

Vaccine Hesitancy

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Learning Objectives: On completion of this article, you should be able to (1) list factors that contribute to modern vaccine hesitancy; (2) identify interventions to improve vaccine uptake that have a strong scientific evidence base; and (3) name 3 online available resources clinicians can depend upon to support their vaccination efforts.

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Abstract

Vaccine refusal received a lot of press with the 2015 Disneyland measles outbreak, but vaccine refusal is only a fraction of a much larger problem of vaccine delay and hesitancy. Opposition to vaccination dates back to the 1800s, Edward Jenner, and the first vaccine ever. It has never gone away despite the public's growing scientific sophistication. A variety of factors contribute to modern vaccine hesitancy, including the layperson's heuristic thinking when it comes to balancing risks and benefits as well as a number of other features of vaccination, including falling victim to its own success. Vaccine hesitancy is pervasive, affecting a quarter to a third of US parents. Clinicians report that they routinely receive requests to delay vaccines and that they routinely acquiesce. Vaccine rates vary by state and locale and by specific vaccine, and vaccine hesitancy results in personal risk and in the failure to achieve or sustain herd immunity to protect others who have contraindications to the vaccine or fail to generate immunity to the vaccine. Clinicians should adopt a variety of practices to combat vaccine hesitancy, including a variety of population health management approaches that go beyond the usual call to educate patients, clinicians, and the public. Strategies include using every visit to vaccinate, the creation of standing orders or nursing protocols to provide vaccination without clinical encounters, and adopting the practice of stating clear recommendations. Up-to-date, trusted resources exist to support clinicians' efforts in adopting these approaches to reduce vaccine hesitancy and its impact.

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The recent outbreak of measles originating in “the happiest place on earth”—Disneyland—resulted in notoriety for Orange County, California, which has been described as the epicenter of vaccine refusal.¹ In the first 4 months of 2015, more than 80% of measles cases reported in the United States occurred in individuals not vaccinated. Of those, 43% cited philosophical or religious objections to vaccination.¹ Although all states require measles-mumps-rubella vaccination for daycare and school attendance, most states permit personal belief exemptions. In 2014, California’s kindergarten exemption rate was 2.5%; however, 8 California counties reported kindergarten children with personal belief exemptions of 8% or higher, with Nevada County having the highest rate of 22%.

Vaccine refusal is the visible surface of a massive iceberg of vaccine delay and hesitancy. Vaccine hesitancy refers to concerns about vaccine safety and necessity. Most vaccine-hesitant parents proceed with most vaccinations but often delay some or all vaccines and, as a result, leave their children at risk for vaccine-preventable diseases. We offer a historical perspective on this phenomenon, describe the impact of vaccine hesitancy, and provide guidance for practicing clinicians.

HISTORICAL NOTES

Antipathies toward vaccination date back to the first vaccine. In the 1800s, Edward Jenner’s efforts to promulgate vaccination with cowpox against smallpox resulted in substantial protest. Clergy protested the unnaturalness of using animal infection in humans. Parents protested the invasiveness of the procedure. Others questioned the scientific basis for contagion and vaccine efficacy. Newspaper cartoonists illustrated the public’s anxiety by depicting cow’s heads growing from the skin of vaccine recipients. Although Britain successfully mandated universal smallpox vaccination in 1855, an antivaccine movement resulted in the law’s reversal in 1895. The father of modern medicine, William Osler, failed to convince a nervous British War Department to vaccinate soldiers against yellow fever, a scourge of World War I. More recently, unfounded claims of neurologic injury from the diphtheria and tetanus toxoids and whole-cell

pertussis vaccine caused widespread rejection of that vaccination in many countries. A resurgence of infant morbidity and mortality from whooping cough ensued.

WHAT FACTORS CONTRIBUTE TO MODERN VACCINE HESITANCY?

Heuristic Thinking

Heuristics are shortcuts we use to estimate risk—something we all do when faced with decisions we want to make quickly. Laypeople qualitatively attach a higher magnitude of risk to threats that they readily recollect using a mental process known as the availability heuristic.² More than a dozen vaccines have joined the routine schedule in the past 30 years. The diseases that these vaccines prevent are rare enough that people may not fathom their seriousness. Examples include *Haemophilus influenzae* type b and invasive pneumococcal disease. Alternatively, some diseases are common enough to generate complacency; patients often assert that influenza poses no substantial danger. The 2009 influenza pandemic is illustrative; a substantial portion of adults did not get the pandemic H1N1 vaccine once available because they no longer believed that the disease posed a serious threat.³

Aggravating this guesswork is the fact vaccination is an act of commission rather than omission.⁴ Vaccination requires performance of an active intervention on a usually healthy individual. For most people, acts of commission, such as routine vaccination, carry heavier moral weight and create more decisional conflict than acts of omission.

Success of Vaccination

Ironically, as vaccines reduce disease occurrence, the lack of disease makes vaccination seem unnecessary and fosters complacency.⁵ Indeed, common claims made by those leading the anti-vaccine movement are that vaccines are unnecessary and the diseases’ disappearances occurred before routine vaccination and because of modern hygiene.

Unnaturalness of Vaccination

Many people protest that vaccination is unnatural. Some antivaccinationists extend this argument, stating that it is more natural and, thus, healthier to develop immunity from the

disease itself. Thus, even in the 21st century, we learn of parents organizing chickenpox parties, purchasing mail-order chickenpox lollipops, and arranging purposeful measles exposures.

The Nature of Scientific Evidence

Laypeople struggle with science's refusal to express itself in absolutes, and when science reverses itself on the dangers of dietary cholesterol and entertains ongoing debates about the utility of prostate-specific antigen testing and mammograms at certain ages and intervals, laypeople associate the same lack of certainty with much-better-studied and understood interventions, such as vaccination.

The Nature of Pharmaceutical or Biological Materials

Vaccination is neither perfectly effective nor perfectly risk free. In the 2014-2015 influenza season, live attenuated influenza vaccine was ineffective against the pandemic H1N1 and had an apparent effectiveness of 25% otherwise. Even the measles vaccine has a measurable failure rate, albeit only 2% to 5%. Although vaccines are better studied and monitored for safety than are any other pharmaceutical or biologic, they inherently pose risks. The measles-mumps-rubella vaccine is a live viral vaccine posing a risk of disseminated disease in the immunocompromised, a small but real risk of anaphylaxis in healthy individuals (approximately 1 of 2 million recipients), and other concerns (thrombocytopenia for 1 of 40,000 recipients). Although benign in nature, fevers transiently resulting from vaccination of infants and toddlers can result in febrile convulsions, which may result in subsequent vaccine delays and refusals.

The Presence of Incipients

Antivaccinationists claim that adjuvants and other vaccine incipients are dangerous. Attempts to minimize concern can backfire, however. The concerted efforts of the Food and Drug Administration, vaccine manufacturers, and public health officials to remove thimerosal from childhood vaccines led to public fears and antivaccinationist rallying cries, despite a lack of evidence that the material ever caused any harm. Remaining incipients continue to

attract unwarranted attention despite a wealth of safety data.

Loss of Public Confidence

Experts note a loss of public confidence in vaccination.⁵ This may potentiate unscientific claims of vaccine dangers (eg, "the measles vaccine causes autism" and "giving too many vaccines at once (or too early in life) is dangerous"). Public health officials and clinicians find the persistence of the fear that vaccines might cause autism particularly frustrating. This fear persists despite revelation of the fraud behind the original claim and numerous studies that have disproven the claim.

WHAT IS THE IMPACT OF VACCINE HESITANCY?

Few children in the United States go completely unvaccinated. In 2013, only 0.7% of children 19 to 35 months of age had none of the routine childhood vaccines due.⁶ The larger problem with routine vaccination is vaccine hesitancy among those who do vaccinate. Salmon and colleagues⁷ showed that 34% of non-exemption-seeking Wisconsin parents—those whose children were up-to-date for school-mandated vaccines—had concerns that too many vaccines would weaken their children's immune systems, and 23% felt that their children received more vaccines than was good for them. Fifteen percent thought it was better for children to acquire their immunity through illness rather than through vaccination.⁷ Rates for these concerns were much higher in exempting parents,⁷ and these findings reflect findings in other regions of the United States.⁸ Clinicians struggle with parental vaccine hesitancy. In 2015, a study showed that clinicians report that parents routinely request delaying vaccines and that clinicians routinely acquiesce.⁹

In 2013, the national up-to-date rate for the routine vaccines due in the first 15 months of life in children aged 19 to 35 months was 70.4%.⁶ This percentage represented no change from the previous year. Across the United States, up-to-date rates vary. Arkansas had the lowest rate at 57.1%, and Rhode Island had the highest at 82.1%. Daycare and school requirements vary across states, despite studies showing that these do improve up-to-date status.¹⁰ For example, in the 2013-2014 school year, the median up-to-date rate for vaccines due by school entry for

the measles-mumps-rubella series was 94.7%.¹¹ That year, the median rate across 49 reporting states for the total percentage claiming exemptions from kindergarten vaccine requirements was 1.8% (1.6% nonmedical exemptions), with the highest rate in Idaho at 6.4% and the lowest in Mississippi at less than 0.1%. Mississippi is 1 of 2 states accepting only medical exemptions. The other is West Virginia at 0.2%. Teen vaccine rates in 2013 showed great variability across the states and across the vaccines due. Forty-two states reached the Healthy People 2020 target for the tetanus–diphtheria–acellular pertussis vaccination for children 13 to 15 years of age, but only 18 did so for meningococcal vaccination.¹² No state met the target for the three-dose human papillomavirus (HPV) vaccine series.¹²

Those who delay or forego vaccination are somewhat protected by the herd immunity created by those who vaccinate. Indeed, Robert Sears, whose *Vaccine Book* serves as a resource for parents seeking to delay their children's vaccines, writes that parents seeking to delay the measles-mumps-rubella vaccine should avoid sharing their intentions with neighbors lest the herd immunity protecting their own child falters.¹³

Vaccine hesitancy results in the failure to achieve or sustain herd immunity. We need nearly 95% immunity to prevent measles outbreaks, but those who refuse vaccination often cluster geographically, creating pockets of underimmunization. Such geographic regions experience higher rates of vaccine-preventable diseases, such as measles.^{1,14}

Furthermore, hesitancy results in the failure to protect individuals against diseases where no herd immunity exists, such as for tetanus and shingles. A disease that once made the list lost its place when concerns about vaccine safety resulted not only in the vaccine's underuse but also its commercial failure—the Lyme disease vaccine LYMERix (SmithKlineBeecham, Pittsburgh, PA). Although no study ever demonstrated any scientific evidence against its safety, given the weight of lawsuits and the failure of widespread use, the manufacturer withdrew the vaccine.

WHAT APPROACH SHALL WE TAKE TOWARD VACCINE HESITANCY?

A 2013 systematic review found no convincing evidence for effective interventions that directly

address parental vaccine hesitancy and refusal.¹⁵ Furthermore, recent studies indicate that pursuing educational efforts to reverse vaccine hesitancy seems to backfire, strengthening parents' negative attitudes and beliefs.¹⁶ However, a systematic review of interventions to improve vaccination uptake found strong evidence for point-of-care reminders, reminder-recall communications, and standing orders.¹⁰ We recommend that primary care clinicians take the lead in pursuing 7 evidence-based practices to improve up-to-date vaccination rates.

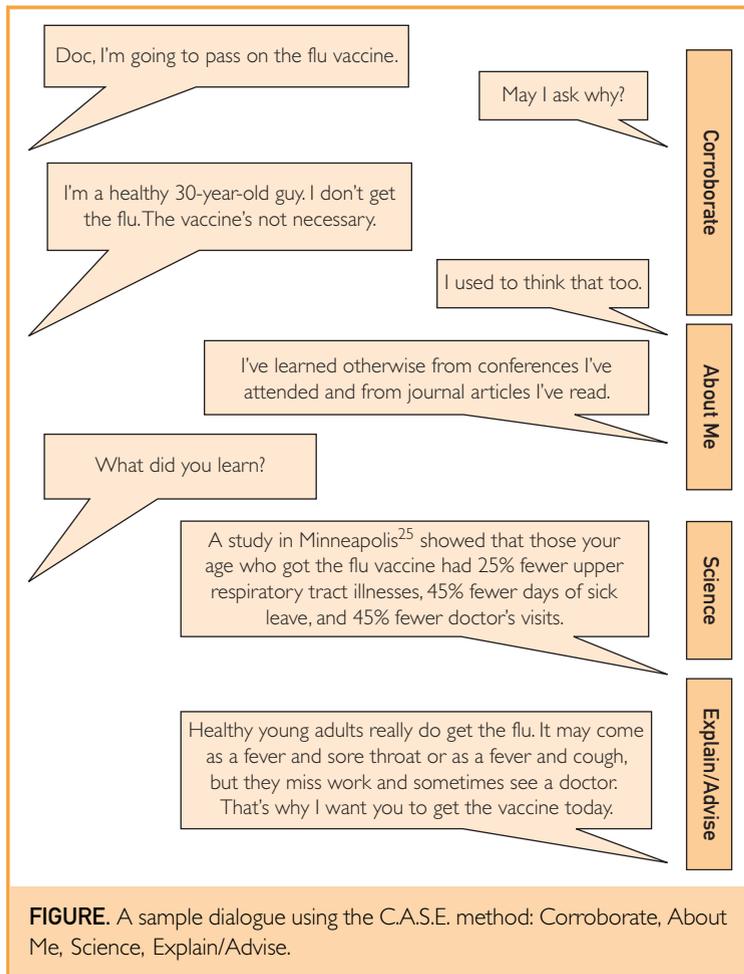
Know the Schedule

With frequent additions and revisions of recommendations resulting in schedule changes, knowing the recommended routine vaccine schedule gets more difficult every year. The Centers for Disease Control and Prevention (CDC) has harmonized the schedule annually since the 1990s to reduce confusion. The Advisory Committee on Immunization Practices (ACIP) works closely with the major clinical colleges and academies, including the American College of Physicians, the American Academy of Family Physicians, the American College of Obstetricians and Gynecologists, and the American Academy of Pediatrics. At least annually, the ACIP publishes childhood, adolescent, catch-up, and adult schedules, including a harmonized schedule reflecting all the changes recommended through the year.

When considering their recommendations, clinicians must not confuse state-specific school and daycare rules with the national ACIP recommendations. Local requirements often do not keep pace with ACIP recommendations and may not include certain ACIP-recommended vaccines. Furthermore, although school and daycare rules are effective in improving the vaccine up-to-date status and reducing vaccine-preventable diseases, states vary in permitting nonmedical exemptions.¹⁰ Communities with higher rates of exemptions have higher rates of vaccine-preventable diseases.¹⁴ The more permissive states experience worse rates of vaccination and vaccine-preventable diseases.¹⁷

Use Every Visit to Vaccinate

Clinicians should use every patient visit to assess vaccination status and deliver needed vaccinations.¹² Such visits otherwise count as



missed opportunities. If clinicians had taken advantage of missed opportunities for HPV vaccinations in 2012, coverage among 13- to 17-year-old females with at least 1 dose of HPV vaccine would have reached 92.6% rather than 53.8%.¹⁸ Many patients do not schedule regular health maintenance visits. Therefore, clinicians must use visits for injuries, acute illnesses, and chronic diseases to identify and address vaccine needs. Point-of-care notification of upcoming or due vaccines also improves vaccine status.¹²

Ascertain Vaccination Status

Relying on oral recollections of vaccine status may result in both undervaccination and overimmunization.¹⁹ The ACIP recommends that clinicians accept only written, dated vaccine records except for influenza and pneumococcal polysaccharide vaccination.²⁰ Clinicians should participate in

regional immunization information systems or registries. Furthermore, clinicians should know the vaccination rates across their panel of patients. Regular assessments make clinicians aware of their coverage rates and lead to their improvement.¹²

Use Standing Orders

Clinicians can substantially improve their practices' vaccination rates through standing orders or nursing protocols.¹² This proven approach facilitates nurse visits where patients can get vaccines without having to undergo a clinical examination. The Immunization Action Coalition publishes standing orders for all routinely recommended vaccines for all ages.

Make Clear Recommendations

Clinician recommendations drive the use of preventive services, including vaccination. Studies of undervaccination show that patients or parents report the clinician failing to recommend vaccines due. National Immunization Survey-Teen data demonstrate that parents whose daughters received the HPV vaccine are 5 times more likely to recall a clinician's recommendation than parents whose daughters did not.²¹

Recordings of conversations between clinicians and parents demonstrate that presumptive communication (eg, "Well, we have to do some shots.") results in vaccination completion more often than does collaborative communication (eg, "What do you want to do about shots?").²² Of note, when parents hesitated or refused, clinicians who persisted obtained higher rates of vaccination despite the initial refusals.

Address Hesitancy With C.A.S.E.

The C.A.S.E. approach—Corroborate, About Me, Science, and Explain/Advise—offers a promising method to address vaccine hesitancy in the clinic (Figure).^{23,24} The clinician starts by seeking to understand the nature of the hesitancy and identifying a shared goal or aspiration. Through this, the clinician *corroborates* the hesitant patient or parent and normalizes the topic. The clinician should then establish or reestablish the clinician's ethos or professional standing. The clinician needs to convey a command of both experience and evidence to address concerns (*about me*). Next, the clinician should summarize the *science* addressing the topic and *explain/advise*

in terms of the common ground and the science so that the patient hears the clinician's recommendation in a way that addresses the basis for hesitation. The [Figure](#) illustrates such a discussion.

PURSUE REMINDERS AND RECALLS

Clinicians should reach out to patients between visits through reminders and recalls.¹² Reminders are messages that notify patients when vaccines are due. Recalls refer to past-due vaccines. A Cochrane Collaboration systematic review reported that these are effective in improving vaccination rates in young and old people whether conducted by mail, telephone, or text.²⁶

RESOURCES

Several resources support practice improvement regarding vaccine hesitancy ([Table](#)). Clinicians should start with the Web pages maintained by the CDC and the ACIP. The ACIP has worked hard to publish harmonized recommendations at least each year for children and adults, including recommendations for high-risk individuals. The CDC also populates the website with information about vaccine delivery, storage, administration, safety, and uptake rates.

The Immunization Action Coalition, a national, not-for-profit resource organized to support clinicians, hosts a website offering practical solutions to organizing information about vaccine recommendations, experts' answers to frequently asked questions, and Vaccine Information Statements translated into 44 languages.

Another resource, Voices for Vaccines, particularly designed for parents, provides vaccine-specific information, testimonies from parents who have successfully addressed their vaccine hesitancy, and online toolkits for improving vaccine delivery.

CONCLUSION

Although vaccine hesitancy began with the first vaccine, its modern formulation maintains a youthful vigor. A variety of factors drives vaccine hesitancy, resulting in outbreaks of vaccine-preventable disease despite having remarkably effective vaccines. Clinicians should know the vaccination schedule and their patients' vaccination status, and they should make their recommendations clear. Furthermore, they should adopt processes that support the management

TABLE. Vaccine Resources for Clinicians and Parents

Resource	Website
For clinicians	
Centers for Disease Control and Prevention Immunization Action Coalition	http://www.cdc.gov/vaccines
Community Preventive Services Task Force	http://www.thecommunityguide.org/vaccines/vpd-ajpm-evrev.pdf
For parents	
American Academy of Pediatrics immunization website	http://www.2.aap.org/immunization
Vaccine Education Center	http://vec.chop.edu/service/vaccine-education-center/home.html
Vaccine Information You Need	http://www.vaccineinformation.org
Voices for Vaccines	http://www.voicesforvaccines.org

of patient populations, including standing orders or vaccine protocols, point-of-care notifications, and reminder-recall systems.

Abbreviations and Acronyms: ACIP = Advisory Committee on Immunization Practices; CDC = Centers for Disease Control and Prevention; HPV = human papillomavirus

Potential Competing Interests: Dr Jacobson serves on a safety review committee for Merck & Co for a study of human papillomavirus vaccine safety and on a data monitoring committee for studies of pneumococcal vaccine immunogenicity and safety.

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