, Opel DJ, Cataldi JR, et al. Strategies for Improving Vaccine Communication and Uptake. *Pediatrics*. 2024;153(3):e2023065483. doi:10.1542/peds.2023-065483

Parent Questions & Answers

Before any specific vaccine Q&A, it is helpful to emphasize that the goal of every encounter is to **build trust** with families. A visit that ends without vaccination can still be meaningful progress if parents feel genuinely heard and the pediatrician feels they had the opportunity to respectfully share accurate information. Many in-depth vaccine conversations unfold over multiple visits and require time, consistency, and relationship-building.

Common high-yield topics to address include:

1. **Pain during vaccination** - discussing ways to reduce discomfort such as topical numbing spray/cream, breastfeeding, sucrose for infants, distraction devices, comfort positioning, and parental presence.
2. **Giving vaccines together vs. delaying them** - especially at the 12-month visit when vaccines such as MMR vaccine are due. Explaining that recommended schedules are carefully studied and that receiving multiple vaccines at once is safe and effective can be helpful.
3. **“The flu shot gives you the flu”** - clarifying that Influenza vaccine cannot cause influenza illness, though mild soreness or short-lived symptoms can occur as the immune system responds.
4. **“My child doesn’t need it”** - reviewing how vaccines protect the individual child, vulnerable family members, and the broader community from serious preventable disease.

In general, when addressing concerns, **focus on facts more than myths**. Communication research suggests that repeating myths can unintentionally reinforce them because people often remember what receives the most attention. Lead with what is true: why vaccines are recommended, how they are tested for safety, and the diseases they prevent.

The questions and answers below are listed in order from most to least common, with links and trusted resources you can reference during the visit or share with families for further review afterward.

“Too many shots”: Safe to administer together; supports timely protection.

- If a new vaccine is added to the schedule at a time when other vaccines are given, studies must be completed to show that neither vaccine interferes with the safety or ability of the other to work.
- Given the diverse repertoire of our immune system, we can respond to about 10,000 different antigens/infectious components in a given day. The CDC vaccine schedule exposes children to only about 200 unique antigens.
- www.chop.edu/vaccine-education-center/vaccine-schedule/science-behind-vaccine-schedule

“Too young to get shots” or “I want to delay vaccines”: Safe to administer per recommended schedule which also supports timely protection.

- Young children are more vulnerable to serious infections, which is why so many vaccines are given early in life to protect them at the time they are most at risk of getting sick.
- No correlation between the number of vaccine-specific antigens received and adverse neuropsychological outcomes.
- The number of immunological components in current vaccines is actually less than the one vaccine (smallpox) that children received 100 years ago.
- Delaying vaccines only increases the duration of susceptibility to life-threatening infections. It is okay to delay vaccines when there are true contraindications or precautions.
- www.chop.edu/vaccine-education-center/vaccine-schedule/altering-the-schedule

“Vaccines cause autism”

- Autism is a neurodevelopmental condition that has a strong genetic component with presentation before one year of age, when MMR vaccine is typically administered.
- No increased risk of autism in those who received one or two doses of MMR vaccine compared with those who didn't. Large studies comparing vaccinated and unvaccinated children do not show differences in rates of autism diagnosis.
- The 1998 Wakefield study that MMR started the vaccine-autism controversy is scientifically flawed with deliberate fraud motivated by substantial financial interests.

The study was fully retracted, and the medical community has extensively disproven any link between the MMR vaccine and autism through many studies. Read more here! www.chop.edu/vaccine-education-center/vaccine-safety/vaccines-and-other-conditions/autism

“COVID-19 vaccine has too many risks”

- Side effects: fatigue, headache, muscle aches, lymph node swelling
- COVID-19 vaccination does not affect fertility in males or females.
- COVID-19 vaccination reduces myocarditis risk from SARS-CoV-2 infection. SARS-CoV-2 poses a much greater myocarditis risk than vaccines for nearly all demographics. Newer analyses have also shown that rates of vaccine-associated myocarditis have dropped to almost non-existent now. The evolution of the long-term prognosis of vaccine myocarditis is being actively monitored, but thus far, there have been no reported deaths or heart transplants required in the US. While some deaths from vaccine myocarditis have been reported, they are exceedingly rare (especially compared to classic myocarditis), and at that point, you are looking at a tiny subset of people within a tiny subset of people. Early- and medium-term outcomes are reassuring. www.chop.edu/vaccine-education-center/vaccine-details/covid-19-vaccine/prevent-covid ⁶

“Too many harmful ingredients in vaccines”:

- Aluminum salts have been used as adjuvants in vaccines in the United States since the 1930s. Adjuvants are additives which help promote stronger immune recognition and response. Aluminum is present in our environment – in the air we breathe, the water we drink, and the food we eat. Infants will get up to 4-12x more aluminum from breast feeding/formula.
- Thimerosal (mercury): Absent from routine vaccines (only in some flu vaccines). Children exposed and not exposed to thimerosal during early infancy had similar outcomes of cognitive-developmental tests and there has not been an association with

⁶ Voleti N, Reddy SP, Ssentongo P. Myocarditis in SARS-CoV-2 infection vs. COVID-19 vaccination: A systematic review and meta-analysis. Front Cardiovasc Med. 2022;9:951314. Published 2022 Aug 29. doi:10.3389/fcvm.2022.951314

autism. Breastfed infants consume 15 times more mercury in breast milk than is contained in the influenza vaccine.

- Formaldehyde: Formaldehyde is used during the manufacture of some vaccines to inactivate viruses and bacterial toxins and to ensure that vaccines can be stored safely. Most of this is purified in later steps of vaccine manufacturing. Formaldehyde is a natural byproduct of DNA synthesis and there is 10x the amount in our blood than in any vaccine.
 - Peak concentrations of formaldehyde in blood were estimated to be less than 1% of the level of formaldehyde naturally produced by the body.
- Gelatin: Used as a stabilizer. Gelatin in vaccines has been highly purified and hydrolyzed. All religious groups have approved the use of gelatin-containing vaccines.
www.chop.edu/sites/default/files/vaccine-education-center-vaccine-ingredients.pdf

“The HPV vaccine has too many risks”

- The only reported side effects are pain, redness, and tenderness at the injection site and allergic reaction (1 in a million).
- HPV vaccine does not increase the risk of autoimmune diseases, including central demyelination, multiple sclerosis (MS), Guillan Barre Syndrome (GBS), connective tissue disease, type 1 diabetes mellitus (T1DM), autoimmune thyroiditis, rheumatoid arthritis (RA), juvenile idiopathic arthritis (JIA), systemic lupus erythematosus (SLE), and immune thrombocytopenia (ITP).
- HPV vaccine does not increase the risk/incidence of chronic fatigue syndrome, complex regional pain syndrome (CRPS), POTS, primary ovarian insufficiency.
- HPV vaccination is not associated with underage sex, earlier sexual exposure, multiple sex partners, or unprotected sex.
- The vaccine prevents 9 of 10 HPV infections.
- >30,000 new HPV associated cancers diagnosed each year in the US; about half are in men including head and neck cancers as well as genital cancers; 8 out of 10 people get HPV at some point in their life.
- www.chop.edu/vaccine-education-center/vaccine-details/human-papillomavirus-vaccine
- www.cancer.org/cancer/risk-prevention/hpv/hpv-vaccine.html

“Vaccines during pregnancy”

- No link between exposure to Tdap, Flu, COVID-19 vaccination during pregnancy and later diagnosis with ADHD, Autism spectrum disorder has been found.
- Maternal infection with influenza and COVID are associated with preterm birth, low birth weight, and other complications for the newborn.
- Young infants are the most vulnerable to infection with pertussis, influenza, COVID, and RSV. Vaccination during pregnancy allows maternal antibodies to pass through the placenta and protect babies during those first few months of life when they are at highest risk.
- www.chop.edu/vaccine-education-center/vaccine-schedule/vaccine-considerations-specific-groups/new-and-expectant-parents

“Vaccines should be delayed for my preterm infant”

- Preterm infants should receive vaccines based on chronological age (not corrected gestational age).
- The HepB birth dose does not count toward the series if the infant weighs less than 2,000g – revaccinate after discharge or delay initial dose.
- Some NICUs delay rotavirus for risk to other medically fragile babies.
- www.chop.edu/vaccine-education-center/vaccine-schedule/vaccine-considerations-specific-groups/preterm-infants
- www.healthychildren.org/English/safety-prevention/immunizations/Pages/Immunizations-For-Preterm-Babies.aspx

“Vaccines increase the risk of SIDS”

- National Vital Statistics SIDS reports found vaccination coverage for routinely used childhood vaccines was not associated with an increased risk of SIDS.
- Patients with SIDS were vaccinated less frequently and later than those infants without SIDS.
- www.chop.edu/vaccine-education-center/vaccine-safety/vaccines-and-other-conditions/sudden-infant-death-syndrome-sids

“Vaccination causes type 1 diabetes”

- No evidence that early vaccinations increased the risk of type 1 diabetes. Read more about the latest study here. ⁷

“My child has an egg allergy and can’t get the Flu vaccine”

- Egg allergy, even severe cases, is not a contraindication to receive flu shots. There may be trace amounts of egg protein (ovalbumin), but this is not enough to cause a reaction.
- www.aaaai.org/tools-for-the-public/conditions-library/allergies/egg-allergy-and-the-flu-vaccine

“Getting vaccines increases the risk of Guillain-Barré Syndrome (GBS)”

- Influenza infection is a stronger risk factor for GBS than is influenza vaccine.
- An association between influenza vaccine and GBS was first noted in the 1970s with the swine flu vaccine. Risk with current influenza vaccines has generally been lower than with that older vaccine.
- History of Guillain-Barré syndrome after prior influenza vaccination is a precaution to future influenza vaccination.
- www.chop.edu/vaccine-education-center/vaccine-safety/vaccines-and-other-conditions/guillain-barre-syndrome

“Vaccines increase risk for MS”

- There is no evidence that vaccines increase risk of MS ⁸

“DTaP affects neurodevelopment”

- In general, no increased risk of serious acute neurological illness including complex febrile seizures, afebrile seizures, infantile spasms, or acute encephalitis/encephalopathy, Reye syndrome.

⁷ Glanz JM, Clarke CL, Daley MF, et al. The Childhood Vaccination Schedule and the Lack of Association With Type 1 Diabetes. *Pediatrics*. 2021;148(6):e2021051910. doi:10.1542/peds.2021-051910

⁸ Mailand MT, Frederiksen JL. Vaccines and multiple sclerosis: a systematic review. *J Neurol*. 2017;264(6):1035-1050. doi:10.1007/s00415-016-8263-4

- Children with epilepsy do not appear to be at increased risk of seizures following immunization.
- Significant number of children with alleged vaccine injury related to old whole-cell pertussis vaccine (DTP / DTwP) had pre-existing neurologic or neurodevelopmental abnormalities. The paper below showing Dravet syndrome /SCN1A mutation association with neurologic issues after vaccination. ⁹

“DNA components in vaccines cause cancer”

- People with cancer are even more vulnerable to getting sick with infections, making vaccination even more important for them and their family members.
- 230 billion doses of vaccine would need to be administered before a potential cancer gene dosage equivalent would be reached, and 83 trillion doses would need to be administered to induce an infective event.
- The number of cancer genes in 100 picograms cellular DNA is less than one-billionth of the amount needed to induce tumors.
- www.chop.edu/vaccine-education-center/vaccine-safety/vaccine-ingredients/dna

⁹ Berkovic SF, Harkin L, McMahon JM, et al. De-novo mutations of the sodium channel gene SCN1A in alleged vaccine encephalopathy: a retrospective study. Lancet Neurol. 2006;5(6):488-492. doi:10.1016/S1474-4422(06)70446-X

Vaccine Requirements for School

Every state has different requirements. For Colorado, please visit the Colorado Department of Public Health and Environment website for the most updated information on required vaccines. Here is the website: cdphe.colorado.gov/immunization/requirements-for-school-entry

Vaccines required to enter childcare

- Hepatitis B (HepB)
- Diphtheria, tetanus, pertussis (DTaP)
- *Haemophilus influenza* type b (Hib)
- Inactivated poliovirus (IPV)
- Pneumococcal conjugate (PCV)
- Measles, mumps, rubella (MMR)
- Varicella (chickenpox)

Vaccines required to enter school (K-12)

- Hepatitis B (HepB)
- Diphtheria, tetanus, pertussis (DTaP)*
- Inactivated poliovirus (IPV)*
- Measles, mumps, rubella (MMR)*
- Varicella (chickenpox)*
- Tetanus, diphtheria, pertussis (Tdap)*

* Students 4 through 6 years of age are required to have their final doses of DTaP, IPV, MMR, and Varicella prior to kindergarten entry.

** Students are required to have Tdap prior to entry into 7th grade. One dose of Tdap is required for 7th through 12th grades.

Students who are physically attending college or university classes must provide proof of immunity to measles, mumps, and rubella diseases, or have an exemption on file at their school.

New college and university students **living in student housing** must review information about meningococcal disease and vaccine. Students are required to provide their school with documentation that they are current with the MenACWY vaccine or have a signed meningococcal vaccine waiver.



Vaccine Development, Approval, and Monitoring for Safety

The modern era of vaccination began with Edward Jenner in 1796, when he scientifically demonstrated that inoculating a person with material from a cow-pox blister could protect them from smallpox. In the early 20th century, several other major vaccines entered routine use—those against pertussis (1914), diphtheria (1926), and tetanus (1938)—and by the late 1940s these were combined into the DTP vaccine (diphtheria-tetanus-pertussis). The landmark achievement of the 1950s came with the licensure of the polio vaccine in 1955, developed by Jonas Salk, which galvanized public health efforts and significantly reduced poliomyelitis in many countries.

From the 1960s onward, vaccine development steadily expanded: the measles vaccine in 1963, mumps in 1967, and rubella in 1969, which were later combined into the MMR vaccine in 1971. The 1970s also saw the eradication of smallpox leading to the discontinuation of routine smallpox vaccination after 1972. In subsequent decades, newer vaccines such as those for Hib (1985), hepatitis B, varicella (1996), rotavirus, hepatitis A, pneumococcal disease, meningococcus, and more recently COVID-19 (2020-2023) were developed and added to immunization schedules. These advances reflect the evolving complexity and broadening scope of vaccine science and public-health implementation. For more about the history of vaccines, please see the Children's Hospital of Philadelphia Vaccine Education Center, www.chop.edu/vaccine-education-center.

How are vaccines made?

Vaccines are made in different ways! Below is a table that summarizes how each vaccine type is made with information from the CHOP Vaccine Education Center. There is a great visual picture that you can use with families as well: www.chop.edu/sites/default/files/types-of-vaccines.pdf.

Vaccine Type	Description	Examples of Vaccines
Live-attenuated (weakened virus)	Weakened virus can not cause severe disease but still induces immunity (may cause mild disease).	MMR; Rotavirus; Varicella; Intranasal influenza
Inactivated (killed virus)	Virus is completely inactivated so it cannot replicate or cause disease.	Inactivated polio (IPV); Hepatitis A; Injectable influenza; Rabies
Subunit / Component (use part of the virus)	Uses specific virus parts (often surface proteins) to trigger immunity.	Hepatitis B; HPV
Toxoid (inactivated bacterial toxin)	Bacterial toxin is inactivated so the immune system learns to recognize and neutralize it.	Diphtheria; Tetanus; Pertussis (DTaP/Tdap)
Conjugated polysaccharide (use part of the bacteria)	Bacterial sugar capsule is linked to a protein to improve immune response. T cell-dependent B cell response to allow immune system to make IgG, IgA.	Hib; Pneumococcal (PCV); Meningococcal ACWY
Genetic vaccines (mRNA, DNA, viral-vectored)	Provides genetic instructions for the body to make a harmless piece of the pathogen (antigen).	mRNA: COVID-19 vaccines, some RSV vaccines for older adults
Monoclonal antibodies (passive immunization)	Provides short-term protection through antibodies to prevent infection	RSV: nirsevimab and clesrovimab

What are the stages of vaccine development?

Vaccine development involves multiple rigorous stages of research, testing, approval, and ongoing monitoring—typically spanning 10-15 years. Below are key high-yield points summarizing each phase of the vaccine-development process. To read more, visit: www.healthychildren.org/English/safety-prevention/immunizations/Pages/how-vaccines-are-developed-tested-for-safety-and-approved-step-by-step.aspx

Stage	What Happens	Key Points
Preclinical Research	Basic science research; identification of vaccine targets; testing in labs and animals to evaluate immune response and safety.	Determines whether a vaccine candidate is viable and safe enough to move into human trials.
Phase 1 Clinical Trials	Small group (tens) of healthy volunteers; evaluates safety, dosing, and initial immune response.	Focuses on safety and identifying optimal dose ranges.
Phase 2 Clinical Trials	Larger, more diverse group (hundreds); further assesses safety, side effects, and immune response.	Helps refine dosing, evaluates consistency of response across populations.
Phase 3 Clinical Trials	Large-scale studies (thousands); evaluates efficacy and detects less common side effects.	Provides the primary evidence for the United States Food and Drug Administration (FDA) approval.
FDA Review & Approval	FDA reviews all safety, efficacy, and manufacturing data.	Approval ensures vaccine meets federal standards.
Advisory Committee on Immunization Practices (ACIP) Review & Recommendations	ACIP evaluates evidence and issues official use recommendations.	Determines how and for whom the vaccine should be used.

Manufacturing Oversight	Ongoing quality testing for each vaccine lot; facility inspections.	Ensures consistency and safety across doses.
Post-Marketing Surveillance	Monitoring through VAERS (Vaccine Adverse Event Reporting System), VSD (Vaccine Safety Datalink), CISA (Clinical Immunization Safety Assessment) for rare or long-term side effects.	Allows ongoing evaluation of safety and effectiveness.



List of Resources

Healthcare Professional List

Resource	Quick Description	Link
AAP Child & Adolescent Immunization Schedule	Official schedule for routine vaccines in children and adolescents	www.aap.org/immunization
Vaccine Integrity Project, CIDRAP	Multidisciplinary group to advocate for Evidence, Access, and Public Trust in Vaccines	www.cidrap.umn.edu/vaccine-integrity-project
Lange's Current Diagnosis & Treatment in Pediatrics (28 th edition in press)	Chapter 10 (Immunization) is a detailed resource for rare and routine situations.	Published in print and available online.
RedBook - International Travel	AAP guidance on vaccines for international travel	www.redbook.solutions.aap.org
CDC Traveler's Health	Travel-related vaccine and health recommendations	wwwnc.cdc.gov/travel
Vaccine Information Statements (VIS)	Official patient education sheets for vaccines	www.immunize.org/vaccines/vis/about-vis/

Family and Caregiver List

Resource	Quick Description	Link
HealthyChildren.org, from the AAP	Overview of common topics on immunizations and disease prevention	www.healthychildren.org/english/safety-prevention/immunizations/Pages/default.aspx
CHOP Vaccine Education Center	Complete, up-to-date and reliable information about vaccines across ages	www.chop.edu/centers-programs/vaccine-education-center
History of Vaccines:	Resources for lesson plans on history of vaccines, how they work, and glossary of terms	www.historyofvaccines.org/
Immunize.org	Comprehensive vaccine education and resources	www.vaccineinformation.org/
Immunize.org - Vaccine Information Sources	List of trusted resources and links to sites	www.vaccineinformation.org/vaccine-basics/trusted-sources/
Immunize for Good	Parent facing site for Immunize Colorado	www.immunizeforgood.com/
Voices for Vaccines	Credible information about vaccines made for families, by families	www.voicesforvaccines.org/



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