BACKGROUND: All 50 states have school-entry immunization requirements, and many also allow exemptions based on medical and non-medical reasons. School nurses are responsible for managing student immunization compliance based on state policies, but lack standardized resources and guidance.

METHODS: Pennsylvania school nurses (N = 21) participated in semi-structured interviews regarding their strategies for communication and management of student immunization information, along with resources needed for practice improvement. Data were analyzed using descriptive content analysis.

RESULTS: Nurses reported similarities in timelines used for communication of immunization requirements, but differences in mechanisms used to secure and manage immunization records. Nurses reported a need for clarity regarding exclusions and exemption policy implementation and requested standardized resources and guidance for navigating immunization compliance.

CONCLUSIONS: A need exists for standardized processes that support immunization compliance. Furthermore, nurses highlighted a need for additional training and enhanced networks to develop creative strategies for promoting immunization uptake among families.

Keywords: school nursing practice; child & adolescent health; communicable diseases; health policy; organization & administration of school health programs.

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Adolescent immunizations are important to maintain the health of our population. In the United States, all 50 states and DC have immunization requirements for school entry to mitigate preventable disease transmission. However, states also allow exemptions from immunization for medical reasons, and most allow non-medical exemptions (NMEs) based on the parents’ religious, philosophical, and/or personal beliefs. In recent years, rising rates of NMEs have been associated with lower immunization...
compliance. When exemption rates are high, herd immunity can be compromised, exposing vulnerable populations to vaccine-preventable disease outbreaks. This has contributed to outbreaks of preventable diseases such as the 111-case outbreak of measles in late 2014 that originated at Disneyland.\(^3\)\(^4\) In response to the recent outbreaks of vaccine-preventable diseases, Pennsylvania (PA) has reduced the school-entry provisional period from 8 months to 0 days for single-dose immunizations, and 5 days for multi-dose immunizations.\(^5\) As an example, seventh-grade students are required to have one dose of tetanus, diphtheria, acellular pertussis (Tdap) and one dose of meningococcal conjugate vaccine (MCV) by the first day of school or risk exclusion. According to PA Department of Health (DOH) in 2018, 94% of middle school students were vaccinated with Tdap and MCV.\(^6\) As PA allows NMEs, overall exemptions from vaccination were reported for medical (.08%), religious (1.4%), and philosophical (1.5%) reasons. However, rates of NMEs are much higher (up to 8.3%) in certain PA communities, challenging herd immunity.

School nurses play a pivotal role in the collection and management of student immunization data. The literature further suggests nurses are tasked with promoting immunization and educating students and families.\(^7\)-\(^9\) We conducted formative work with school nurses (N = 9) in a high-need, PA school district to explore the nurses’ role and practices in vaccination communication. As the only employed medical professional in the school setting, nurses face complex challenges with immunization compliance. They reported “telling [parents] what the requirements are” and “teaching about the value of immunizations,” even going so far as calling clinicians’ offices to make appointments for immunizations. The data from this focus group encouraged us to gain a deeper understanding of the school nurse’s role in immunization communication and compliance across PA.

The purpose of this study was to improve understanding of the communication and management of student immunization information, identify needed resources to help improve those processes and understand parent attitudes and barriers to immunization compliance from a school nurse’s perspective. To our knowledge, this is the only qualitative study investigating school nurse perspectives on these topics. National school nurse organizations conduct semi-regular surveys with constituents,\(^10\) but there is limited literature describing the perspectives and processes used by school nurses to implement school-entry immunization compliance strategies and procedures.

**METHODS**

**Participants**

School nurses were recruited at the PA Association of School Nurses and Practitioners conference in March 2019. Additionally, nurses from a local partnering school district were recruited through an email invitation. Interested nurses (N = 38) completed an online screening survey to determine eligibility, resulting in 37 eligible participants. All participants were required to fluently speak and read English, and be a part- or full-time school nurse in PA. One nurse was found ineligible due to an inability to fluently speak and read English. Ultimately, 21 school nurses representing 5 of the 6 Pennsylvania health districts participated in semi-structured phone interviews from May to July 2019.

**Procedures and Instrumentation**

Eligible participants completed an online demographics questionnaire. Study data were collected and managed using REDCap (Research Electronic Data Capture), a secure, Web-based application designed to support data capture for research studies, hosted at Penn State Health Milton S. Hershey Medical Center and Penn State College of Medicine. Interviews (N = 21) were scheduled based on school nurse availability. Each 30-minute interview was conducted over the Zoom conference platform, recorded and professionally transcribed. At the start of each interview, participants were reminded that their participation was voluntary, and they could decline at any time. There were no refusals. Study team members conducted interviews using a semi-structured interview guide (Figure 1) that included questions about the communication and management of student immunization information, practices related to immunization exemption and student exclusion, and resources needed to help improve those processes and practices.

**Data Analysis**

Descriptive content analysis was used to analyze the data.\(^11\) Codes were initially identified using a data-driven approach, and definitions for each code were developed to enhance consistency among coders.\(^12\)-\(^14\) Using NVivo 12, 2 coders independently coded 20% of the transcripts using the developed codebook (Table 1). Individual coding was compared for reliability (kappa) between them and modest adjustments to the codebook and definitions were made to enhance consistency in coding. When an acceptable kappa was reached (> .8), the 2 coders divided the transcripts and independently coded the full dataset.

**RESULTS**

**Participant Characteristics**

All nurses who participated in the interviews (N = 21) were white females and the majority (81%) had a graduate degree. Over half (57%) served in an
urban school setting and 43% served multiple school ages (Table 2).

Overview of Themes

Through qualitative analysis, 4 key themes were identified that related to: (1) immunization compliance management and communication processes, (2) alternative communication strategies, (3) practices and opinions regarding exclusions and exemptions, and (4) resources needed for navigating immunization compliance.

**Theme 1: Immunization compliance management and communication processes.** Nurses reported the common first step in the immunization compliance process was reviewing existing student records to identify students who are non-compliant. Specifically, for middle school students with a seventh grade MCV and Tdap requirement, nurses initiated the review in the spring of sixth grade. All nurses reported using electronic data management tools (N = 21), such as Skyward, eTools, SNAP, or Sapphire, to track student immunization records. Interestingly, several nurses reported using paper tracking systems in addition to their electronic tracking systems, noting “our student health records are electronic...but we also keep vaccine cards.” Nurses who indicated serving different school buildings in a district reported diversity in the data management methodologies applied, citing “the nurses in the other schools keep handwritten sheets, where I keep an electronic sheet.”

Upon identifying missing immunization records, nurses contacted students’ families to request updated immunization records and/or remind families of the need to have their student immunized for entry into the subsequent school year. Overall, phone calls (N = 20; 95%) and letters (N = 19; 90%) were used to communicate with families. In about half of the interviews, nurses indicated communicating with parents through their school website (N = 10; 50%) or email (N = 9; 43%). Text messages were not used.

Nurses shared similar timelines for engaging parents in communication about immunization requirements. In Figure 2, we summarize a parent communication timeline resulting from data extracted from nurse interviews. Over half (N = 15) of the nurses reported making “phone calls over the summer to parents as a last reminder.” Nurses reported increased efforts in the few weeks before the start of the school year and then subsequent involvement with administrators if compliance was not met. When handling unresponsive parents, nurses reported the need for implementing multiple communication tactics over several months, such as sending a notice in the spring, another mailing in July for non-compliant immunization students, and a final “e-mail blast through our software [program].”
| Category/primary codes and secondary codes (subcategories) | No. of coded references | Description |
|-----------------------------------------------------------|-------------------------|-------------|
| Communicating with families about vaccine requirements   | 154                     | This set of codes is intended to capture specifics about the communication interactions/methods used for obtaining immunization records/exemptions |
| Educational resources used                                |                         |             |
| Phone call communication                                  |                         |             |
| Text message communication                                |                         |             |
| Email communication                                       |                         |             |
| Letter communication                                      |                         |             |
| School website communication                              |                         |             |
| School portal communication                               |                         |             |
| Not specified communication strategy                      |                         |             |
| Non-English communication strategies                      |                         |             |
| Barriers to communicating with families about requirements|                         |             |
| Exemption/waivers from vaccination                        | 42                      | Includes all references made to exemption/waivers (process, conversations about it, etc.) |
| Exclusion of non-vaccinated students                      | 40                      | All references made to exclusion practices actually occurring (alternatives to exclusion, process, administrator involvement, etc.). Applies to exclusion at the beginning of the school year for non-compliance and exclusion of an unvaccinated child due to an outbreak. Does not include references to things heard about or what other people are doing. |
| Steps taken by nurses to increase individual student vaccination | 41                      | This is different from the nurse’s process used to communicate about vaccine requirements. Includes quotes regarding details at the beginning of the school year during “crunch time” as the nurse is trying to get all students compliant. |
| Host a vaccine clinic                                      |                         |             |
| Make appointments for children                            |                         |             |
| Contact doctors’ offices                                  |                         |             |
| Search for information in State Immunization Information System (SIIS) |                         |             |
| Nurses provide individual educational/support/consults to parents |                         |             |
| Vaccine data management process                           | 92                      | “Methodology for tracking data” should include things like “we track electronically and on paper” or “we use skyward software”. Also include any references to how much time it takes |
| Methodology for tracking data                             |                         |             |
| Responsible person/people                                 |                         |             |
| Resources needed to improve the process                   | 61                      | Resources were coded in instances when nurses identified specific resources and changes they perceive would improve the immunization compliance process |
| Resources/education needed by nurses for parents          |                         |             |
| Networking/collaboration with other nurses or partners    |                         |             |
| Skills training needed for nurses                         |                         |             |
| Universal change                                          |                         |             |
| Other                                                      |                         |             |
| Parent reported barriers/reasons why parents do not vaccinate | 33                      | Captures any reasons provided by nurses as to why parents do not vaccinate (beliefs, too busy, etc.) |
| Yes                                                       |                         |             |
| No                                                        |                         |             |
| Nurses work over the summer                               | 21                      | Includes all mentions of work (paid or unpaid) over the summer to get the vaccine work accomplished. |
| Yes                                                       |                         |             |
| No                                                        |                         |             |

**Theme 2: Alternate communication strategies.**

About half (N = 11) of the nurses reported needing to use alternative communication strategies for non-English speaking families. Some nurses used district-provided interpreter services to assist with calling families (“I have 4 interpreters in the building that will make calls for me”), or external interpretation services, such as Language Line, if no internal resources were available. Nurses also reported working with English as a second language (ESL) students, ESL teachers, and foreign language teachers to assist in communicating with non-English speaking families. Still, other nurses rely on an English-speaking student in the home, with one nurse stating, “I’ve found… there’s usually somebody in the household that can assist.”

When nurses were unable to break the communication barrier verbally, they used multiple methods to translate written materials. Some nurses reported...
using a software platform, such as Skyward or Trans-ACT, to translate emails and phone calls based on a family’s primary language. Nurses who did not have a software platform in place used documents and letters that had already been translated, such as handouts that are publicly available through the PA DOH, or used an online translator, such as Google Translate. Beyond communicating with families, school nurses have gone one step further by helping to educate students and teach them to be their own advocate. One nurse described her strategy of speaking directly with rising seniors to engage them in their own health care, “I do a one-on-one contact with them, the actual student, at the end of the year... I call them together and explain [the requirements] to them... being that those are 17-year-olds, they should at least be able to have some interaction with their parents about it.” Another nurse described speaking “to the children directly [to] try to impart the importance of the vaccinations... so hopefully they can be advocates as well.”

**Theme 3: Practices and opinions regarding exclusions and exemptions.** Practices related to immunization exemption and student exclusion varied among respondents. While nurses reported that exemptions, sometimes known as waivers, are not very common, they do contribute to sub-par immunization rates. Nurses also referenced that people have “already made up their mind” and cannot be persuaded when it comes to exemptions. In addition, there was a common sentiment of not knowing how to approach parents regarding exemptions: “...it’s a tricky process, so I don’t discuss exemptions with them.” Another nurse reported exemptions being beyond the scope of her role:

> The exemption is not between the nurse and the parents, that’s between the doctor and the parent... If a parent did want an exemption, we would refer them to the physician so that that parent and physician can discuss the pros and cons of that.

This was not the perspective of all nurses, as several reported personalized approaches to improving vaccination rates among those who requested exemptions. One strategy required the parent to re-sign an exemption every year to reaffirm that “it’s not that they just forgot about it, it’s that they have chosen for the
student not to get it.” Other nurses referenced contacting care providers for immunization records and scheduling immunization appointments, even getting bus passes or taxis for transportation for appointments in an attempt to reduce barriers for families. Several also reported volunteering time over the summer to contact families.

The nurses who work hard to prevent exemptions expressed frustration with the ease at which a parent can request an exemption, suggesting that “they’ll just get an [exemption] because they can sign [it] for any reason, and they’ll do that rather than get the immunizations.” They also reported feeling that some parents chose to sign an exemption form for their child because “they were sick of [nurses] following up with them,” or “[getting the immunization] was just inconvenient.”

When nurses were unable to achieve immunization compliance within the provisional period, they reported differing practices for excluding students. When referencing different school buildings within a district, one nurse stated “It’s the wild west. Everybody pretty much does their own thing.” Some nurses shared examples of strict adherence to the PA Code for school health, “If they have not made an attempt... they’re excluded. No option” and “They just can’t come to school.” Other nurses reported their school opted for a more flexible approach stating if parents are making reasonable attempts to get immunizations, they let the children attend school and “worry about it as we go.” Another approach to non-compliance was to put students who were not immunized in a separate classroom.

Despite exclusion practices varying during times of wellness, nurses reported confidence in their ability to enforce policies related to exclusion during an outbreak. Many of them cited the PA DOH recommendations, where they would notify individual parents, alerting them of “a case of chickenpox and according to the [PA DOH] guidelines, [their] student needs to stay out of school... We always refer them to their physician too.”

**Theme 4: Resources needed for navigating immunization compliance.** When nurses were asked to describe tools or resources that supported their success or may help them be more successful in managing immunization compliance, several cited accessing their existing networks, such as other local nurses, regional or state-wide groups, for guidance in challenging situations. Nurses also described the Statewide Immunization Information System (SIIS) as an important tool for obtaining immunization records of students. However, they described frustration with the inconsistency in reporting of immunization records in the SIIS, “…if all pediatricians participate with the SIIS program so that the information was available on every student; that would be the best thing for us.” One nurse even alluded to the value the database would have for students and their families stating:

> If the doctor inputs immunizations in that database, no matter where that student goes, the nurse can pull that up and have all their vaccinations right there. Because many times we might say to a family member, ‘you know your child needs a vaccination or they’re going to be excluded’ and they don’t have anything to hand to us and then we find out that at someplace they had the vaccination, they just didn’t know. The doctor didn’t put it in this database...

Nurses also requested resources that improve parental response, stating, “I think we all have the same frustrations and have all tried numerous things and nobody’s come up with the ideal way to get that information yet from parents.” One nurse suggested that a toolkit would be of value, “it might help keep things [standard] across the board.” Some nurses also discussed the need for additional training or resources to help them navigate challenging conversations with parents, “…We do have a lot of students that have philosophical and religious exemptions…we need more education…to get more grassroots education to those people…just to be sure that they’re making the decision based on good information.”

**DISCUSSION**

Results of the nurse interviews highlight several common communication methodologies and a general communication timeline to consider, along with creative solutions to commonly faced immunization compliance barriers. In addition, several aspects of the school nurse role in immunization compliance deserve greater attention and guidance, particularly strategies for handling immunization exemptions and student exclusions, and an opportunity for a greater promotional role in immunization uptake.

Nurses used a variety of methods to communicate and track immunization compliance data. However, phone calls and letters emerged as the most common mechanisms. Several studies and case reports described using similar communication methods and reaching parents with reasonable success. Swallow and Roberts described a school-based intervention using direct-mailed letters to parents. The intervention increased immunization compliance from 66% to 99.6%, exceeding both national and state averages.

In today’s digital age, most parents have a text-message enabled mobile phone and an email address. Consideration should be given to using more technology-centered approaches for reaching parents of non-compliant students. In a study by Bar-Shain et al. a family practice clinic used text
message reminders to parents to improve adolescent immunization compliance. Similarly, Morris et al. described an intervention comparing multiple methods of parent communication when attempting to update an immunization registry. Their study suggested text messages are an effective method to reach parents. They also reported that e-mail and postcard correspondence were effective, though less so than text messages. Each of these mechanisms had greater effectiveness than phone calls, which were only slightly better than no intervention. Despite the evidence suggesting text messaging is useful, none of the nurses in our study reported using this communication method.

Whereas communication strategies can be found intermittently throughout the literature, there is little information available regarding the timelines applied by school nurses in these studies. In our study, although nurses reported individualized timelines and strategies, they generally described a 6-month timeline of communication activities to support immunization compliance (Figure 2). Additional research is needed to fully understand the impact of this emerging model on school-aged immunization compliance.

Interviews revealed that persistence and creativity are key in managing immunization compliance. Beyond the traditional communication methods, several nurses shared unique examples of how they go “above and beyond” to improve immunization compliance. One nurse indicated that “typically you spend 90% of your time on 10% of the students…” which was evident in the unique strategies reported, such as arranging transportation, reaching out to clinicians’ offices, and scouring the PA-SIIS on a frequent basis to secure updated data that may not have been directly provided to a nurse.

Creativity may be especially important to ensure proper communication for hard-to-reach populations, such as transient families or those with limited English proficiency. For the latter, nurses described a combination of written and verbal communication methods, primarily calling on resources that were already available to them, such as ESL teachers and translation services. A study by Boyer-Chu described several different strategies for reaching this population and highlights the importance of developing translated materials for immunization education and compliance. Engaging students in the immunization compliance conversation was a tactic utilized by several nurses, and similarly supported in a study by Maurer et al. who describe having students develop immunization compliance reminder postcards to be mailed to their parents as they approach a school-entry immunization milestone.

The PA Code for school health specifies immunization requirements, PA’s allowance of exemptions, and policy for excluding non-compliant students. However, guidelines and best practices have not yet been developed for nurses expected to uphold the code. For example, detailed guidance for excluding students who are non-compliant beyond any allowable school-entry provisional periods or during outbreaks would be useful. Nurses reported a multitude of strategies to prevent students from exclusion due to immunization non-compliance, including making immunization appointments and holding vaccine clinics within the school setting. However, there was inconsistency in practices reported by nurses when students were non-compliant at the conclusion of the provisional period. Some schools reported implementing exclusions as written in the PA Code, while others cited loose adherence or adapted procedures. Interestingly, some nurses discussed strategies for quarantining non-compliant students from compliant students, while still allowing them to attend school. Motivators for this strategy include both continuity of educational activities for the student and safety-related concerns, as younger students would not be allowed to leave the school building without the care of their parent or approved guardian, regardless of their compliance status.

Parents in PA can easily request a NME for moral or philosophical reasons. Some states that allow these exemptions have provisions in place to make it more challenging to be granted an exemption, such as needing the exemption notarized or requiring that the parent participate in an educational session about the impacts of their immunization decisions. Several nurses in this study described challenges in securing immunization data from parents and felt that the exemption form was an “easy out” to no longer have to be bothered by the nurses’ requests for immunization records. Also, nurses described a lack of confidence in discussing immunization with families who indicated they may be hesitant to immunize or interested in requesting an exemption. Similar findings were reported in a study describing a survey conducted among members of the National Association of School Nurses, indicating a need for more robust strategies for discussing these challenging and sometimes controversial topics. In addition, a survey of school nurses in Ohio and Missouri revealed that nurses’ level of confidence had an impact on whether or not they would suggest the HPV vaccine to parents, suggesting improving nurse self-efficacy could have a positive impact on their ability and likelihood to have vaccine-related discussions with families. Nurses have the opportunity to set the immunization record straight, both figuratively and literally. They should feel empowered to be immunization advocates and provide counseling and guidance.

The role of the school nurse in immunization compliance can be enhanced and made more efficient with additional resources. In many communities,
school nurses are a trusted source of medical information and guidance.\textsuperscript{5,24,25} The Council on School Health underscores the importance of school nurses as a part of the health care delivery team.\textsuperscript{26} School nurses see students and families more regularly than traditional medical providers, particularly in the adolescent age range when few see their primary care clinician on an annual basis.\textsuperscript{27} As such, nurses serve as an important link—both educational and advocative—between primary care providers and families as it relates to immunizations. However, training and additional resources are required to best support school nurses in this role.

State and national-level school nurse professional organizations have developed limited resources\textsuperscript{28} to advise nurses in their immunization compliance roles, and the lack of a standardized process is mimicked in the paucity of literature supporting this topic. Nurses in this study often cited the use of standardized vaccine information sheets provided by the PA DOH or the US Centers for Disease Control and Prevention. However, they also reported the need for resources that improve their confidence in speaking with parents about needed immunizations, particularly if those parents are hesitant and/or considering exemption.

In addition to local nurse-specific resources, policy-level changes would create significant support for the nurses’ roles in immunization compliance. States with reliable registry systems relieve the burden on nurses by providing a dependable and easily accessible source of immunization information,\textsuperscript{17,29} increasing the nurse’s capacity to serve in consultative and educational roles for families considering the non- or modified-immunization route. While school nurses currently have access to the PA-SIIS, lack of regulation for immunization providers to keep this registry up-to-date undermines the value of the system for school nurses and causes them to seek immunization information directly from the students’ parents and/or providers. Currently, the PA DOH provides resources for school nurses to effectively plan and implement data collection for other required student screenings, such as annual height, weight, vision, and hearing screeners.\textsuperscript{30} Similar resources that describe best practices and successful strategies for immunization compliance would be useful for school nurses.

**Limitations**

Limitations of this study include the use of self-reported data from school nurses who spoke from their perspectives. Additionally, most nurses were recruited at the 2019 PA Association of School Nurses and Practitioners conference, which may result in some selection bias due to the convenience sample. However, demographics of nurses in this study were similar to those completing a nationally representative survey described by Willgerodt et al.\textsuperscript{31} This study focused specifically on the change in PA immunization policy and interviewed only PA nurses, meaning the findings of this research may not be generalizable to other states with differing school-entry immunization policies. This study was based on a descriptive analysis so there were no priori hypotheses or formal statistical methods.

**Conclusion**

The results of this study demonstrate a need for standardized processes and guidance that PA school nurses can use to achieve immunization compliance. School nurses are in the unique position to interact with students and their families to promote immunization compliance. However, this role requires creative solutions and is influenced by their access to training resources, educational materials, and support from their school administration and state government. Nurses could benefit from additional opportunities to connect with regional, state-wide, and even national networks, along with training focused on enhancing motivational interviewing skills, particularly for interfacing with parents who are “on the fence” about immunizations.

**IMPLICATIONS FOR SCHOOL HEALTH**

The findings of this study may assist administrators and policymakers as they work to improve student health. We propose several implications below:

- Administrator support for ongoing professional development and networking may enhance nurse self-efficacy for communicating with parents about immunization requirements, particularly those seeking immunization exemptions.
- Districts may benefit from creating standardized processes regarding the handling of exemptions and exclusions within their community and improving clarity and consistency among nurses and administrators throughout all school buildings. This will be particularly important if immunization requirements change as a result of a COVID-19 vaccine.
- State-level attention to the development of resources for school nurses, such as standardized communication methodologies, trainings, and the investment of a reliable SIIS is paramount to reducing these barriers to immunization compliance.

**Human Subjects Approval Statement**

This study was approved by the Penn State College of Medicine Institutional Review Board (IRB # 11916) with an exempt determination.
Conflict of Interest
The authors declare no conflict of interest.

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