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Addressing Parental Vaccination Questions in the School Setting: An Integrative Literature Review

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Abstract

School nurses work in a unique environment with key opportunities to address parental concerns and questions regarding their child's health. A common concern for parents during school enrollment is childhood vaccination safety and efficacy. As public health leaders, school nurses are well respected among parents, therefore school nurses are in a prime position to educate parents and promote childhood vaccinations while also dispelling common vaccination myths. The purpose of this integrative literature review is to synthesize evidence-based answers to common parental questions regarding childhood vaccinations.

Addressing Parental Vaccination Questions in the School Setting: An Integrative Literature Review

Vaccination mandates for school children were first introduced in the United States (U. S.) during the early 1800s, primarily to control the transmission of the smallpox virus (College of Physicians of Philadelphia, 2015). Since that time several vaccines have been developed, protecting children from a variety of potentially devastating communicable diseases (Centers for Disease Control and Prevention [CDC], 2014a). Today, all 50 states have instituted childhood vaccination requirements prior to school entry and while the requirements between states are similar, there are also notable differences (CDC, 2011a).

Prior to receiving approval by the United States Food and Drug Administration for widespread distribution, commercially available vaccines undergo rigorous study, thus ensuring vaccine safety and effectiveness (CDC, 2014a). Following the collection of vaccination research, scientific data, and results of clinical trials, the Advisory Committee on Immunization Practices (ACIP) critically reviews the information and then makes a recommendation on the age of vaccine administration, the number of doses in a series, the length of time between doses, and vaccine precautions and contraindications (Advisory Committee on Immunization Practices, 2013). The recommendation is then forwarded to the Director of the Centers for Disease Control and Prevention (CDC), where it must receive final approval before becoming an official CDC recommendation.

While the widespread use of vaccines has unquestionably and positively influenced public health and safety, this tremendous success has, in some cases, resulted in the public's lack of appreciation for the severity of vaccine-preventable diseases (Kempe et al., 2011). Consequently, some children are unvaccinated. The percentage of unvaccinated children in the

U. S., in fact, has more than doubled since 1991 (Offit, 2011) -- a worrisome trend that could potentiate the spread of communicable and vaccine-preventable diseases.

In school settings, children are able to attend class even if inadequately vaccinated, as long as parents have filed a vaccination exemption (Wang, Clymer, Davis-Hayes, & Buttenheim, 2014). There are three types of vaccination exemptions in the U. S.: medical, religious, and philosophical (Seither et al., 2014). All 50 states allow school vaccination exemptions for medical reasons and, currently, 48 states allow school vaccination exemptions for religious reasons (National Conference of State Legislatures [NCSL], 2015). Currently, 20 states allow parents to exempt their children from school vaccination mandates on the grounds of philosophical beliefs, such as personal or moral beliefs; however, California and Vermont recently passed legislation revoking the philosophical vaccination exemption, a change that will take place in July 2016 (NCSL, 2015).

Parents who exempt their children from receiving vaccinations often have questions regarding vaccines. According to one study, the most common parental concerns included questions about vaccination safety, such as whether or not childhood vaccines overwhelmed the immune system or caused chronic illnesses. Parents also had questions regarding vaccine effectiveness. In addition, parents often have questions about how frequently children experience adverse side effects from the vaccine (Luthy, Beckstrand, Callister, & Cahoon, 2012). Some parents refuse a single vaccination because they prefer their child develop acquired active immunity from exposure to a specific pathogen rather than a vaccination (Offit, 2011). Other parents have questions regarding specific ingredients of vaccines and whether or not these ingredients pose health risks (Luthy, Beckstrand, & Meyers, 2012).

As the healthcare expert in the school setting, school nurses are "well-poised to create awareness and influence action to increase the uptake of mandated and recommended immunizations" (National Association of School Nurses [NASN], 2015, para. 1). In addition, school nurses "…play an important role in enhancing vaccine uptake by providing a strong vaccine recommendation; educating about vaccine-preventable diseases, vaccine myths, vaccine safety, and recommended vaccine schedules; and addressing vaccine hesitancy" (NASN, 2015, para. 8). Because school nurses frequently and directly interface with parents, their ability to adequately address parental questions regarding childhood vaccinations is of utmost importance. The purpose of this integrative literature review is to synthesize evidence-based answers to common parental questions regarding childhood vaccinations.

Research Questions

1. Is it possible for vaccines to overwhelm the immune system?
2. Do vaccines increase a child's risk for developing a chronic illness?
3. Do vaccines contain ingredients that can be harmful to children?
4. Does the chickenpox disease provide better protection than the vaccine?

Methods

Nine electronic databases were searched to identify articles examining common parental questions regarding childhood vaccinations and the evidenced-based answers to these questions. All searches were guided by the research questions. The databases included *CINAHL, MEDLINE, Pubmed, Academic Search Premier, PsycINFO, Scopus, Family & Society Studies Worldwide, Health Source: Nursing/Academic Edition,* and *ERIC*. Eight websites were also reviewed, including the Centers for Disease Control and Prevention, American Academy of Pediatrics, Advisory Committee on Immunization Practices, College of Physicians of

Philadelphia, National Conference of State Legislatures, Johns Hopkins Bloomberg School of Public Health, Institute of Medicine, and National Association of School Nurses.

Inclusion criteria encompassed research or review articles published in English and within the past 15 years (2000-2015). Additionally, only articles pertaining to children and adolescents aged 0-18 years were included for review. Research articles published outside the United States and articles pertaining to adult vaccinations were excluded. Search terms included: immunize, immunization, vaccine, vaccination, school nurse, parental questions, parental concern, parental hesitant or refusal, parental attitudes, parent perception, and treatment refusal or refusal to participate, MMR, Autism, varicella, herpes zoster, vaccine safety, vaccine effectiveness, vaccine ingredients, and thimerosal.

Findings

Common parental concerns regarding childhood vaccines were identified in a literature search. Two topics - safety and efficacy - were commonly shared concerns among parents. Questions about vaccination safety included concerns that vaccinations may overwhelm the immune system, cause chronic illness, and contain worrisome ingredients (Allred, Shaw, Santibanez, Rickert, & Santoli, 2005; Hulsey & Bland, 2015; Humiston, Lerner, Hepworth, Blyth, & Goepp, 2005; Kennedy, Lavail, Nowak, Basket, & Landry, 2011; Luthy, Beckstrand, & Meyers, 2012; Smith, Chu, & Barker, 2004; Smith et al., 2011). In addition, parents often express concerns regarding vaccine effectiveness and whether or not contracting the disease provides a superior immune response when compared to the immune response from vaccinations (Healy & Pickering, 2011; Kempe et al., 2011; Luthy, Beckstrand, Callister, & Cahoon, 2012; Whyte, Whyte, Cormier, & Eccles, 2011).

Vaccine Safety

Question 1: Is it possible for vaccines to overwhelm the immune system? The idea that vaccinations have the potential to overload a child's immune system is rooted in a few inaccurate beliefs. One such belief is that the present number of vaccinations administered in the first 2 years of life is excessive when compared to the number of childhood vaccines delivered during the following decades (Kennedy et al., 2011). Thus, some parents worry the number of vaccines currently recommended introduce too many antigens within too short a time period. These parents also express concern that introducing too many antigens in the first 2 years of life has the potential to overwhelm or overload the child's immune system (Hulsey & Bland, 2015). Additionally, some parents incorrectly believe that an infant's immune system is immature and, therefore, ill-equipped to respond to vaccines, at least until later in childhood (Luthy, Beckstrand, & Callister, 2010).

Response. It is true that the total number of vaccinations a child receives by age 2 years old has increased over the last three decades (Every Child by Two [ECBT], 2013a). However, the total number of vaccines received during childhood is less important than the number of antigens or immunological components present within the vaccine. Every vaccine contains antigens that include altered or weakened parts of viruses or bacteria (National Institute of Allergy and Infectious Diseases [NIAID], 2012). When exposed to the antigens in vaccines, the immune system creates antibodies in order to combat the viruses or bacteria, which are perceived as a potential threat. Thankfully, the antigens in vaccines are powerful enough to produce protective antibodies without actually subjecting the child to the illness (CDC, 2014b). The vaccine-induced antibodies remain in the body, continuously searching for exposure to the same illness and then mounting a quick immune response to negate the infection (NIAID, 2011).

From the moment of birth, an infant's immune system is challenged with millions of bacteria and other microorganisms already present in the environment (Plotkin, Orenstein, & Offit, 2013). Fortunately an infant's immune system is capable of managing such challenges, otherwise infants would become ill shortly after birth. In fact, within hours of birth an infant's immune system has already successfully managed the colonization of the gastrointestinal tract with bacteria such as *Escherichia coli* (Gerber & Offit, 2009). While vaccines also challenge an infant's immune system, vaccines cannot over utilize or overwhelm the immune system (Immunization Action Coalition [IAC], 2014). In fact, given the number of circulating B cells and T cells in an infant's immune system and the average number of antigens present in a vaccine, researchers theorize an infant's immune system is capable of receiving 10,000 vaccines simultaneously (Gerber & Offit, 2009).

In the 1980s there were only seven available childhood vaccines. Today children receive up to 24 vaccines by the time they are 2 years old (Children's Hospital of Philadelphia [CHOP], 2013a). While the overall number of vaccines has increased over time, the amount of antigens present in vaccinations has decreased dramatically due to advances in the vaccine manufacturing process, namely in protein chemistry and recombinant DNA technology (CHOP, 2013a; ECBT, 2013a; Offit et al., 2002; Gerber & Offit, 2009). For example, in 1980 the typical child received 3,041 different antigens in vaccinations. Currently, however, children are exposed to only 152 antigens in all childhood vaccines combined (ECBT, 2013a). When compared to the fact that children are routinely exposed to 2,000 to 6,000 antigens with everyday activities such as playing, eating, and breathing (American Academy of Pediatrics [AAP], 2013), the number of antigens present in childhood vaccines is inconsequential.

Question #2: Do vaccines increase a child's risk for developing a chronic illness?

Widely publicized myths exist regarding a correlation between childhood vaccines and predisposition to chronic illnesses although perhaps the most well-known myth is that vaccines cause Autism (Kennedy, Basket, & Sheedy, 2011; Luthy, Beckstrand, Callister, & Cahoon, 2012). The erroneous correlation between vaccines and Autism started in 1998 with Andrew Wakefield's publication in the *Lancet,* which implied the measles, mumps, and rubella (MMR) vaccine caused Autism. In Wakefield's study, fiber optic scopes were inserted into the large intestines of eight children with Autism, all of whom had parents who believed their child's Autism was caused by the MMR vaccine. All of the children, according to Wakefield, had lymphatic nodules in the large intestine and suffered from chronic enterocolitis (Eggertson, 2010; Offit, 2010). Because all eight children had also received the MMR vaccine, Wakefield hypothesized that following MMR vaccination the large intestines were directly infected with the measles virus, thus causing chronic inflammation (Offit, 2011). As a consequence, the chronic intestinal inflammation compromised the integrity of the intestinal wall, allowing the leakage of harmful proteins from the intestines into the bloodstream. Once in the bloodstream, the harmful proteins traveled to the brain where it caused Autism (Offit, 2010).

Following the publication of Wakefield's study, a media frenzy ensued and parents from around the world rapidly became familiar with the concept – albeit an incorrect concept - that a vaccine was to blame for the unexplainable increase in Autism rates (Dube et al., 2013). The public's concern was further fueled with public statements from political leaders such as Congressman Robert F. Kennedy, Jr. and Senators John Kerry, Chris Dodd, and Joseph Lieberman, all of whom said they believed Autism was caused by vaccines (Olpinski, 2012). Additionally, celebrities such as Jenny McCarthy used popular television shows such as *Oprah*

Winfrey Show, Good Morning America, and *Larry King Live* to reach millions of people with anti-vaccine sentiment. While in the spotlight, McCarthy relentlessly insisted that the MMR vaccine was the cause of her son's Autism (Offitt, 2011).

The damage of the negative media coverage quickly became evident. Parents began to delay and, in some cases, completely refuse to vaccinate their children with MMR (Poland & Spier, 2010). In a number of countries, MMR vaccination rates fell and the incidence of measles began to increase (Ahearn, 2010). Moreover, parents refusing to vaccinate with MMR seemed to geographically cluster together, resulting in pockets of unvaccinated individuals throughout the world. Such geographic clusters have perpetuated outbreaks of vaccine-preventable diseases, such as measles (Smith et al., 2011). While MMR vaccination rates have slowly recovered around the globe, the World Health Organization recommends MMR vaccination rates of 95% in order to sustain a healthy herd immunity (Andre et al., 2008). However, 113 countries out of a total of 194 countries still report MMR vaccination rates below 95% (World Health Organization, 2015).

Response: Well-controlled epidemiologic studies provide strong evidence that vaccines do not cause chronic illnesses such as multiple sclerosis, asthma, allergic rhinitis, diabetes, or arthritis (Offit & Hackett, 2003). The most well-known myth regarding vaccines and chronic illness, that vaccines cause Autism (Kennedy, Pruitt, Smith, & Garrell, 2011), has been thoroughly studied in the years that followed Wakefield's publication. The Institute of Medicine (2004) conducted eight safety review panels regarding vaccines and Autism and could find no association. Multiple studies conducted by multiple researchers have since found no evidence of a possible link between any vaccine and Autism (Taylor, Swerdfeger, & Eslick, 2014).

Brian Deer, an investigative journalist for the *Sunday Times,* revealed that Wakefield's study was not only flawed, it was also unethical. Unbeknown to his research colleagues, Wakefield received $800,000 from a personal-injury lawyer who was planning on suing the vaccine manufacturers shortly after the release of Wakefield's article (ECBT, 2013b; Offit, 2010). In 2004, 10 of the original 12 co-authors retracted their names from the article, stating that the data were insufficient to establish a causal link between the MMR vaccine and Autism (Murch et al., 2004). In February 2010, twelve years after its original publication, the *Lancet* retracted the entire article (Eggertson, 2010). Due to his fraudulent research linking the MMR vaccine and Autism, Andrew Wakefield was asked to leave his place of employment at the Royal Free Hospital and lost his license to practice medicine in the United Kingdom (Park, 2010).

Several professional organizations dedicated to finding a cure for Autism have published position statements regarding Autism and vaccines. One such example is Autism Speaks (2015a), the world's leading Autism science and advocacy organization. Rob Ring, the Autism Speaks Chief Science Officer stated, "over the last two decades, extensive research has asked whether there is any link between childhood vaccinations and autism. The results of this research are clear: Vaccines do not cause autism. We urge that all children be fully vaccinated" (Autism Speaks, 2015b, para. 1). Additionally, the Autism Science Foundation, a nonprofit organization whose mission is to support Autism research and provide Autism education to the general public (Autism Science Foundation [ASF], 2015a) stated, "The results of studies are very clear; the data show no relationship between vaccines and autism" (ASF, 2015b, para. 1).

Question #3: Do vaccines contain ingredients that can be harmful to children?

While vaccines are primarily composed of antigens – the substances responsible for stimulating a healthy immune response – vaccines also include small amounts of other ingredients, also known

as adjuvants. Adjuvants are compounds added to vaccines with the primary purposes of either enhancing the immune response or preserving the vaccine's safety (CDC, 2014c; Gellen & Salisbury, 2015). However, oftentimes the purpose for adjuvants in vaccines is not well explained (Gellen & Salisbury, 2015). Thus, parents may not understand the need for vaccine adjuvants and express concern regarding the safety of such adjuvants (Saada, Lieu, Morain, Zikmund-Fisher, & Wittenberg, 2015). Some adjuvants are especially worrisome to parents (Saada et al., 2015), especially those that intuitively sound harmful to children such as aluminum, formaldehyde, or mercury.

The release of Dr. Robert Sears' (2007) best-selling publication, *The Vaccine Book: Making the Right Decision for Your Child*, further stimulated the debate regarding the safety of adjuvants in vaccines, thus promoting vaccine anxiety among parents. For example, while Sears admits "research has not proven that the aluminum in vaccines is harmful," he also states "some research shows that when too much aluminum is given at once, some toxic effects can occur" causing neurologic and degenerative conditions (Sears, 2007, p. 22). Formaldehyde, Sears (2007) says, is the same chemical that "preserved the frogs, cats, or whatever types of cadavers you dissected in biology class" (p. 209). He goes on to say that formaldehyde is present in several vaccines and in the very next sentence states that formaldehyde is "a carcinogen" that "can cause kidney damage and genetic damage' (Sears, 2007, p. 209). Finally, Sears (2007) also weighed in on mercury use in vaccines. In his book Sears (2007) states, "Do I think mercury is harmful? Yes. Do I think the amount in the old vaccines caused harm? I think no one has proven that it was safe, and the studies showing some harmful effects from vaccines containing mercury are thought-provoking" (p. 209). While on one hand Sears (2007) admits that mercury toxicity from vaccines is "a thing of the past" (p. 209), he simultaneously recommends parents

ask their "doctor for a completely mercury-free brand" (p. 208) of flu vaccine to limit the amount of mercury children receive in vaccines.

Response: It is true that aluminum is used as an adjuvant in vaccines. The purpose of aluminum in vaccines is to stimulate an early, potent, and persistent immune response (CDC, 2011b). While some parents may be alarmed at the inclusion of aluminum in vaccines, the amount of aluminum needs to be contextualized. Aluminum is an element that is abundant in nature. It is, in fact, the third most plentiful element on the planet, right behind oxygen and silicon, and is present in plants, water, soil, and air (CHOP, 2014). The amount of aluminum in vaccines is comparable to the amount of aluminum in one liter of infant formula. During their first 6 months of life, infants receive approximately 4.4 milligrams of aluminum from vaccines. However, during the same time span infants who are breastfed ingest about 7 milligrams of aluminum from breastmilk. Furthermore, formula-fed infants ingest about 38 milligrams of aluminum and infants who are fed soy-based formula ingest about 117 milligrams of aluminum (CHOP, 2014). It is important for parents to know that the amount of aluminum in vaccines is small compared to what infants already receive in their normal diet (Block, 2013). Nevertheless, aluminum has been safely used as an adjuvant in vaccines for almost 6 decades (U.S. Food and Drug Administration [USFDA], 2015).

Formaldehyde is used in some vaccines to inactivate viruses and remove naturally occurring bacterial toxins from vaccines without influencing overall vaccine efficacy (Mitkus, Hess, & Schwartz, 2013). There is only a small amount of formaldehyde used in vaccines, although the small amount is further diluted during the vaccine manufacturing process (USFDA, 2014). While the use of such a substance in vaccines may seem unsettling for some parents, formaldehyde is already present in the human body where it is utilized in the process of making

amino acids (USFDA, 2014). The amount of formaldehyde that children are exposed to during vaccination can be as high as 0.2 mg; however, the amount of formaldehyde already naturally present in an average 2-month-old infant is about 1.1 mg. Thus, the amount of formaldehyde already self-produced in an infant's body is five times greater than the amount present in a vaccine (CHOP, 2013b). Furthermore, formaldehyde is metabolized so quickly that it cannot accumulate in the human body (American Chemistry Council, 2015). In fact, Mitkus, Hess, and Schwartz (2013) reported that 30 minutes following injection of a formaldehyde-containing vaccine there were no residual traces of formaldehyde at the injection site. Hence, formaldehyde is safely used as a component in some vaccines.

Thimerosal is an ethyl-mercury compound used as an adjuvant in some vaccines to prevent bacterial growth, although it is quickly processed in the body (CDC, 2011b). Some parents, however, confuse ethyl-mercury with methyl-mercury. Methyl-mercury is present in fish and shellfish and, because it is slowly excreted from the body, has the potential to cause neurotoxicity when ingested in large amounts (Offit & Moser, 2011; U.S. Environmental Protection Agency, 2014). While ethyl-mercury may audibly sound similar to methyl-mercury, the two compounds are chemically very different. Notwithstanding these differences, in 2001 ethyl-mercury was removed from virtually all vaccines, with the exception of some influenza vaccines (CDC, 2014c), in response to a joint statement from the American Academy of Pediatrics and the U.S. Public Health Service (AAP, 1999). However, the statement was based upon data regarding methyl-mercury exposure and neurotoxicity, not exposure to ethyl-mercury. No causative link has ever been established between ethyl-mercury and neurological disorders in children (Hurley, Tadrous, & Miller, 2010).

Vaccine Effectiveness

Question #1: Does the chickenpox disease provide better protection than the vaccine? Traditionally, chickenpox has been viewed, not as a dangerous infectious disease but rather a common disease virtually all children had before adulthood (CHOP, 2013c). In fact, before the chickenpox (varicella) vaccine in 1995 parents often viewed chickenpox simply as a rite of passage during childhood (Offit & Moser, 2011). Some parents would even have their child attend chickenpox "parties" (Hambleton & Arvin, 2005) to ensure infection with the chickenpox virus during childhood when the infection was typically milder (IAC, 2015; Offit & Moser, 2011).

With the availability of a new chickenpox vaccine states began to pass legislation, requiring chickenpox vaccination prior to school entry (Lopez, Kolasa, & Seward, 2008). Such legislation markedly improved the uptake of chickenpox vaccine and, as a result, cases of chickenpox in the United States decreased ten-fold (CHOP, 2013c). While the chickenpox vaccine was successful in reducing the cases of chickenpox, still, about 15-20 children in every 100 did not develop sufficient immunity to chickenpox after one dose of the vaccine (CHOP, 2013c). As a result, some parents began to doubt the effectiveness of vaccines when compared to the long-lasting immunity from contracting the illness (Luthy, Beckstrand, & Meyers, 2012).

In 2007, a study published in the New England Journal of Medicine reported that children who initially developed chickenpox immunity after the first vaccination did not have long-lasting immunity, meaning the efficacy of the chickenpox vaccine waned with time (Chaves et al., 2007). Chaves et al. (2007) further reported that children who had received their chickenpox vaccine within 5 years had a reduced risk for developing a moderate or severe case of chickenpox. In contrast, children who received the chickenpox vaccine more than 5 years ago

had an increased risk for developing moderate or severe chickenpox (Chaves et al., 2007). In response, the ACIP updated the childhood vaccine schedule in 2007, recommending a second dose of chickenpox vaccine (Marin, Guris, Chaves, Schmid, & Seward, 2007). Despite the change in vaccination schedule, some parents still questioned whether or not "natural immunity" following chickenpox infection was superior to the immunity developed after two chickenpox vaccines (Offit & Moser, 2009).

Response: Exposure to the natural illness produces a superior immune response when compared to the immune response following vaccination (CHOP, 2013d). However, parents should carefully consider the risk of exposing a child to a disease process as opposed to the risk of receiving a vaccination. While diseases often produce life-long immunity, the infections are often accompanied by moderate to severe disease symptoms and, in some cases, can result in long-lasting effects or even death (CHOP, 2013d). Vaccines, on the other hand, provide immunity without the potential consequences of the disease (Offit & Moser, 2011).

One clear example of the benefits of vaccination in lieu of disease is chickenpox, caused by the varicella-zoster virus. With chickenpox disease, the varicella-zoster virus can migrate from the skin lesions to the nervous system where it can remain dormant for many years (Offit, 2011). Later in adulthood, though, the varicella-zoster virus can reemerge, causing a shingles infection. Similar to chickenpox infection, shingles causes an outbreak of painful rash with blisters on the skin that can last up to 5 weeks (National Institute of Neurological Disorders and Stroke [NINDS], 2015). Unfortunately, 20-30% of shingles patients over 60 years old develop post-herpetic neuralgia, a secondary complication of shingles (Fashner & Bell, 2011). Furthermore, individuals suffering from shingles can also transmit the varicella-zoster virus to unvaccinated children (NINDS, 2015), thus perpetuating chickenpox infection.

While chickenpox infection caries a life-long risk of a secondary shingles infection, the chickenpox vaccine protects against chickenpox while simultaneously lessening the risk for shingles infection as an adult (Offit & Moser, 2011). In fact, those who receive two doses of chickenpox vaccine are 50% less likely to develop shingles later in life. Furthermore, the chickenpox vaccine also reduces the incidence of post-herpetic neuralgia by 66%. Even in patients who develop shingles despite receiving the chickenpox vaccination, a subsequent shingles infection is much less severe (National Foundation for Infectious Diseases, 2009). Therefore, while naturally-acquired immunity is perhaps longer-lasting, vaccine-induced immunity spares the individual from experiencing the disease and lessens the risk and intensity of secondary illnesses such as shingles and post-herpetic neuralgia.

Discussion

Providing accurate vaccine education to parents is an important strategy to reduce vaccine hesitancy (Kestenbaum & Feemster, 2015), albeit the school nurse must first establish an ideal environment wherein the parent-nurse conversation can occur. At the very foundation of effective communication with vaccine-hesitant parents is the principle of respect. Facilitating a respectful interaction between school nurse and parents with vaccine concerns promotes trust and may ultimately help guide parents towards the decision to vaccinate (Leask et al., 2012). In addition to establishing respect, Healy and Pickering (2011) also recommend establishing an open and honest dialogue where parents can express their vaccine concerns without feeling as though they are being judged. With this type of environment, parents who are uniformed but educable usually respond favorably to vaccination education (Healy & Pickering, 2011).

While it may be tempting to utilize fear tactics during communication, for example trying to alarm parents with the dreaded consequences of contracting a vaccine-preventable illness,

such communication strategies may be ineffective with some parents (Nyhan, Reifler, Richey, & Freed, 2014). Though anti-vaccine activists often capitalize on anecdotal storytelling to instill fear and doubt in parents with questions regarding vaccines (Shelby & Ernst, 2013), pro-vaccine messages that instead focus on myths and facts with evidence to counteract the myths appears to be an effective strategy in increasing parents' existing knowledge regarding vaccines (Cameron et al., 2013). In addition, it is helpful to not only understand parents' vaccination beliefs but also determine the process by which parents came to their conclusions (Brunson, 2013), such as under the influence of a friend or trusted family member. With this knowledge, the school nurse can tailor the vaccine education to meet parents' needs.

Because parents may still have lingering questions regarding vaccinations, even after receiving in-depth information by the school nurse, it is helpful to suggest additional resources where parents can access accurate and reputable information (Healy & Pickering, 2011). It is important for the school nurse to guide the parents to specific and reputable websites, rather than simply encouraging the parents to search the Internet for answers where they are required to filter through less than reputable websites with inaccurate information. Parents who have no guidance in their search for further information will, in fact, encounter more sites with incorrect information than with correct information, which could perpetuate vaccination myths (Ruiz & Bell, 2014).

Implications for School Nurses

The public identifies nurses as experts in health-related matters (Miller & Reynolds, 2009) and as trusted sources of health-related information. In fact, according to a recent Gallup poll the American public perceived nurses to be both honest and ethical in their interactions (Riffkin, 2015). Additionally, nurses have topped the list of the most ethical professionals for

well over a decade (American Nurses Association [ANA], 2015). As trusted health authorities nurses have an ethical responsibility to promote the health and wellbeing of the patients entrusted to their care. Encouraging parents to vaccinate their children and offering in-depth information regarding the safety and efficacy of vaccinations promotes the health and wellbeing of school-aged children and is one of the many ethical responsibilities of school nurses.

School nurses are on the front lines of educating the public on vaccinations and "should use evidence-based immunization strategies, such as…strong vaccination recommendations, and vaccine education for students, staff, and families" (NASN, 2015, para. 1). Consequently, it may be helpful for school nurses to have ready-made resources to direct vaccine-concerned parents to reputable resources (see Table 1). Furthermore, school nurses should have access to trustworthy materials, which can be easily accessed and utilized to share concise and consistent vaccination information with parents, perhaps through regular email correspondence, on the school's Facebook page, or through school newsletters (see Table 2).

Conclusion

Vaccination rates are steadily declining in part due to parental concerns regarding safety and efficacy. Although vaccinations are required prior to school enrollment, exemption rates continue to increase. School nurses are on the front lines, interacting with vaccine-hesitant parents, and must provide factual and evidenced-based information to parents about vaccinations. Therefore, it is imperative school nurses have access to resources that provide accurate and pertinent information regarding common parental concerns for childhood vaccinations. School nurses are in a position to help decrease vaccinations exemption rates through parent education while using reliable resources.

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Table 1: Resources to guide parents with vaccine concerns

Author(s)	Title	Resource Type	Availability	Cost
P. A. Offit and L. M. Bell	*Vaccines: What you should know.*	Book	Online and traditional bookstores. Paperback and Kindle.	Approx. $30
P. A. Offit and C. A. Moser	*Vaccines and your child: Separating fact from fiction.*	Book	Online and traditional bookstores. Paperback and Kindle.	Approx. $15
P. A. Offit	*Deadly choices: How the anti-vaccine movement threatens us all.*	Book	Online and traditional bookstores. Hardcover, paperback.	Approx. $15
P. A. Offit	*Autisms false prophets: Bad science, risky medicine, and the search for a cure.*	Book	Online and traditional bookstores. Paperback and Kindle.	Approx. $15
M. G. Myers and D. Pineda	*Do vaccines cause that?! A guide for evaluating vaccine safety concerns.*	Book	Online and traditional bookstores. Paperback, audiobook, and Kindle.	Approx. $12
American Academy of Pediatrics	*Immuniza-tion resources: Addressing common concerns of vaccine-*	Website	http://www2.aap.org/ immunization/pediatricians/ pdf/vaccine-hesitant%20parent_final.pdf	Free

	hesitant parents.			
American Academy of Pediatrics	*Immuniza-tions.*	Website	https://www.healthychildren.org /english/safetyprevention/ immunizations/pages/default.aspx	Free
Children's Hospital of Philadel-phia	*Parents PACK*	Website with videos and newslet-ters	http://vec.chop.edu/service/parents-possessing-accessing-communicating-knowledge-about-vaccines/home.html	Free
Luthy, Asay, Gibson, and BYU College of Nursing	*Reasons to immunize*	YouTube video	https://www.youtube.com/watch?v=6J92tWPYA_U	Free
L. M. Eden	*Measles, Mumps, & Rubella (MMR) vaccine*	Website	https://youtu.be/kxEqRnxMft8	Free
American Academy of Pediatrics	*Questions and answers about vaccine ingredients*	Website	http://www.vaccinateyourbaby.org/pdfs/Vaccine_ingredients.pdf	Free
Every Child by Two	*Parents' guide to immuniza-tions*	Website with electronic booklet	http://www.ecbt.org/images/articles/Complete2014GuideGeneric.pdf	Free

Table 2: School nurse materials for distribution of vaccine-related information

Author(s)	Title	Resource Type	Availability	Cost
Immunization Action Coalition	*Responding to parents.*	Website with handouts	http://www.immunize.org/talking-about-vaccines/responding-to-parents.asp	Free
Centers for Disease Control and Prevention	*Provider resources for vaccine conversations with parents.*	Website with handouts	http://www.cdc.gov/vaccines/hcp/patient-ed/conversations/	Free
Association of State and Territorial Health Officials	*Communicating effectively about vaccines: New communication resources for health officials.*	Website with free print adds	http://www.astho.org/WorkArea/DownloadAsset.aspx?id=5464	Free
Children's Hospital of Philadelphia	*Vaccine update for healthcare providers.*	Website with free newsletters and webinars	http://vec.chop.edu/professionals/vaccine-healthcare-providers/home.html	Free
American Academy of Pediatrics	*Immunization FAQs*	Website with free question and answer handouts	http://www2.aap.org/immunization/families/faq.html	Free
Vaccine News Daily	*Latest headlines*	Website with daily vaccination headlines	http://vaccinenewsdaily.com/	Free
Immuniza-tions for Public Health	*Are vaccines safe? Evaluating information on the Internet*	Pdf pamphlet for download	http://immunizationinfo.com/wp-content/uploads/2015/03/Are_Vaccines_Safe.pdf	Free