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EDITORIAL

The power of vaccination: from prevention of infectious pandemics to the prevention of cancer: why the skepticism?



To quote Benjamin Franklin, “An ounce of prevention is better than a pound of cure.” Of course, historians would be correct in stating that this famous quote was in reference to a fire prevention speech given in his city of Philadelphia; however, the statement could not be more applicable to disease prevention. Vaccine-preventable diseases are a significant cause of morbidity and mortality. Furthermore, the trickle-down effects of any such disease cannot be measured just in the specific patient mortality or disease sequelae. One must not forget the psychological and financial costs on the patient’s family, income lost due to the inability to work, burden on a health care system, and potential risk to others, especially when dealing with communicable diseases.

One only has to reflect on the current severe acute respiratory syndrome coronavirus (SARS-CoV) 2 pandemic (coronavirus disease 2019) to understand what cost a disease can inflict on our global society with respect to loss of direct human life, burden on health care systems, and complete socioeconomic shutdown.

When faced with any such disease, therapeutic options will consist of 1 of 2 tactics. The first option is to find effective therapies that will eliminate the disease once the patient has already contracted the disease. Although this approach can be effective for the individual patient, it can often result in costly therapies and have long-term effects and does not necessarily prevent spread of disease to other vulnerable groups within the population. One such example includes the viral respiratory disease influenza. This seasonal disease is rather quite benign in healthy populations; however, anyone infected who develops more severe symptoms can be treated with antiviral medications to shorten the duration of disease and lessen the symptoms. Despite therapy, significant symptoms such as fever, malaise, and cough can be significant enough to force even a healthy individual temporarily out of the workforce and utilize precious health care resources. Those unfortunate enough to develop secondary bacterial infections such as *Streptococcus pneumoniae* can have even further complications requiring added medical therapies and costs, including antibiotics, hospitalization, and need for lengthy rehabilitation. Despite existing treatments, a small subset of those patients will die of this disease (0.01% death rate in the United States). Another example is patients who develop

human papillomavirus–related cancers (HPV-associated cancers such as cervical, anogenital, and oropharyngeal cancers). Although this group may be smaller in terms of population numbers relative to a disease such as influenza, the treatment regimens carry far more morbidity (surgery, radiation, chemotherapy) and a larger subset of this patient group will ultimately succumb to their disease. Those who survive will have more posttreatment morbidities, often with lifelong side effects. Future treatments including gene therapy are still in their infancy and are very expensive.

An alternative approach to patient disease is a preventative strategy. This involves a combination of patient education and community-wide vaccination. Through numerous vaccination strategies (killed/inactivated and live/attenuated technologies), the body’s own immune system develops the ability to prevent infection or severely limit the disease’s ability to afflict significant harm and resultant disease sequelae. One only has to look to the numerous examples of the effectiveness of vaccination against diseases such as measles, mumps, rubella, tetanus, meningococcal meningitis, chicken pox, and hepatitis B. Vaccination does not just apply to us as humans but is used to protect our livestock and plant populations, thus ensuring the safety of our food chain and the environment. Indirect vaccination of other animal species can also serve to protect humans by preventing the transfer of zoonotic diseases from other species to humans as evidenced by the SARS-CoV-1 epidemic and SARS-CoV-2 pandemic.

As HPV-related cancers continue to rise, logic would dictate that a vaccine to prevent both the contraction and spread of such a cancer-causing virus would be more prevalent. The current quadrivalent and nonavalent HPV vaccines, designed to protect against the most common HPV serotypes known to cause oropharyngeal, cervical, and anogenital cancers, have clearly shown promise, with a reduction or elimination in both infections and precancerous lesions in young populations that have been studied. Final conclusions as to the efficacy of these vaccines to prevent HPV-related cancers will require another 20 to 30 years of study, with the expected incidence of these cancers to decrease in our recently vaccinated young population (aged 11-15 years) as they reach adulthood. Furthermore, the safety of the HPV vaccine has been studied since its approval

in by the US Food and Drug Administration in 2006, with a demonstrated sustained antibody response of at least 8 years and counting. Myths regarding increased adolescent sexual promiscuity among HPV-vaccinated individuals have also been disproven.

With so much evidence in support of vaccine therapy, why all the hesitation and skepticism? Numerous myths, including insufficient testing, lack of efficacy in disease prevention, decreased natural immunity, the development of the flu, and increased autoimmune and neurologic conditions, have never been proven. Ethical issues surrounding mandatory vaccination for individuals, healthcare workers, students, vulnerable and the general population will continue to be vigorously debated as the rights of the individual versus the health and safety of the collective society continue to be challenged.^{1–3} One must also remember that the maintenance of vaccine-acquired herd immunity is dependent on vaccination coverage above a specific threshold value within that specific population. With

these challenges, it is imperative that health care professionals, teachers/educators, and community leaders serve as positive examples as to the power of vaccination.

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