REVIEW

Characterizing Research About Interprofessional Education Within Pharmacy

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Objective. To determine how interprofessional education (IPE) in pharmacy has been studied, namely which disciplines have engaged in IPE research initiatives, the research methodologies that have been used, and what journals have published in this area.

Findings. In the 145 IPE studies included in the review, the authors represented 13 different disciplines (3.2 ± 1.5 disciplines per study). Pharmacy authors most commonly published with co-authors from nursing, medicine, and health management and support and most frequently served as first author or last author. The IPE activities involved 4.0 student disciplines (SD = 1.9) and 211.8 students (SD = 280.1), and most commonly included nursing (n = 104, 71.7%), medicine (n = 102, 70.3%), and health management and support students (n = 50, 34.5%). Most studies did not include an author from each student discipline involved in the IPE (n = 88, 60.7%). Further, a majority of studies used nonrandomized groupings (n = 103, 71.0%) with quantitative data (n = 74, 51.0%) and most were published in an interprofessional journal (n = 65, 44.8%) or pharmacy-specific journal (n = 45, 31.0%).

Summary. Pharmacists have increased their engagement in IPE research as demonstrated by the number of articles published and authorship order position. However, mismatches between student disciplines and author disciplines on published papers elucidate opportunities to foster collaborations that position students for success within a collaborative healthcare environment.

Keywords: interprofessional education, research methods, scholarship, publishing, authorship

INTRODUCTION

In 2007, the World Health Organization (WHO) launched its Programme on Interprofessional Education and Collaborative Practice to investigate and advocate for Interprofessional Education (IPE) across the health professions.1 According to the WHO, “interprofessional education occurs when students from two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes.”1 To optimize patient care, educators must strategically organize interprofessional teams that are focused on intentionally equipping students with the skills requisite for success in today’s collaborative health care environment.2

The importance of IPE in pharmacy has been emphasized by various scholars and organizations, including the Center for the Advancement of Pharmacy Education (CAPE) and the Accreditation Council for Pharmacy Education (ACPE) standards for the entry-level Doctor of Pharmacy (PharmD) degree.3,4 Specifically, researchers have found that IPE initiatives successfully increase knowledge, promote team building, and build problembased learning skills.5-7 Cohen and colleagues, for example, reported that IPE training resulted in sustained improvements in knowledge of IPE and understanding the role of other disciplines, and promoted positive attitudes toward the value of teams after training.5 The authors of these studies have advocated for the continued implementation of IPE initiatives because of their many positive outcomes.5-7

Faced with a substantial and growing number of studies about IPE in pharmacy, several scholars have conducted reviews about the various aspects of IPE. These include reviews of IPE assessment tools,8 interprofessional distance education,9 and pharmacy perspectives towards IPE.10 To date, publications have largely focused...
on what has been studied in IPE (eg, design, implementation, and assessment of IPE), with little attention to how it has been studied (eg, researcher disciplines, research design, dissemination). Because IPE has been shown to improve knowledge and enhance teamwork, it is important to understand how IPE has been studied in pharmacy education. Therefore, the purpose of this review was to characterize research on IPE involving student pharmacists; specifically: which disciplines have engaged in pharmacy IPE research initiatives, which research methodologies have been used to study that IPE, and which journals have published those studies.

METHODS

The search phrase used for this review was “interprofessional education” AND “student.” These search terms were picked to provide the most extensive selection of articles to capture IPE research in all health professions disciplines. The search was conducted in October 2018 using PubMed, SCOPUS, PsycINFO, EMBASE, MEDLINE, and ERIC. While PubMed, SCOPUS, EMBASE, and MEDLINE were the databases used in other IPE reviews,10-12 we also included ERIC and PsycINFO to find additional education and interdisciplinary articles. The Journal of Interprofessional Care was hand-searched to capture additional articles.

A study was included in this review if the research conducted involved students from the United States; described an IPE opportunity where students engaged, collaborated, participated, and/or exchanged ideas with students from another health profession;1 was published in a peer-reviewed journal; and included at least one pharmacy-affiliated author. Some of the selected studies may have included a pharmacy-affiliated author but not pharmacy students. Authors were categorized according to their credentials (PharmD, MD, etc), their university affiliation, their university biography, and/or their Google Scholar or ResearchGate account. A study was excluded if it was a review (eg, meta-analysis, systematic review, literature review), not peer-reviewed (eg, commentaries, dissertations, book chapters), not written in English, or designed to validate a measure or instrument.

The selected journal articles were cataloged in Mendeley and uploaded to Covidence (Melbourne, Australia), a software used for article screening, data abstraction, and duplication removal. Adhering to the inclusion and exclusion criteria, two independent reviewers conducted an abstract review followed by a full-text review of each article. Conflicts were resolved by a third independent reviewer.

After identifying articles for inclusion, data were extracted for the following variables: author discipline; student discipline; analytic technique, ie, quantitative = analyzed numerical data; qualitative = analyzed nonnumerical data; and mixed-methods = analyzed both nonnumerical and numerical data); participant grouping technique (ie, observational, randomized, and nonrandomized); and journal type (ie, IPE or discipline-specific journal). Author and student disciplines were classified according to WHO categorizations.1 Specifically, pharmacy, nursing, medicine, midwifery, dentistry, physiotherapy, optometry, dietetics, occupational therapy, audiology, environmental health, and physician assistants were classified as “health professionals.” Professions in the “health management and support” category included social work and clinical psychology. Occupations in the “health associate professionals” category included professions that complete technical and practical tasks to support diagnoses and treatments (eg, respiratory therapists and medical assistants).1 Professions in which workers were not categorized as health professionals by the WHO were placed in the “non health professionals” category, which included educational researchers and statisticians. Authors were categorized using all possible degree holders within those categories, meaning that medicine, for example, included individuals who were medical doctors (MD), doctors of osteopathic medicine (DO), and/or affiliated with a school of medicine.

In a data audit of extracted data from 15% of the articles, agreement between researchers on categorizations exceeded 95%. Descriptive statistics were used to analyze the variables of interest. Categorical data are presented as number and percent, and continuous data are presented as mean and standard deviation.

RESULTS

A total of 3,058 studies were imported into the database for screening, and 1,518 abstracts were reviewed after removing duplicates, which yielded 680 studies for inclusion in the full text screening (Figure 1). Of these studies, 145 met the inclusion criteria and were included in the analysis.

In the reviewed studies, pharmacy authors collaborated with 12 disciplines: nursing (n = 73, 50.3%), medicine (n = 71, 49.0%), health management and support (n = 47, 32.4%), non-health professionals (n = 47, 32.4%), physiotherapy (n = 25, 17.2%), occupational therapy (n = 16, 11.0%), dentistry (n = 12, 8.3%), health associate professionals (n = 12, 8.3%), physician assistants (n = 10, 6.9%), dietetics (n = 9, 6.2%), audiology (n = 3, 2.1%), and environmental health (n = 1, 0.7%) (Table 1). On average, there were 6.1 (SD = 2.7) authors per study and 3.2 (SD = 1.5) author disciplines per study. Authorship
collaboration ranged from one discipline per study (n = 10, 6.9%) to seven disciplines per study (n = 3, 0.02%). Most of the first authors were from pharmacy (n = 68, 46.9%), medicine (n = 27, 18.6%), or nursing (n = 17, 11.7%). Similarly, most of the last authors were from pharmacy (n = 48, 33.1%), medicine (n = 29, 20.0%), or nursing (n = 19, 13.1%). On average, there were 4.0 (SD = 1.9) student disciplines per study, ranging from 2 to 10 student disciplines.

There were 211.8 (SD = 280.1) students per study (range = 7 to 2,139). Pharmacy students were involved in 141 (97.2%) of the 145 studies that included an author from pharmacy. Other common student disciplines included nursing (n = 104, 71.7%), medicine (n = 102, 70.3%), and health management and support (n = 50, 34.5%). When comparing student and author disciplines, most studies, predominantly from nonpharmacy professions, contained a mismatch, where a student discipline was included in a study without an author from that same discipline (n = 88, 60.7%).

The research methodologies used in the studies we reviewed included quantitative (n = 74, 51.0%), mixed-methods (n = 54, 37.2%), and qualitative (n = 17, 11.7%) approaches. Of the papers involving quantitative data, a majority included inferential statistics (n = 99, 77.3%). Most qualitative methods included inductive coding analysis (n = 65, 92.9%). Further, participants were mostly grouped in a nonrandomized fashion (n = 103, 71.0%). Thirty-seven (25.5%) studies used observational groupings and only 5 (3.5%) studies used randomly assigned groupings.

Interprofessional education research articles that included pharmacy authors were most commonly published in one of seven interprofessional journals (n = 65, Table 1. Characteristics of Studies on Interprofessional Education That Included Authors from US Pharmacy Schools

| Profession                      | Studies Authored, N (%) | Studies as First Author, Total N (%) | Studies as Last Author, Total N (%) | Student Participants, N (%) |
|---------------------------------|------------------------|--------------------------------------|-------------------------------------|-----------------------------|
| Pharmacy                        | 145 (100.0)            | 68 (46.9)                            | 48 (33.1)                           | 141 (97.2)                  |
| Nursing                         | 73 (50.3)              | 17 (11.7)                            | 19 (13.1)                           | 104 (71.7)                  |
| Medicine                        | 71 (49.0)              | 27 (18.6)                            | 29 (20.0)                           | 102 (70.3)                  |
| Health Management and Support   | 47 (32.4)              | 11 (7.6)                             | 12 (8.3)                            | 50 (34.5)                   |
| Non-Health                      | 47 (32.4)              | 9 (6.2)                              | 20 (13.8)                           | 12 (8.3)                    |
| Physiotherapy                   | 25 (17.2)              | 4 (2.8)                              | 5 (3.5)                             | 42 (29.0)                   |
| Occupational Therapy            | 16 (11.0)              | 4 (2.8)                              | 2 (1.4)                             | 30 (20.7)                   |
| Dentistry                       | 12 (8.3)               | 0 (0)                                | 3 (2.1)                             | 31 (21.4)                   |
| Health Associate Professionals  | 12 (8.3)               | 3 (2.1)                              | 2 (1.4)                             | 20 (13.8)                   |
| Physician Assistant             | 10 (6.9)               | 0 (0)                                | 2 (1.4)                             | 21 (14.5)                   |
| Dietetics                       | 9 (6.3)                | 2 (1.4)                              | 2 (1.4)                             | 13 (9.0)                    |
| Audiology                       | 3 (2.1)                | 0 (0)                                | 0 (0%)                              | 11 (7.6)                    |
| Environmental Health            | 1 (0.7)                | 0 (0)                                | 0 (0%)                              | 0 (0)                       |
| Midwifery                       | 0 (0)                  | 0 (0)                                | 0 (0%)                              | 1 (0.7)                     |
| Optometry                       | 0 (0)                  | 0 (0)                                | 0 (0%)                              | 2 (1.4)                     |

*Peer-reviewed research articles published between 2008-2018 (N = 145).

bStudies may include individuals from multiple professions, therefore total percentages may exceed 100%.

*c”Health Management and Support” refers to supporting professions (eg, social work, clinical psychology); “Non-Health” includes non-health fields (eg, educational researchers, statisticians); and “Health Associate Professionals” refers to health professions that perform technical and practical tasks to support diagnoses and treatment (eg, respiratory therapists and medical assistants).
44.8%) or one of five pharmacy-specific journals (n = 45, 31.0%) (Table 2). The majority of these 45 studies were published in one of the following journals: Journal of Interprofessional Care (n = 38, 26.2%), Currents in Pharmacy Teaching and Learning (n = 22, 15.2%), the American Journal of Pharmaceutical Education (n = 19, 13.1%), and the Journal of Interprofessional Education and Practice (n = 12, 8.3%). Several studies were published in discipline-specific journals, including journals in medicine (n = 22, 15.2%), nursing (n = 8, 5.5%), and health management and support (n = 5, 3.4%). Further, the number of IPE publications including pharmacy authorship increased from one study in 2008 to 37 studies in 2018 (Figure 2).

**Table 2. Characteristics of Journals Publishing Interprofessional Education Studies with Authors from Pharmacy Schools (N=38)**

| Profession               | Journal Focus, n (%) | Journal Focus by Study, n (%) |
|--------------------------|----------------------|-----------------------------|
| Interprofessional        | 7 (18.4)             | 65 (44.8)                   |
| Pharmacy                 | 5 (13.2)             | 45 (31.0)                   |
| Nursing                  | 6 (15.8)             | 8 (5.5)                     |
| Medicine                 | 12 (31.6)            | 15 (10.3)                   |
| Health Management and Support | 4 (10.5)   | 5 (3.45)                    |
| Specialized Medicine     | 3 (7.9)              | 6 (4.1)                     |
| Dietetics                | 1 (2.6)              | 1 (0.7)                     |
| Total                    | 38                   | 145                         |

**DISCUSSION**

Since the WHO launched its interprofessional initiative in 2007, pharmacy educators have increasingly engaged in IPE and IPE research. The substantial body of IPE literature to date reflects the critical efforts by health care educators to both prepare aspiring health professionals for team-based care and generate evidence providing insight into these collaborative initiatives. As an extension of previous reviews that emphasized IPE settings and effectiveness, this study specifically explored research strategies used by pharmacy educators to study IPE, including authorship, student involvement, study design, and publication.

The results of this study suggest that authors from pharmacy education have collaborated across a wide range of disciplines to implement, evaluate, and disseminate IPE. Not surprisingly, pharmacy authors most commonly co-authored papers with colleagues from nursing and medicine as these disciplines may have more students take part in these studies because of proximity and job responsibilities (e.g., inpatient medical settings). Similarly, there were more medicine, nursing, and pharmacy student participants than any other profession, which could also be a byproduct of the size of these large professions. Further, the logistical barriers related to scheduling IPE activities across health professions schools may be less prevalent for these disciplines given their close working proximity, particularly in experiential settings. Engaging additional authors and students from other professions may require more arduous efforts to reduce barriers between professions and their trainees.
Pharmacy authors were more commonly listed as either the first author or the last (presumably, senior) author on IPE studies compared to authors from other professions represented in this review. Because most journals do not require a description of author roles, it was not possible to determine the contributions of each author of the studies included in this review. Differences between disciplines as it relates to authorship norms can influence authorship order and contributions. As discussed by Minshew and McLaughlin, “It is important to understand how authorship impacts faculty members’ ability to be successful within and beyond their disciplines.” For example, a faculty member from one discipline (eg, pharmacy) may have different authorship needs or expectations for promotion than a faculty member from another discipline (eg, non-health), resulting in varied authorship practices. Because IPE is inherently collaborative, more work should be done to promote transparency and integrity in authorship practices. Authors should explicate their roles within articles so readers are able to discern the contributions of each individual to the IPE initiative and related research described in the paper. Depending on journal requirements, this could be done within sections of the manuscript (eg, using author initials in the methods section to explicate author roles) or in a separate section immediately preceding the references.

Given the importance of collaboration in IPE, in pharmacy authored publications, the author group should consider including an author representative for each discipline from which students were included. In other words, health professions students were often included in a study but an author from that same discipline was not included in the research (eg., pharmacy students were studied, but there was not a pharmacy author on the paper). Because health professionals are trained in a tradition that aligns with the responsibilities of their specific profession, a study lacking authorship representation may fail to sufficiently address the implications of IPE outcomes for a discipline specifically or for health care broadly. Without the contribution of an author from the same profession, some question may remain as to whether the IPE activity adequately addressed and discussed the needs of the students from that profession. More work is needed to understand why these mismatches occurred and how they may influence the design, evaluation, and interpretation of IPE involving pharmacy.

Nearly half of the studies in this review used qualitative data, which was surprising given that the pharmacy and pharmaceutical sciences, especially bench science, are grounded in quantitative methods. This suggests that the research and analytic designs used in this study may not follow pharmacy research norms. Further, very few studies in this review used experimental design or random assignment, which are generally considered the gold standard for making causal claims about effectiveness. While random assignment can enable causal conclusions to be drawn, randomization can be difficult to implement in educational settings and may be considered unethical if only some students are randomized into an educational condition that may likely be beneficial. As noted by Harpe, due to the debate surrounding causality in educational scholarship, consideration should be given to study designs and analytical approaches that can determine what influences student- or program-level performance. Study designs each have their own advantages and disadvantages with respect to the strength of causal conclusions, and the lack of random assignment used in IPE pharmacy studies raises some question as to the appropriateness of causal claims about IPE. In addition, the use of qualitative data and observational design may indicate that the qualitative aspects of IPE are better understood than other educational interventions or curricula.

The IPE studies in this review were published in a variety of journals. Although most were published in IPE- or pharmacy-specific journals, many were published in journals belonging to other professions (eg, journals for medicine, nursing, and health management and support). It is important to understand where IPE research is being published as journals often target specific audiences and may engage the audience with discipline-specific lenses. Pharmacy educators may not realize that IPE research is being published in medical or nursing journals, or may not think to actively search journals from other disciplines for IPE research involving pharmacy students. Furthermore, this review identified seven unique IPE-specific journals in which these pharmacy-authored studies were published. With IPE research being published through so many different journals, it may become difficult to maintain awareness and become deeply engaged with this line of research. We recommend using advanced search strategies, such as citation mapping, and consulting with a librarian who is a trained expert in finding appropriate literature.

There were several limitations to this study. First, because our aim was to determine who engaged in IPE research and how they engaged in it, this review did not assess the content, quality, or rigor of each study included. Second, even though our search terms were broad and comprehensive, we may have missed relevant articles. Third, there may be articles that reported on collaboration among different health professions but did not explicitly use the term “interprofessional education” and therefore were not captured in the literature searches we conducted.
Despite these limitations, this study is an important step toward understanding IPE and identifying potential gaps or anomalies in IPE research that might inform IPE research moving forward. Pharmacy educators may need to consider additional authors, student disciplines, and dissemination strategies to address gaps in pharmacy IPE effectiveness, utility, and acceptability. Further research should explore the impact and utility of various research practices used to study IPE, how IPE research is incentivized and operationalized (eg, authorship), and how these practices influence the extent to which we understand the impact of IPE on learners. Promoting the use, evaluation, and dissemination of IPE initiatives, and improving transparency in IPE research are imperative for advancing collaborative care models within a rapidly evolving health care system.

CONCLUSION

Research in interprofessional education can elucidate strategies for promoting the skills students must develop for success within a rapidly evolving and highly collaborative health care system. Since the WHO declared IPE a priority in 2007, pharmacists have increased their engagement in IPE research as indicated by the number of articles published and authorship order position. However, apparent mismatches in author and student disciplines and varied publication practices raise some questions about IPE research practice. In light of the findings from this study, pharmacy educators must pursue IPE research that is inclusive and accommodating of scholars from various professions, fosters collaboration between traditional and emerging health professions, and positions students for success within a collaborative health care environment.

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