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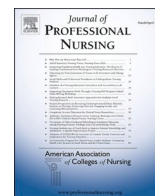
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Addressing immunizations in nursing education: Immunization resources for undergraduate nursing

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ABSTRACT

Nursing faculty are challenged to integrate immunization content in prelicensure nursing curricula. Historically, most immunization content has been delivered in pediatrics courses, with less emphasis on other populations across the lifespan. Skills related to vaccine administration may be prioritized over the most current immunization science, such as pathophysiology, immunology, and epidemiology. As the most trusted profession rated by the public (Saad, 2020), nurses are ideally suited to address vaccine hesitancy and promote vaccination in the communities they serve. Nurses apply active listening, problem solving, and communication skills with patients and their families, contributing to a person's confidence in their decision to be vaccinated. The Centers for Disease Control and Prevention and the Association for Prevention Teaching and Research collaborated to develop a framework for immunization content and teaching resources, Immunization Resources for Undergraduate Nursing (IRUN), for faculty to use in designing the nursing curricula. Content includes a curriculum framework, curriculum mapping tool, multiple teaching resources, and a dedicated website (IRUNursing.org). The framework provides guidance for faculty on integrating immunization content into a curriculum. Teaching resources include case studies, simulation scenarios, and PowerPoint slide decks. Although primarily focused on prelicensure nursing education, resources are also relevant to advanced professional nursing education.

Introduction

Addressing immunization content in prelicensure nursing curricula has become increasingly important due to the development of new vaccines, the need for strategies to increase vaccine confidence, the impact of international travel and globalization of health, the changing epidemiology of vaccine-preventable diseases, and an expanding body of scientific knowledge. Integration of immunization content in prelicensure nursing programs has been challenging; curricula

development is often impeded by content saturation and the rapidity of evolving evidence, and advances in clinical care across all areas of health care. As this occurs, older or more traditional content, such as that related to immunizations, can become reduced or even removed from the curriculum. In addition, nurse educators may prioritize teaching topics that are perceived as more closely aligned with the National Council Licensure Examination-RN®. Yet, a primary duty of educators is to ensure students are prepared to be competent clinicians who can provide care to diverse populations, in multiple settings, and

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across the care continuum. This necessitates immunization education being provided in an organized and comprehensive manner.

A 2010 survey of over 400 U.S. nurse educators reported dispersed immunization content across the curriculum, with 78.8 % of taught immunization content disseminated across more than one course (Buckner et al., 2010). Although much of the content is reported as being dispersed across multiple courses, pediatric theory courses were reported to deliver 81.4 % of immunization content. As such, immunization content in nursing curricula may not be perceived as relevant or important to other populations, such as pregnant persons, adults, seniors, and health care professionals. Covered content focused on vaccine administration (60.5 %) and immunization schedules (63.2 %), with less emphasis on principles of immunity (30.0 %) and other key concepts. Educators identified the most common barriers to teaching immunizations were content fragmentation (44.7 %), inadequate resources (33.6 %), and confusing content (32.5 %) (Buckner et al., 2010).

High immunization rates are necessary to protect the wellbeing of all and for the attainment of community immunity. The nursing workforce must be prepared to promote vaccine confidence with accurate immunization information. Nurse educators can influence nursing students' attitudes and beliefs, which carry over into the students' practice as health care professionals. In a review of 185 studies, Paterson et al. (2016) found that health care professionals who were vaccinated were more likely to recommend vaccination to their patients, have more positive attitudes toward vaccination, have higher vaccination rates, and be more knowledgeable about vaccines. Yet, nurses sometimes feel unprepared to discuss vaccines with patients or their caregivers due to "lack of training" (Paterson et al., 2016). In addition, research indicates nursing students had less immunization knowledge and increased vaccine hesitancy compared to other health care professional students (Dysband et al., 2019). Ensuring that nursing students are educated in immunizations may create a paradigm shift in future clinical settings. The expectation is that a nursing student who is confident and competent in immunizations will one day become a registered nurse who will subsequently promote accurate vaccine messages to their patients and the public.

The Immunization Resources for Undergraduate Nursing (IRUN) project was developed through a CDC Workforce Improvement Project funded through the Academic Partnerships to Improve Health Cooperative Agreement (Centers for Disease Control and Prevention, 2018). The Workforce Improvement Project aims to improve the health of populations while engaging the existing workforce and future health professionals in various areas of public health practice. IRUN includes resources to help improve immunization knowledge and access to and consistency of current information for faculty and students.

Nurses are on the front lines of patient care and are responsible for providing immunization services. As advocates, educators, and health care professionals, nurses play a key role in achieving and maintaining high immunization coverage. A core component of clinical prevention and population health is provision and oversight of safe and appropriate vaccine administration following Advisory Committee on Immunization Practices (ACIP)/CDC (Centers for Disease Control and Prevention, 2021a) recommendations. It is essential that nursing faculty design curricula to incorporate comprehensive vaccine knowledge and communication skills to interact with individuals (or parents/caregivers) who have questions. Curricular standards for registered nurses delineate clear expectations for preparation in clinical prevention and population health (American Association of Colleges of Nursing, 2008; American Association of Colleges of Nursing, 2021; Council of Public Health Nursing Organizations, 2018).

Utilizing the IRUN resources will ensure that nursing students have evidence-based knowledge regarding immunization practices, such as vaccine storage and handling, vaccine administration, and contraindications and precautions, and can employ effective vaccine-related communication skills for diverse populations. IRUN provides up-to-date resources to enhance the inclusion and integration of

immunization content in prelicensure nursing curricula. This article discusses the IRUN project and the primary resources that have been developed. It suggests how nursing faculty members may use these resources to improve immunization content within their programs, thereby preparing a future nursing workforce.

Procedure

The IRUN project was created through a cooperative agreement between CDC's National Center for Immunization and Respiratory Diseases, and Association for Prevention Teaching and Research (APTR) to offer resources to increase immunization content in prelicensure nursing curricula and ensure a future nursing workforce that supports the Healthy People 2030 objectives. To initiate this project, in 2015 CDC and APTR collaborated with the AACN to convene an invitational meeting of prelicensure nursing faculty from across the country with expertise in immunization education, vaccine research, community health, and resource development. Twelve academic institutions and seven national nursing practice and education associations were represented: AACN, American Nurses Association, Association of Community Health Nursing Educators, National Association of School Nurses, National Council of State Boards of Nursing, National Student Nurses' Association, and National League for Nursing. These participating nursing faculty and nursing association representatives were called the Nursing Education Experts (NEE) (Table 1). Additionally, nursing students participated in the first and subsequent meetings.

During this first meeting, APTR representatives summarized feedback collected from NEE members regarding the integration of

Table 1
Nursing Education Experts and organizations.

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^a IRUN Project Staff.

immunization content into the curriculum, which corroborated findings from Buckner et al. (2010) that nursing curricula related to immunization content lacked structure and content was not taught consistently within any program. The IRUN NEE members subsequently provided three main recommendations to address these issues: 1) develop a framework to guide immunization education in prelicensure nursing programs, with content appropriate for prelicensure professional nurses, 2) develop teaching resources for nursing faculty, and 3) assure wide availability of the IRUN Curriculum Framework and teaching resources for nursing faculty and practicing nurses on a dedicated website.

IRUN project resources

Project resources were developed by expert nurse educators across the United States in conjunction with CDC immunization experts to support faculty in implementation of the framework components. The IRUN project resources included curriculum resources (framework and mapping tool) and teaching resources (case studies, simulation scenarios, and PowerPoint slide decks). Resources can be adapted or integrated into any nursing curriculum. IRUN resource content is based on ACIP recommendations and the CDC 13th Edition Epidemiology and Prevention of Vaccine-Preventable Diseases, commonly referred to as “The Pink Book” (Centers for Disease Control and Prevention (CDC), 2015). Although the resources have varied content, all of them address common core immunization issues, including vaccine safety, storage and handling, and administration.

IRUN curriculum framework

The purpose of the IRUN Curriculum Framework is to 1) provide guidance for faculty on integrating immunization content into a curriculum, with a focus on entry-level learning for the prelicensure nursing student, 2) ensure access to and consistency of current information for faculty members and students, and 3) prioritize information and content to be included in nursing curricula.

The IRUN Curriculum Framework is adapted with permission from the Public Health Agency of Canada, 2008 “Immunization Competencies for Health Professionals,” and three U.S. immunization curricula: Teaching Immunization Practices (now retired), Nursing Initiative Promoting Immunization Training (2021), and Competencies of the Immunization Technical Workforce (World Health Organization, 2021). Competencies of the Immunization Technical Workforce was originally developed by CDC’s Global Immunization Division and designed for the assessment, design, development, and evaluation of immunization workforce development initiatives.

The IRUN Curriculum Framework is organized into 12 topic areas (Table 2). Each topic area includes a description, recommended objectives, and suggested resources. Objectives are written broadly to provide faculty members with latitude in developing content depth. The IRUN Curriculum Framework and teaching resources can be found on the IRUN website (Immunization Resources for Undergraduate Nursing (IRUN), 2021).

Curriculum mapping tool

The IRUN Curriculum Mapping Tool (CMT) links the objectives of the 12 IRUN Curriculum Framework topics to relevant sample courses or areas of study within a nursing curriculum. For example, discussion on types of immunity, antibodies, antigens, and factors that affect immune response could be addressed in Pathophysiology for Nursing Practice. Alternatively, types of vaccines (i.e., live, nonlive), vaccine components, storage and handling best practices, and vaccine diluent expiration could be addressed in Pharmacology. These concepts can also be applied through Health Assessment through the demonstration of vaccine administration as it pertains to the appropriate site and age of the patient. The CMT operationalizes the IRUN Curriculum Framework and

Table 2
IRUN curriculum framework topics.

Framework topics	Content
1. Public health perspective	The impact of immunization on the health of the population, the entities and systems in place to ensure/maintain a highly immunized population, and the nursing-related activities to support this effort.
2. Immunization strategies	Barriers to immunization, evidence-based strategies to increase vaccination coverage, and the nursing-related activities to minimize missed opportunities to vaccinate.
3. Immune system/immunology	Types of immunity, difference between immunity from vaccination and immunity from wild-type infection, factors that affect vaccine immune response.
4. Vaccine-preventable diseases	Vaccine-preventable diseases covered by routinely recommended vaccines to children, adolescents, and adults; vaccine-preventable diseases covered by travel vaccines; symptomatology and infection control of vaccine-preventable diseases.
5. Types of vaccines	Types of vaccines, how they are derived, how they produce immunity, common vaccine components.
6. Immunization schedules	ACIP’s role in the development of immunization schedules and vaccine recommendations; vaccine contraindications and precautions; appropriate spacing and timing of vaccine doses; and simultaneous administration.
7. Communications	Evidence-based information for communicating with parents and patients about vaccines; use of the vaccine information statements (VISs); credible sources of vaccine information; and nurse’s personal attitudes and beliefs affect communication.
8. Legal/ethical issues	How ethical principles apply to immunization; federal and state laws related to immunization practice; types of vaccine exemptions; and nurse’s own professional scope of practice as it relates to immunization.
9. Vaccine storage and handling	Maintaining vaccine integrity through vaccine storage and handling best practices; common vaccine storage and handling errors; and determining BUD and vaccine expiration dates.
10. Vaccine administration	The rights of medication administration adapted for vaccines; common vaccine administration error; how to prepare vaccines; determine age-appropriate sites for vaccine administration; determine appropriate needle size; and strategies to prevent syncope and reduce procedural pain.
11. Documentation	Federal requirements for vaccination-related documentation; state and local requirements for vaccination-related documentation; documenting an adverse event following vaccination (i.e., anaphylaxis); and the use of immunization information system (IIS).
12. Vaccine safety	Common adverse reaction or side effects following vaccination; how to manage an adverse event (i.e., anaphylaxis) following vaccination; the National Vaccine Injury Compensation Program (VICP); vaccine post marketing safety monitoring; and the Vaccine Adverse Event Reporting System (VAERS).

serves as a starting point for designing individual courses or curriculum revision. The IRUN CMT can be used by individual faculty and/or curriculum committees for single course design and/or integration across multiple courses. The CMT facilitates the course integration process, which requires evaluating immunization content that is currently being covered within one course or across the curriculum to identify content gaps, redundancies, and misalignments, which can then be addressed using IRUN resources.

Case studies

The IRUN case studies include immunization scenarios addressing individuals across the life span, including healthy persons and those with chronic illnesses. IRUN case studies are based on CDC vaccine training materials; they have been reviewed and adapted based on recommendations of the NEE and designed for all levels of prelicensure nursing education. The cases are grouped by patient age and topic into

four parts, outlined below. Within each component, the cases are arranged by difficulty level (i.e., easy, moderate, advanced). Examples of topics included in the case studies include vaccine storage and handling, anatomic site and needle selection and vaccine schedules (child, adult, and catch-up).

The four parts of the case studies include: Part 1—patient encounters focusing on general pediatric issues; Part 2—patient encounters focusing on healthy infants, children, and adolescents; Part 3—vaccine schedule and healthy pregnancies, healthy older adults, and health care personnel; and Part 4—vaccine schedule and using the *Catch-up immunization schedule for persons aged 4 months–18 years who start late or who are more than 1 month behind, United States* (Centers for Disease Control and Prevention, 2021d). Each case study includes an overview, objectives, teaching tools, glossary words, background questions, and answers to the questions.

The most current version of the Recommended Child and Adolescent Immunization Schedule for ages 18 years or younger, United States (Centers for Disease Control and Prevention, 2021c) or Recommended Adult Immunization Schedule for ages 19 years or older, United States (Centers for Disease Control and Prevention, 2021b) should be used with each case. The 21 case studies are flexible in their design and allow for modification for use in a particular course or area of nursing practice; for example, an individual scenario may be inserted into a presentation to emphasize a teaching point.

Simulation scenarios

Simulation-based learning has become widely embedded in health care education and can be used to improve learners' cognitive, psychomotor, and affective skills. The IRUN simulation scenarios promote clinical decision-making and enhance immunization-related communication skills. The simulation scenarios are flexible and fit within a variety of settings and simulation plans. Each simulation scenario includes a pre-simulation guide, suggested equipment list, handoff report, scenario progression outline, and debriefing guide. Within each scenario, facilitators can select a specific time period within a scenario's progression outline or simulate all time periods provided. For example, in the infant vaccination scenario, the first time period of the simulation is when the parent comes into the office wanting to talk about immunizations. The second part of this same simulation is when the parent is more anxious and upset about the number of immunizations the infant will receive. The third and final part of the simulation is when the parent agrees to the vaccination. Any or all of these time periods could be selected to simulate. Scenarios can be used independently in a classroom role-play, a stand-alone laboratory simulation, or incorporated into an existing simulation to complement the nursing program's current curriculum. They cover immunization issues that are pertinent to specific age groups, such as simultaneous vaccine administration for pediatric patients, human papillomavirus (HPV) vaccination in adolescents, and influenza vaccination in adults. Two simulation scenarios (simultaneous administration and HPV vaccination) are based on IRUN case studies, so faculty have the option to cover the same content as an in-class or asynchronous learning exercise, or both.

PowerPoint slide decks

PowerPoint slide decks provide nursing faculty with the most current and necessary content for prelicensure nursing students to address existing gaps in vaccine content. The IRUN PowerPoint slide decks provide prelicensure lecture material on individual vaccines. Slide deck content is organized according to the topics in the IRUN Curriculum Framework and addresses public health perspective, immunization strategies, immune system/immunology, vaccine-preventable diseases, types of vaccines, immunization schedules, communications, legal/ethical issues, vaccine storage and handling, vaccine administration, documentation, and vaccine safety. These slide decks were originally

developed for CDC trainings and have been further adapted by CDC and the NEE to address prelicensure nursing faculty needs. Slide decks are available in editable (without the CDC logo) and non-editable (with the CDC logo) formats. Slide decks can be tailored for the prelicensure nursing student audience and can be used either in part or in their entirety, based on faculty needs.

IRUN website

The IRUN website (www.IRUNursing.org, 2021) is a dedicated repository for all IRUN resources. The site is accessible to the public and is therefore available to all nursing and other health professional faculty, hospital-based educators, clinical preceptors, and students. The site includes the IRUN Curriculum Framework, CMT, and teaching resources described above.

How to use products and integrate into curriculum

The IRUN Curriculum Framework can be used to identify curriculum gaps and/or redundancies. When using the CMT, faculty can identify courses in which to include immunization content and objectives to include. Faculty can then use IRUN teaching resources in didactic, clinical, and/or simulation settings. For example, if a faculty finds a gap in immunization schedule content in their curriculum, they can choose case studies, simulation scenarios, and/or PowerPoint slide decks.

IRUN teaching resources can also be used to foster interprofessional collaboration to include integrating and/or adapting IRUN resources for existing interprofessional education or workshops. One focus could be to promote understanding of interprofessional team roles through learning about the nurse's scope of practice in relation to other professions in immunization-related activities. In addition, IRUN resources could be adapted to meet educational needs of other clinical professions.

Dissemination efforts and next steps

The initial general dissemination strategy was to reach national nursing audiences through the organizations participating in this project and the NEE (Table 1). APTR and CDC developed and distributed marketing kits to facilitate dissemination and provide national nursing organizations with a ready-to-use toolkit with information about the IRUN resources. The marketing kits provided standardized and customized text to announce the availability of IRUN resources and contained text, links and images for press release/newsletter article, e-mail announcements, and social media posts for Facebook, LinkedIn, and Twitter.

In 2019, IRUN and its resources were introduced at the AACN Baccalaureate Conference to over 200 faculty educators (Buckner et al., 2019), and have continued to be disseminated at national nursing meetings and events (Brasher & Gallego, 2020; Buckner et al., 2020). Other presentations and webinars are anticipated. Evaluation activities are being planned for the IRUN project.

Summary

Nurses often serve as front line vaccine providers. As such, nurses are accountable for adhering to standards of care related to immunizations, including communication, documentation, storage and handling, administration, safety, and monitoring of adverse events. Nurses hold a unique and important role as leaders in patient and family education (Marshall et al., 2016). Nurses are often the first person to encounter families and inpatient nurses spend more time with patients than any other healthcare provider. As such, much of the time is spent communicating about safety issues, which can include the safety and benefits of vaccines. In order to do this, nurses need extensive knowledge and skills which are essential in ensuring safe and effective immunization practices. Nurses make significant contributions to achieving high immunization coverage, which is essential for the development of community

immunity. Although immunization and vaccine-preventable disease content exists in current U.S. prelicensure nursing curricula, there is variability in the depth and breadth of content taught. With an increasing number of routinely-recommended vaccines and the resurgence of pockets of vaccine-preventable disease driven by under-vaccination, as well as an increasing amount of circulating misinformation, nurses, as the most trusted professionals (Saad, 2020), are needed to not only administer immunizations, but to foster high vaccination coverage through patient education and communication. To create an effective nursing workforce, prelicensure nursing curricula should be enhanced with an increasing focus on immunization content. Incorporation of IRUN resources supports the development of students that are prepared to be competent clinicians who can provide care to diverse populations in multiple settings, and across the care continuum.

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Disclaimers

The findings and conclusions in this work are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention or the US Department of Health and Human Services or the other institutions or organizations represented.

Declaration of competing interest

No conflicts of interest present.

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IRUN Nursing Education Experts.

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