Review

Clinical Interprofessional Education in Inpatient Pharmacy: Findings From a Secondary Analysis of a Scoping Review

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\section*{ABSTRACT}

\textbf{Objectives:} Clinical interprofessional education (IPE) is defined as learning that occurs within clinical learning environments such as hospitals, primary care clinics, and long-term care facilities where learners collaborate to deliver care to real patients. The objective of this secondary analysis of a scoping review is to identify, characterize, and summarize evidence from the published literature regarding clinical IPE for pharmacy learners in the inpatient setting.

\textbf{Findings:} PubMed, CINAHL, and Scopus databases were searched for clinical IPE articles that met the following inclusion criteria: ≥ 2 health professions, ≥ 2 learner groups, and involvement of real patients/patient care. For this secondary analysis, 12 articles involving pharmacy learners in an inpatient setting were included. The most common interprofessional partner was medicine (66%), and the median number of student participants involved in the activity was 19 (range, 10–525). Five studies conducted clinical IPE in the context of advanced pharmacy practice experiences. Clinical IPE activities were described primarily as inpatient rounding with the medical team, but were often outside the normal clinical workflow (66%). Incorporation of Interprofessional Education Collaborative competencies was limited, as was the use of validated IPE assessment tools to measure outcomes.

\textbf{Summary:} Current literature is limited in reports of pharmacy learner involvement in inpatient clinical IPE. Expansion of pharmacy partnerships and alignment of team outcomes with the Interprofessional Education Collaborative competencies are needed to demonstrate the relationship between clinical IPE and patient care outcomes within established workflows.

\section*{1. Introduction}

Interprofessional education (IPE) has been proven essential in preparing health care students to collaborate together.\textsuperscript{1–3} Numerous studies and systematic reviews have demonstrated that health care students are engaged and ready to “learn with, from, and about each other.”\textsuperscript{3–7} Within the last decade, there has been a renewed effort to translate the momentum and growth observed in IPE into the clinical learning environment (CLE). Clinical learning environments are defined as “the hospitals, medical centers, and other clinical settings in which new clinicians train.”\textsuperscript{9} The expansion of IPE into the CLE has been fueled by the widespread recognition of the 2016 Interprofessional Education Collaborative (IPEC) competencies as the seminal IPE competency framework and the 2019 Health Professions Accreditors Collaborative guidance to institutions encouraging collaboration in creating strategic plans and initiatives to further expand IPE activities.\textsuperscript{9,10} Clinical learning environments are a critical context for the training of future health care providers in collaborative practice. In these environments, students often encounter a complex health care system and must learn to navigate the nuances of their unique
professional role and identity within a health care team. Clinical learning environments should support student preparation to participate in interprofessional collaborative practice, defined as “multiple health workers from different professional backgrounds work[ing] together with patients, families, care providers, and communities to deliver the highest quality of care.” The complexity of health care and the health care system requires that “professionals work together in collaborative, interdependent care systems and in partnership with the people served by these systems.” Health care students should engage in CLEs in a way that not only prepares them to collaborate in the provision of quality patient care, but also empowers them to be positive change agents in a health care system that has struggled with achievement of the now Quintuple Aim. Unfortunately, some traditional practice environments do not exemplify the collaborative practice taught in preclinical curricula; thus, there is a need to transform current models of practice to better align with team-based care.

The pharmacy profession has been a strong advocate for advancing IPE in clinical learning. Representatives from the Accreditation Council for Pharmacy Education, the American Association of Colleges of Pharmacy (AACP), and the American Society of Health-System Pharmacists have participated as members of national collaboratives focused on identifying strategies for optimizing CLEs. While the interprofessional CLE (IP-CLE) encompasses more than experiential education, introductory and advanced pharmacy practice experiences (IPPEs and APPEs) provide pharmacy students the clinical contexts wherein they can demonstrate competence in interprofessional team dynamics and collaborative practice during experiential education, as outlined by the Accreditation Council for Pharmacy Education Standards. However, there is a need to identify how to best facilitate intentional interprofessional clinical experiences. Results from an AACP task force report in 2018 found that most APPEs are not designed to intentionally create interprofessional experiences that achieve IPE educational outcomes. Across institutions reporting IPE in experiential education, there was a lack of consensus terminology for IPE, and the IPEC competencies were not used to provide and assess student learning. The objective of this secondary analysis of a scoping review is to identify and characterize evidence from the published literature regarding clinical IPE for pharmacy learners in the inpatient setting. Additionally, this review examines the use of IPEC competencies in clinical IPE and identifies strategic directions for advancement of clinical IPE experiences.

2. Methods

To foster the expansion of quality IPE activities as part of an institutional effort to address accreditation expectations, an interprofessional group was formed to explore learning within IP-CLEs and advance meaningful clinical IPE opportunities. We conducted a wide-ranging scoping review of published literature focused on clinical IPE activities involving the full range of health professional programs and learners, and sought to characterize current efforts in clinical IPE. This secondary analysis was initiated following completion of an original scoping review conducted in accordance with JBI (formerly Joanna Briggs Institute) guidelines for scoping reviews (ie, PRISMA-ScR). In short, the original scoping review included articles of students or postgraduate learners of ≥ 2 professions participating in clinical activities in a variety of CLEs. Clinical activities were defined as interactions with a real patient in a health care environment. PubMed, Scopus, and CINAHL databases were searched for articles published since 2015, including peer-reviewed quantitative, qualitative, and mixed-methods literature. The year 2015 was intentionally selected because it represents 1 year before the 2016 IPEC updated competencies. The 2016 IPEC competencies are the most widely accepted and used framework for creating and assessing IPE activities. Restricting our review to 2015 and after allowed us to capture the current IPE practices based on the 2016 IPEC competencies. From the original scoping review, 2074 articles were identified. Titles and abstracts were screened by 2 independent, blinded reviewers using the inclusion criteria. Articles that met the inclusion criteria were retrieved in full, and citation details were imported into Rayyan (Qatar Computing Research Institute). Full-text review by 2 independent reviewers resulted in 83 included articles.

2.1. Secondary Analysis of a Scoping Review

The original scoping review included 83 articles between 2015 and 2020. An updated search was conducted in October 2022 that identified additional 41 articles, increasing the 2015–2022 scoping review search total to 124 articles. For this secondary analysis, all 124 articles were screened for involvement of pharmacy learners in the inpatient setting, which yielded 12 articles for inclusion. The Figure presents the flow diagram for the initial scoping review and this secondary analysis. For the 12 studies included, we applied the following research questions to focus on impact and implications for pharmacy education and practice: (1) What professions have participated in clinical IPE with pharmacy students and residents? (2) What are the characteristics of the IP-CLE for pharmacy in the inpatient setting, as described by number of learners involved, clinical activities, incorporation into APPEs, clinical workflow model, faculty involvement, and challenges and barriers? (3) What topics and/or health conditions are commonly addressed within clinical IPE activities? (4) What interprofessional competencies have been targeted and/or evaluated in clinical IPE? (5) What types of programmatic outcomes have been targeted and/or evaluated in clinical IPE, and which measurement tools have been used?; and (6) What types of patient and/or health outcomes linked to clinical IPE have been reported?

Each article was reviewed in depth, and data were extracted regarding the following characteristics: student professions involved, size and duration of the clinical learning activity, faculty involvement, CLE, clinical activity, didactic activities, assessment of IPE outcomes, learning outcomes as characterized by the modified Kirkpatrick model of educational outcomes, and clinical outcomes reported. The Table provides a summary of these findings.

3. Results

3.1. Learners Involved

Across the 12 studies, the following 6 professions were represented in addition to pharmacy: medicine, nursing, psychology, social work, advanced nurse practitioner, and physician assistant. The most common pairing was medicine and pharmacy (66%; n = 8), 24,25,27,30,31,33–35 The average number of professions involved was 2 (range, 2–4). The 2 studies with 4 professions represented included medicine, advanced nurse practitioner, pharmacy, and either psychology or social work. Four studies (33%) had pharmacy residents involved 27–29,34 with 3 studies including both medical and pharmacy residents. 27–29 Five studies (42%) incorporated the clinical IPE activity into APPEs for pharmacy students. 25,27,31,32,35

3.2. Size and Duration of the IPE Activity

The median number of student participants in the clinical IPE activity was 19 (range, 10–525). Most studies (n = 7; 58%) presented collective data from total students participating over multiple offerings of the activity, and did not provide data on the size of individual cohorts. 25,27,29,31,34,35 Four studies reported on a pilot or first-time offering. The median duration of the activity was 7 days (range, 2 h to 6 weeks). Six programs were sustained for over 1 year.
Study selection for the secondary analysis

Records identified from:
Pubmed (n = 441)
CINAHL (n = 4)
Scopus (n = 370)

Records removed before screening:
Duplicate records removed (n = 134)

Records screened (n = 681)

Reports sought for retrieval (n = 84)

Reports excluded (n = 597)

Reports not retrieved (n = 0)

Reports assessed for eligibility (n = 84)

Reports excluded (n = 43)

New studies included in review (n = 41)

Total studies included in review (n = 124)

Previous studies

Studies included in previous version of review (n = 83)

Identification of new studies via databases and registers

Reports of total included studies from the initial review (n = 124)

Reports excluded: Did not include pharmacy learners (n = 71)
Did not take place in the inpatient setting (n = 41)

Reports of included studies in the secondary analysis (n = 12)

Figure. PRISMA flow diagram for the initial scoping review and secondary analysis.
<table>
<thead>
<tr>
<th>Author and year</th>
<th>Professions (n)</th>
<th>Duration of activity</th>
<th>Description of clinical activities</th>
<th>Nonclinical activities</th>
<th>Modified Kirkpatrick level</th>
<th>Reported outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anderson and Lakhani, 2016</td>
<td>Medicine (n = 294), pharmacy (n = 231)</td>
<td>2 afternoons; full implementation: 2 y</td>
<td>Inpatient team rounding or clinical care; case conference involving real patients. Students interviewed older patients with complex prescription regimens about their medications, reviewed medical records and medications for DDIs, ADRs, and prescribing errors. Presented findings to team.</td>
<td>Orientation, lecture, workshops; Themes: clinical, some IPE.</td>
<td>Levels 1, 2, 2a</td>
<td>IPE outcomes: Validated IPE tool: N/A Student satisfaction; Self-reported improvement in knowledge and skills related to polypharmacy; 4 main themes: value of collaborative learning, enhanced clinical competence in safe prescribing, greater awareness and understanding of polypharmacy in older adults, value and challenges of learning together in clinical practice. Clinical outcomes: recommended changes to patient medications.</td>
</tr>
<tr>
<td>Dabaghzadeh and colleagues, 2017</td>
<td>Medicine (n = 25), pharmacy (n = 25)</td>
<td>2-wk course (4 h/d); full implementation: 6 mo</td>
<td>Inpatient team rounding and clinical care. Student pairs were responsible for the care of 3 patients in an ID ward. Pharmacy students reviewed and monitored medications.</td>
<td>Orientation (limited description)</td>
<td>Levels 2a, 2b</td>
<td>Validated IPE tool: RIPLS Student attitudes, self-reported improvement in knowledge related to drug information for medical students and diagnosis of diseases for pharmacy students. No clinical outcomes.</td>
</tr>
<tr>
<td>Davis and colleagues, 2015</td>
<td>Nursing (n = 9), pharmacy (n = 5)</td>
<td>15 d; full implementation: 27 d</td>
<td>International service-learning; student-led consult service; inpatient team rounding or clinical care; shadowing experience/observer role. Students completing patient assessments, patient consultations, immunizations, and medication counseling. Discussion of outpatient hospital formulary, dispensing, and counseling.</td>
<td>Orientation, lectures, recorded presentations. Themes: HIV/AIDS care, cultural training. No IPE training.</td>
<td>Levels 1, 2a, 2b</td>
<td>IPE outcomes: Validated IPE tool: N/A Students reflected on growth in cultural competency and skill in meeting health care needs with limited resources. Positive changes in role perception, increased roles/scope, perceived contributions to the team and value of other profession. Nursing students felt that the addition of pharmacy students to the experience was crucial for patient medication safety and to improve patient outcomes. No clinical outcomes.</td>
</tr>
<tr>
<td>Foral and colleagues, 2016</td>
<td>Medicine (n = 30), pharmacy (n = 60)</td>
<td>5 wk; full implementation: 3 y</td>
<td>Inpatient team rounding or clinical care. Pharmacy team (students, residents, pharmacists) identified and reviewed patients on antimicrobial stewardship service. Cases discussed with MD and pharmacy team, then presented recommendations to medical or surgical team.</td>
<td>Lectures Theme: ID topics and motivational interviewing. No IPE training.</td>
<td>Level 4</td>
<td>No IPE outcomes. Clinical outcomes: 99% acceptance rate of 2266 interventions related to antimicrobial stewardship.</td>
</tr>
<tr>
<td>Gergerich and colleagues, 2019</td>
<td>Medicine residents (n = 7), APN/NP (n = 9), pharmacy students (n = 8), psychology (PhD or PsyD) (n = 7)</td>
<td>4 d</td>
<td>Shadowing experience/observer. Faculty-guided educational rounds at a general hospital and hospice. Students primarily in an observational role.</td>
<td>Orientation, lecture, simulation, social gathering/team building exercise, patient and community panel, role play.</td>
<td>Levels 1, 2a</td>
<td>IPE outcomes: Validated IPE tool: N/A Uni-professional focus group sessions identified key themes of hierarchy: tension regarding the idea that the MD is the team leader or &quot;quarterback&quot;; experiences of marginalization; tendency for hierarchy issues to go unresolved. Hierarchy-related barriers to IPE and IPCP were identified. No clinical outcomes.</td>
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<tr>
<td>Haddock and colleagues, 2021</td>
<td>Medicine residents (n = 39), NP students (n = 4), pharmacy residents (n = 5), social work students (n = 16)</td>
<td>2 h</td>
<td>Interprofessional chart reviews; QI project; 2-h collaborative learning session focused on critical review of health records for a patient readmitted within 30 d. Groups of students worked to determine causes for readmission.</td>
<td>Orientation, Theme: readmissions. No IPE training.</td>
<td>Levels 1, 2a, 2b, 3</td>
<td>IPE outcomes: Validated IPE tool: N/A Student self-reported improvement in knowledge and competence in discharge coordination and communication, increased appreciation and understanding of other professions' roles. No clinical outcomes.</td>
</tr>
<tr>
<td>Jebara and colleagues, 2022</td>
<td>Medicine (n = 5), pharmacy (n = 5)</td>
<td>5 d</td>
<td>Inpatient team rounding and clinical care. Students attended rounds, took a patient medical and medication history, and observed medical procedures. Students completed mini-clinical evaluation exercises (mini-CIE).</td>
<td>Orientation, tutorials Theme: logistics and clinical topics. No IPE training.</td>
<td>Levels 1, 2a</td>
<td>IPE outcomes: Validated IPE tool: N/A Qualitative focus groups found students enjoyed experience more than previous IPE experiences, greater exposure to clinical pharmacy and increased understanding of roles, better prepared for collaborative practice. No clinical outcomes.</td>
</tr>
<tr>
<td>Nwaesei and colleagues, 2019</td>
<td>Medicine (n = 21), pharmacy (n = 18)</td>
<td>5 wk; full implementation: 8 mo</td>
<td>Inpatient team rounding and clinical care. Preliminary rounds, teaching rounds, lunch-and-learn discussions.</td>
<td>Orientation, lunch-and-learn sessions. Theme: IPE orientation and clinical topics.</td>
<td>Levels 1, 2a</td>
<td>IPE outcomes:Validated IPE tool: SPICE-2 Significant improvement from presurvey to postsurvey for IPEC competencies. Students found all components of intentional IPE experience to be effective or very effective (&gt; 85% for each activity). No clinical outcomes.</td>
</tr>
<tr>
<td>O’Connell and colleagues, 2021</td>
<td>PA (n = 19), pharmacy residents (n = 19)</td>
<td>Activity duration: 4 d</td>
<td>Inpatient team rounding or clinical care. Students provided direct patient care in EDs, then completed a TOSCE to assess team skill development.</td>
<td>Orientation, TOSCEs. Theme: logistics, team care details, assessment overview, and modified TeamSTEPPS.</td>
<td>Levels 1, 2a, 3</td>
<td>IPE outcomes: Validated IPE tool: ATHCT Increased team skills in communication, collaboration, roles and responsibilities, patient-centered care, conflict management, team functioning, and global performance. Team and individual assessments on TOSCE improved team skills and attitudes. No clinical outcomes.</td>
</tr>
<tr>
<td>Schmid and colleagues, 2022</td>
<td>Medicine, pharmacy Numbers not provided</td>
<td>Unreported</td>
<td>Inpatient team rounding or clinical care. Students participated in antimicrobial stewardship program rounds and weekly grand rounds.</td>
<td>Weekly infectious disease grand rounds. No IPE training.</td>
<td>Level 4</td>
<td>IPE outcomes: none Student reported knowledge improvement in antimicrobial stewardship. Clinical outcomes: optimization of antibiotic management in medical ICU; pharmacist interventions categorized as indication and selection of therapy (43%), optimization of dosing (27%), drug interactions (9%), side effects (4%), and PK/PD topics (11%), with 86% acceptance rate (higher rate than reported by other studies, 50% if written note only). No clinical outcomes.</td>
</tr>
<tr>
<td>Schramm and colleagues, 2017</td>
<td>Medicine students, pharmacy residents; numbers difficult to determine</td>
<td>1 wk</td>
<td>Inpatient team rounding or clinical care; IP chart reviews. Pharmacy resident served as preceptor on a clinical pharmacology rotation for medical students; reviewed patient medications and chart, attended rounds, afternoon discussions.</td>
<td>Orientation, lectures. Theme: oriented medical student to pharmacy profession and training.</td>
<td>Level 2a</td>
<td>IPE outcomes: Validated IPE tool: N/A Increased understanding of other professions’ education and training, increased appreciation of roles on team. Unique precepting opportunity for pharmacy residents. Medical students gained greater appreciation for medication-related interventions and pharmacology. No clinical outcomes.</td>
</tr>
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3.3. Faculty Involvement

Most activities (n = 10; 83%) were affiliated with a university.24–30,32,34,35 Interprofessional creation of the activity was described in multiple studies,24–26,28–30,32 and was facilitated by interprofessional faculty.28–30 Interprofessional faculty also served as preceptors.26,27,32 Role-modeling by faculty and/or preceptors was only mentioned in 1 study, where they role-modeled techniques to trainees on how to perform motivational interviewing and joint decision-making on rounds.27

3.4. Clinical Learning Environment

All studies (n = 12) were focused on inpatient, acute care.24–35 Seven (58%) were conducted at a large academic health center,25–30,34 defined as an academic center that consists of an allopathic or osteopathic medical school and at least 1 other health profession.38 Most studies (66%; n = 8) took place in the United States,24–26,28–30,32,34,35 3 in Europe and the United Kingdom,24,30,33 and 1 in Asia (Iran).25 In the studies that described the patient population and/or practice site focus, these included polypharmacy in older adults,24 infectious diseases and antimicrobial stewardship,24,25,27,33 cardiovascular/clinical pharmacology/vascular surgery/respiratory,26 and emergency medicine.32

3.5. Clinical IPE Activities

Most studies (n = 9; 75%) described the clinical IPE activities as inpatient rounding with the team,24,25,27,30–35 learners would interview or examine patients interprofessionally24,25,30,32 and review patient charts or medical records together.29,34 Pharmacy students would participate in interprofessional rounds and make recommendations to the team.24,27,31,34,35 The design of the activity was determined to be outside of the normal workflow in most of the studies,24–26,28–30,32,34 and some were designed as creation of a new service that was based on interprofessional collaborative care.37,33 Only 2 studies reported an activity that occurred within the structure of normal workflow,31,35 with Nwaesei and colleagues31 adding components to create an intentional interprofessional clinical experience with an APPE rotation. There were 3 studies that provided limited to no description of the specific clinical activities.26,28,33

3.6. Supportive Didactic Activities

Most (75%; n = 9) clinical IPE activities had an orientation for learners before the experience.24–30,32,34 Additional didactic activities included lectures,24,26,28,30,32,34 simulation or team observed structured clinical encounters (TOSCE),26–32 workshops on clinical content,24 or social gathering/team building exercises.29 Four studies described an orientation or workshop with some component of IPE.27,29,28,32

3.7. Learning Outcomes

Nine of the 12 studies reported IPE outcomes.24–26,28–32,34 However, only 3 used the IPEC competencies as the framework for their assessment.26,31,32 These studies used the following validated IPE tools to assess outcomes: The Readiness for Interprofessional Learning Scale (RIPLS),25 Student Perceptions of Physician-Pharmacist Interprofessional Clinical Education (SPICE-2),31 and Attitudes Toward Health Care Teams Scale (ATHCT).33 Each study assessed competencies related to teams and teamwork and roles and responsibilities, with O’Connell and colleagues32 also addressing interprofessional communication. Most (n = 7) studies assessed IPE outcomes at the individual level only and did not address team outcomes.24–26,29,31,34 The study by O’Connell and colleagues32 was the only study to structure the activity with the goal of assessment of team skill improvement.32 All studies were
assessed for learning outcomes achieved on the basis of the modified Kirkpatrick model. Most studies assessed students on level 1 student satisfaction (n = 7; 58%), and level 2a attitudes and perceptions (n = 9; 75%). Level 2b acquisition of knowledge and skills (n = 3; 25%) and level 3 behavioral change (n = 2; 17%) were less common. Three studies demonstrated level 4 patient or organizational outcomes.

3.8. Patient Care Measures

Only 4 studies included patient care measures. Anderson and Lakhani presented qualitative outcomes of medical and pharmacy student interventions and recommendations related to polypharmacy. Students presented patient cases that included identified drug errors, unclear prescriptions, and drug interactions. Acceptance of recommendations was not reported. Foral and colleagues described the incorporation of IPE and practice between pharmacy and medicine within an antimicrobial stewardship program and the resulting increased acceptance rate of recommendations to the medical and surgical teams. Schmid and colleagues described the impact of interprofessional rounds and team performance on antimicrobial optimization and decreased use of broad-spectrum antibiotics. Vinluan and colleagues described the impact of pharmacy students as members of an adult internal medicine team by reporting the types of interventions made and the level of clinical importance (≥ 60% described as moderate to severe clinical importance). Only Schmid and colleagues provided an active comparator by evaluating antimicrobial use in the 2 years before implementation of the interprofessional team, and found a reduction in antimicrobial spending despite the increase in severity of patient illness.

3.9. Challenges and Barriers

Several studies identified challenges and barriers to implementation. A few encountered difficulties in finding appropriate clinical space to conduct the activity. One described tension created by mismatches in students’ clinical abilities. Busy clinical schedules were mentioned as barriers. Preceptors mentioned the need for more training to be able to teach and evaluate team skills. In 1 study, students’ comments on evaluations led faculty to modify the CLE to provide a strong interprofessional learning environment. Faculty also made changes based on student comments that the clinical activity was too short (activity extended from 5 days to 3 weeks) or had too many scheduled discussion topics per week.

4. Discussion

This review identified 12 clinical IPE studies conducted in the inpatient setting with pharmacy and other health care learners. The review did not identify one clear path to establishing robust IPE clinical experiences for pharmacy learners in the inpatient setting. While most (n = 9) clinical activities centered around patient interviews, chart review, and team rounding, these experiences were often created out of the context of standard clinical workflow. There was a pattern of interprofessional orientation or training that often accompanied the clinical experience, and most experiences were collaboratively created and assessed by an interprofessional group of faculty or clinicians. There was a surprising lack of explicit incorporation of the IPEC competencies into development and assessment of the experiences. Standardized reporting of the curricular context was present in only a few studies, which rendered important questions unanswerable; specifically, whether activities were (1) required for all students, (2) incorporated into required curricula (eg, IPPEs or APPEs), and (3) sustained.

The composition of professions involved in inpatient clinical IPE with pharmacy learners was limited in our review. Medicine was the most common team member and nursing was involved in only 3 studies. This was surprising given that nursing is a well-represented collaborator in the outpatient setting and is a potentially available partner in most academic hospitals. Other clinical IPE studies have described nursing as a collaborator with medicine and professions other than pharmacy in an inpatient setting. Marcussen and colleagues and Hallin and Kiessling both describe interprofessional training wards in Europe, where medicine, nursing, and other professions participate on interprofessional team rounds. Both also describe the intentional creation of a hospital ward designed as a “student-adapted” environment for facilitation of interprofessional clinical learning. The creation of these novel environments to facilitate interprofessional rounds highlights that the traditional rounding model is often not conducive to > 2 student professions. In this review, 9 of the studies described clinical rounds as a component of the clinical IPE experience, and only 2 student professions were included.

Nursing collaboration observed in our review was the result of shadowing experiences, real patient chart reviews outside of the clinical space, and an international service-learning experience. This finding extends beyond nursing to physical therapy, occupational therapy, and dentistry were not represented in the inpatient IP-CLE in any of our studies, but are more common collaborators with pharmacy in outpatient settings according to results from our original scoping review. In a 2021 scoping review, adapting inpatient rounding models to include an interprofessional team and the patient resulted in improved team and patient satisfaction, and positively affected clinical outcomes. However, there were limited data on how best to transform rounding models or how best to capture learner outcomes. Most studies did not describe rounding model characteristics or implementation strategies. While the inpatient rounding model can be a powerful tool to facilitate clinical interprofessional learning, the best strategies for transforming rounding in CLEs remain unclear. Further exploration of how to meaningfully incorporate learners from multiple professions into inpatient rounding is needed.

Four studies in our review discussed issues with clinical workspace to accommodate teams; this may represent one of the most challenging barriers to the expansion of clinical IPE in the hospital setting. Team workspace is often limited and may preclude learners from gathering in larger groups. It is not surprising that the number of professions involved across the 12 studies was low (median = 2). The limitation of space may also explain why the average number of learners in the CLE was relatively small, with a median of 19 students (range, 10–525). Creative solutions were used by studies with larger numbers of students. Anderson and Lakhani structured the activity within a short clinical time frame (2 afternoons), paired students into small groups of 4, and supplemented with presentations and workshops. This design allowed them to accommodate a larger number of students (n = 525) over a 2-year period. Haddock and colleagues provided release from clinical responsibilities to attend a large group session in a location away from the inpatient CLE. Four professions participated (medicine, nursing, pharmacy, social work) with over 90 students in 8 sessions.

The 2021 NCICLE (National Collaborative for Improving the Clinical Learning Environment) report identified physical space as an important component of the CLE infrastructure. Recommendations from the report include creation of common spaces and evaluation of current workflow to determine ways to enhance interprofessional learning. In the long term, hospitals must consider interprofessional learning in the design and remodeling of CLE spaces to maximize team contact and spaces for team use.

In 7 studies (58%) in this review, clinical IPE for pharmacy students was not within the context of a required IPPE or APPE experience. Many activities were of short duration (< 5 days) and created clinical experiences for students that were either outside of the CLE workflow or briefly inserted into the workflow to engage in interprofessional clinical activities.
Despite the brevity of these experiences, studies reported overwhelmingly positive outcomes in student satisfaction,\cite{14,15,16} self-reported growth in knowledge,\cite{14,17,18} recognition of value of other professions,\cite{19,20,21} and improvement in team skills.\cite{22,23} While such learning experiences are valuable, clinical IPE must expand beyond brief interactions that occur outside required pharmacy curricula and should be an essential component within experiential education. Of the 5 studies in our review that incorporated interprofessional clinical learning into APPEs,\cite{25,26,27,28,29} 2 met the definition of intentional interprofessional experiential education (IEE).\cite{13,23} Intentional IEE is defined as “the explicit effort by preceptors and practice sites to create/foster educational opportunities or activities designed specifically to achieve interprofessional educational competencies.”\cite{30} Nwaesei and colleagues\cite{31} restructured an existing inpatient APPE rotation in a community hospital to create an intentional IEE course, with IPEC competencies central to the design and evaluation of the APPE. The study reported significant improvement in perceptions regarding the 3 assessed domains of IPEC competencies, namely values/ethics for interprofessional practice, roles/responsibilities, and teams and teamwork.\cite{32} O’Connell and colleagues\cite{33} created a new IPE collaborative experience between physician assistant and pharmacy students in an emergency department and community pharmacy. The program intentionally incorporated IPEC competencies and assessed student interprofessional team skill development with formal TOSCEs. The lack of intentional IEE in pharmacy education was identified by a 2018 AACP task force, and our review found that the published literature continues to remain sparse with examples of inpatient clinical IPE incorporated into APPEs.

Assessment of learning outcomes yielded several key findings. Our review identified a lack of incorporation of IPEC competencies into clinical IPE, with only 3 studies assessing outcomes based on IPEC competencies.\cite{25,30,31} The IPEC competencies were first published in 2011 with an update in 2016, yet there has been a delay in incorporation into the design and assessment of CLEs.\cite{18} There was also a lack of incorporation of validated IPE assessment tools in assessing learning outcomes. All but O’Connell and colleagues\cite{33} focused on individual outcomes rather than changes in the function of the team. O’Connell and colleagues\cite{33} used the ATHCT and TOSCEs to assess improvement in team skills and attitudes. Most interprofessional learning outcomes were categorized as lower-level Kirkpatrick outcomes, with only 2 studies demonstrating changes in learner behavior.\cite{29,32} This represents a strategic gap in the assessment of clinical IPE in the inpatient setting. Studies are needed that articulate a robust clinical IPE design grounded in the IPEC competency framework and use validated assessment tools.\cite{34} Assessments focused on interprofessional team collaborative behaviors and skills are also needed.

Interprofessional faculty involvement in IPE is a well-established factor in successful IPE.\cite{35,36} Faculty and preceptor development and participation in CLEs is crucial to a well-designed, impactful experience for students.\cite{37,38,39} NCICLE has asserted that faculty role-modeling is an important component to an ideal CLE.\cite{40} In this review, several studies specifically mentioned that interprofessional faculty were present on clinical rounds,\cite{25,30} but only 1 study specifically discussed faculty role-modeling of interprofessional collaboration. The finding of limited examples of role-modeling among IPE faculty or preceptors is supported by prior work.\cite{41} Pharmacy schools must provide faculty and preceptor development that focuses on effective interprofessional precepting and strategies for assessment of team skills and behaviors.\cite{42,43,44} The ultimate goal of clinical IPE is demonstration that achievement of IPE competencies directly improves patient care.\cite{13,14,16} In this review, most studies focused on student satisfaction and changes in attitudes toward IPE\cite{24,26,28-30} or addressed clinical outcomes only.\cite{27,33,35} Folar and colleagues\cite{27} and Schmid and colleagues\cite{45} both describe the intentional creation of an interprofessional collaborative practice model that resulted in optimization of antibiotic stewardship management. However, patient care outcomes were not connected to assessment of IPE competencies in either study.\cite{27,33} Anderson and Lakhan\cite{24} presented the strongest case for clinical IPE’s impact on patient outcomes. They created a clinical IPE activity focused on medication assessment in polypharmacy that improved student appreciation of collaboration, prepared them for teamwork, and demonstrated the value of roles.\cite{24} Students presented medication review findings in case presentation format to physicians who commented that they made changes based on the information.\cite{24} There remains a need for evidence of the impact of well-designed, intentional interprofessional clinical learning on improved patient outcomes in the inpatient setting. Our findings are supported by a recent systematic review that reviewed the impact of interprofessional clinical learning across all settings.\cite{46} Of 256 articles included in the review (published since 1967), 50 (19%) reported patient outcomes. Outcomes included patient satisfaction and experience, health behaviors, use of health services, financial outcomes, and clinical outcomes. Only 9 studies reported clinical outcomes, with 5 demonstrating positive outcomes. Only 1 of the 9 studies was in the inpatient CLE.

The scarcity of published literature on inpatient clinical IPE for pharmacy learners was surprising. Our original scoping review identified 33 studies of clinical IPE that included pharmacy learners, with 76% of studies occurring in ambulatory care, community outreach, nursing homes, long-term care facilities, and home-based care.\cite{47} It seems that inpatient clinical IPE may be either less commonly reported or is being conducted less than in other settings. We believe there is a component of publication bias. It is considered “standard” to work collaboratively to care for patients, and faculty or preceptors may be less inclined to publish their work without a specific focus or novelty to the clinical IPE experience. However, the scarcity of publications in this area is problematic from our perspective; the mere occurrence of an event does not imply its effectiveness, efficiency, or optimality. Without published models to judge and learn from, innovation stalls. There are unique limitations to the inpatient setting, including space issues and traditional practice models. Reports and studies on novel examples of overcoming these barriers are needed. The results of this review highlight this issue.

Our review adds to the current literature in several ways. To our knowledge, there has not been a scoping review describing clinical IPE for pharmacy learners. Identification of key characteristics of current models can assist inpatient clinical educators and preceptors in designing novel experiences that advance clinical IPE in the inpatient setting. Novel clinical experiences in the inpatient space may include examples of incorporation of additional health care learners such as nursing, physical therapy, and occupational therapy students into the clinical IPE setting. Models that assess the impact of clinical IPE experiences on student team outcomes (improvement in team dynamics and performance) and patient care measures are also needed. Our review highlights the continued need for robust clinical IPE design that uses IPEC competencies to frame IPE learning. Use of IPEC competencies in the clinical setting can position programs to measure achievement of IPE outcomes across the curricular continuum as students move from the classroom to collaborative clinical learning. Lastly, the inpatient setting represents significant opportunity for clinical IPE, but also has recognized structural and logistical limitations. Identification of these barriers can empower IPE champions and leaders to engage in movement toward optimizing the CLE to facilitate the advancement and growth of clinical IPE.

4.1. Limitations

There are some limitations to our scoping review. Our review only included peer-reviewed publications written in the English language. The review was also limited to publications after 2015 because we were interested in contemporary examples that incorporated the 2016 update to the IPEC competency framework. Data extraction was limited to the activity descriptions provided in the articles; in cases where these descriptions were limited, it is possible that the authors did not capture...
the full scope of the clinical experience. This could have led to misinterpretations. To reduce subjectivity during data extraction, studies had to explicitly denote key elements of the activity design, including use of IPEC competencies and incorporation of the experience as a component of IPPEs or APPEs.

5. Conclusion

The current literature on inpatient clinical interprofessional learning is limited, and yet the inpatient clinical space represents an untapped well for the development of clinical IPE. Specifically, there is a paucity of reports of pharmacy learner involvement that achieves both dynamic clinical IPE learning and patient care outcomes within established inpatient workflows. Medicine is the most common partner, with a surprising absence of nursing and other health professions students. Examples of collaborative models that partner pharmacy learners with physician assistant, nursing, physical therapy, and occupational therapy students are needed to identify key strategies for incorporating additional learners into the inpatient setting. Intentionality is needed in the design, assessment, and delivery of clinical IPE that is grounded in the IPEC competency framework and incorporated into the required experiential education curricula for all pharmacy learners.

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