Assessing the Frequency and Quality of Hidden Interprofessional Educational Interactions that Occur on Inpatient Rotations: An Exploratory Study

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Abstract

BACKGROUND Clinical interprofessional education (IPE) experiences are necessary to produce a collaborative practice-ready workforce. However, creating clinical IPE courses is challenging. In this exploratory study, we sought to characterize informal IPE experiences that occurred during standard rotations among medical, nursing and pharmacy students.

METHODS Thirteen senior medical, nursing and pharmacy students enrolled on inpatient rotations were invited to participate. They used a web-based tool to assess characteristics of interactions they had with individuals of other professions for five days during their rotations. At the conclusion of their rotations, participants were invited to participate in focus groups.

RESULTS Study participants included 5 medical, 5 nursing, and 3 pharmacy students. 122 interactions were documented. "We discussed care of a patient with many contributing ideas and opinions" was the most common interaction (42.9%), followed by "Others taught me something about patient care" (33.7%). Four students participated in focus groups (2 medical, 1 nursing, 1 pharmacy), and reported meaningful IPE interactions that included feeling valued as a member of the healthcare team when given autonomy and ownership of patient care.

CONCLUSION Students from three separate professions reported impactful informal IPE interactions on inpatient rotations. These findings provide opportunity for enhancing IPE experiences on existing rotations.

> **Implications for Interprofessional Practice**
>
> - Meaningful informal interprofessional interactions occurred among students from multiple professional programs on standard inpatient rotations
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> - Informal interprofessional interactions occurring on inpatient rotations can be recorded and submitted by students
>
> - Students reported greater informal interprofessional interactions when given autonomy within the clinical environment

Introduction

In February 2019, the Health Professions Accreditors Collaborative and the National Center for Interprofessional Practice and Education published guidelines for the future direction of interprofessional education (IPE) (Barzansky et al., 2019). Included in the guideline was a call for intentional design of integrated IPE experiences across all learning settings, including the clinical environment. Also highlighted in this document was expansion of the term "students" to include "learners and members" of healthcare teams. This change indicates the importance of learning from, with and about other health professionals of any level of training or experience, and emphasizes the importance of lifelong learning in IPE (Wagner & Reeves, 2015). This new guideline also reflected similar content from a paper produced by the World Health Organization (WHO) nearly a decade earlier (World Health Organization, 2010). Both documents place considerable emphasis on producing a collaborative practice-ready workforce by instituting effective IPE. Therefore, the challenge for educators is to develop clinical IPE experiences that help produce collaborative practice-ready graduates. This could either be accomplished through creating IPE-specific clinical courses, or enhancing the IPE experiences that occur within existing rotations.

LITERATURE REVIEW

Many challenges are associated with the development of robust clinical IPE-specific experiences, including the need for coordination and scheduling across professional schools, lack of space in the clinical environment, lack of preceptors capable of educating individuals from different professions, and lack of funding directed toward clinical IPE experiences (In-stitute of Medicine, 2015; Reeves et al., 2016; West et al., 2016). Therefore, educators and learners alike may benefit more from enhancing existing clinical experiences to better achieve IPE and collaborative practice goals, rather than developing new clinical IPE courses (Nisbet, Lincoln, & Dunn, 2013). Evidence suggests meaningful IPE and Interprofessional Learning (IPL) takes place in clinical environments outside of specific IPE courses (Hagg-Martinell, Hult, Henriksson, & Kiessling, 2019; Wagter, van de Bunt, Honing, Eckenhausen, & Scherpbier, 2012). These findings are consistent with data on workplace-based learning, which indicate learning and socialization occur on multiple levels, often hidden from curricular descriptions and structures (M. Eraut, 2000; Joynes, Kerr, & Treasure-Jones, 2017). This spontaneous or "informal" IPE is thought to be a powerful force in learning professional roles and developing professional identities (Marsick, Volpe, & Watkins, 1999).

Although evidence suggests IPL occurs outside of designated IPE courses or curricula, instruments for assessing its frequency and quality are lacking (Nisbet et al., 2013). Wagter et al (2012) conducted a cross sectional survey describing the nature of clinical IPL between nurses, senior physicians and resident physicians. However, this study did not involve students and did not develop a measurement tool that could be deployed to determine if learners were experiencing informal IPE or IPL. Determining both the feasibility of collecting data about the nature of informal IPE in student's rotations and identifying what those data reveal about these interactions are important steps in addressing the challenge of providing clinical IPE opportunities for learners. Once accurately measured, informal IPE could be enhanced within clinical rotations toward providing students with valuable learning experiences in real world

collaborative practice clinical settings. Thus, the goals of this exploratory study were three-fold. First, to develop and carefully pilot test a measurement tool designed to capture information on spontaneous informal interprofessional interactions. Second, to determine the feasibility of collecting data on learners' interprofessional interactions as they unfold in their clinical rotations. Third, to assess the frequency, quality, and types of interprofessional interactions that occur among medicine, pharmacy and nursing students as well as those occurring among students, staff and faculty members from different professions.

METHODS

Study Design

This exploratory study was guided by a mixed methods quasi-experimental design.

Participants and Setting

The study setting involved a university-based academic medical center located in the Pacific Northwest. A convenience sample of medical (MD), nursing (RN) and pharmacy (PharmD) students doing either pediatric or adult inpatient rotations during summer or fall of 2019 were invited to participate. Dental students were also initially invited to participate, but were later excluded because their rotations occurred in the outpatient setting and did not involve working with members of different professions. All students were in the last year or semester of their respective 4-year programs. Each student had completed the university's required year-long IPE course, which includes didactic and small group instruction and intersession project-based learning on the core competencies for interprofessional practice (Schmitt, Blue, Aschenbrener, & Viggiano, 2011). Medical and nursing students take this course during the first year of their training program while pharmacy students take the course during their second year of training. Medical and nursing students were completing "capstone" and/or "sub-internship" pediatric rotations, where greater autonomy is provided than occurs earlier in their training. Pharmacy students were enrolled in standard rotations as part of their final year of pharmacy school; 2 were enrolled in adult rotations, 1 in pediatrics. All students doing pediatrics were at the same clinical rotation site, and both students doing the adult rotation were at the same clinical rotation site.

Hospital rounds occur daily from 9-12 in both adult and pediatric units, and are intended to be both interprofessional and family-centered. Though not specifically aimed toward IPL or IPE, these standard clinical rotations are intended to help students further develop their expertise and autonomy in their chosen subject area. Members of the study team, with support from course directors or coordinators, invited students to participate in the study via e-mail. Students who indicated interest in taking part were consented. Our institutional review board approved all study activities.

Evaluation Instrument Design and Development

One online demographic survey was administered to participants, and an online data capture tool was developed, pilot tested and administered. Lastly, focus groups were conducted with students. The first survey collected standard demographic information, including age, gender, race, ethnicity and program of study. This survey included items that had been validated using cognitive interviewing techniques (Willis & Artino, 2013). The second data capture tool, the Interprofessional Encounter Assessment Tool, was developed specifically for this study to assess the quality of and extent to which unstructured informal interprofessional interactions occurred during students' clinical rotations. The Interprofessional Interaction Assessment Tool questions were developed and then pilot tested to determine how well they allowed for accurate documentation of interactions that would fit within the definition of IPE and the framework of the IPEC core competencies (Schmitt et al., 2011). For the purposes of this study, we defined "interactions" as "coming together in ways that have a learning effect on participants." For each encounter, students identified which discipline the interaction partner belonged to (e.g., medicine, nursing, pharmacy) and their role (e.g., student, faculty/staff). Students then identified the type of learning as being related to patient care or not and the direction of interprofessional behavior that occurred during each encounter (Others taught me something about patient care; I taught others something about patient care; We discussed care of a patient with many contributing opinions and ideas; We discussed a topic unrelated to patient care). Students were not specifically directed to seek interprofessional interactions as part of this study, rather they reported on their experiences as they unfolded naturally.

Each encounter was then rated as being positive (Role

clarity occurred, and/or interaction was trusting and collegial), negative (I felt disrespected, noticed negative stereotypes, and/or work was done in silos) or neutral (Neither positive nor negative and/or interaction was as expected). Students were then asked how valuable the interaction was in helping them function as a member of an interprofessional team in the future (1=not at all valuable, 2=somewhat valuable, 3=moderately valuable, 4=very valuable, 5=extremely valuable). This tool also asked students to respond to one open-ended question about each interaction, "What, if anything, prevented you from engaging more with the healthcare team as part of this interaction?" Prior to full implementation, we monitored data captured after the first several encounters to be sure the tool was capturing data as it was designed to do. Lastly, students were asked if they would be willing to take part in a one-hour focus group. Those who reported they would, were contacted to schedule a time that would work for most.

The focus groups were jointly facilitated by the study's principal investigator (Author JPA) and lead evaluator (Author PAC) with the aim of exploring more in depth the ways students interacted with others and what types of interactions were most valuable to them. The focus group questions were developed by study investigators and were informed by data captured using the Interprofessional Encounter Assessment Tool, where we identified topics we wanted to explore in more depth. Students participating in the focus groups were asked: 1) to reflect on their observations of how interprofessional teams function in general; 2) to consider what types of interprofessional interactions were most and least valuable to them, both in terms of patient care and their own education; 3) what they could have done to become more integrated into healthcare teams; 4) how the interactions they had on their clinical rotations prepared them for becoming active members of healthcare teams in the future; 5) how the rotation being discussed compared to other rotations in terms of helping them learn to function on an interprofessional team; and 6) how they planned to implement what they learned about team-based care in their next rotation. With regard to measurement feasibility, students were also asked about their experiences engaging with the Interprofessional Encounter Assessment Tool on a daily basis. Lunch was provided to participants. Once all study activities were accomplished, students were given a gift card in the amount of $20 for on-campus dining to show appreciation for their participation. The gift cards were funded by the university provost's office, and the students were aware of the gift cards prior to signing up for the study.

Data Collection and Analysis

Both surveys were administered online. The demographic survey was administered once. The Interprofessional Encounter Assessment Tool was administered to each student once per day for five days and it allowed each student to report on up to five interprofessional interactions per day. Students received an email message at the end of each day's clinical rotation containing a link to the Interprofessional Interaction Assessment Tool and asking them to complete it about their interaction for the day. The focus groups were held after data collection was completed and survey data could be used to inform the development of the focus group questions.

Descriptive statistics, including standard frequencies were run to assess the shape of the data, which helped determine the analytic tests used. We used Chi square and Fisher's Exact Test (for cell counts < 5) to assess categorical variables across the three programs of study (medicine, pharmacy, nursing). All tests were two-tailed with alpha set at 0.05 for statistical significance.

Authors PAC and JPA co-facilitated the focus groups. Author PAC is trained in qualitative research, including focus group/key informant interview methodologies. Field notes were collected by all three authors, all of whom have experience using this data capture approach, during the focus groups, and individual notes were merged into a single composite document. We used classical content analysis (Bauer MW, 2000) to identify emergent themes. Two qualitatively trained researchers (authors PAC and CT) independently coded and defined emergent themes using open and axial coding techniques. Emergent themes and their descriptions were finalized using consensus meetings.

RESULTS

Participants

Sixteen students consented to take part and 13 students completed study activities, including five medical students, five nursing students, and three pharma-

cy students. Two nursing students and one pharmacy student did not complete the study. The majority of participants, 61.5% (n=8), were between ages 25 and 34, 84.6% (n=11) were female, and 84.6% (n=11) were non-Hispanic white. No statistical differences were found in demographic characteristics according to program of study. Collectively, students submitted data on 122 interprofessional interactions that took place during the planned five days of data collection on their rotations. Two focus groups and one key informant interview were held with four of the 13 students, including one male nursing student, two female medical students and one female pharmacy student.

Quantitative Analyses of Interprofessional Interactions

Each interprofessional encounter could involve up to four types of learning, and a total of 196 types were reported for 122 interactions. The most common type was, "We discussed care of a patient with many contributing ideas and opinions," which represented 42.9% (n=84) of learning types. Just over one third of encounters (33.7%; n=66) involved, "Others taught me something about patient care." All learning types differed statistically according to program of study (Table 1). For example, "I taught others something about patient care" was most often reported by PharmD students (29.2%; n=26) compared to medical students (4.2%; n=2) and nursing students (3.3%; n=2) (p<0.001).

The vast majority of interactions occurred between students and faculty or staff (74.2%; n=92) and, on average, 24.2% (n=30) occurred with other students (Table 2). However, when the student groups were compared, the PharmD students reported that 46.7% (n=21) of their interactions occurred with other students compared to 10.3% (n=4) for medical students and 12.5% (n=5) for nursing students (p<0.001). These same PharmD students reported that 51.1% (n=23) of interactions occurred with faculty or staff, while 89.7% (n=35) of medical students and 85.0% (n=34) of nursing students reported their interactions occurred with faculty or staff.

The vast majority of participants rated their interpro-

	Total Students	MD Students	PharmD Students	RN Students	
	n (%)†	n (%)†	n (%)†	n (%)†	p value**
Others taught me something about patient care	66 (33.7)	17 (36.1)	25 (28.1)	24 (40.0)	.003
I taught others something about patient care	30 (15.3)	2 (4.2)	26 (29.2)	2 (3.3)	< .001
We discussed care of a patient with many contributing ideas and opinions	84 (42.9)	25 (53.2)	29 (32.6)	30 (50.0)	.012
We discussed a topic unrelated to patient care	16 (8.2)	3 (6.4)	9 (10.1)	4 (6.7)	.005
Total types of learning	196 (100.0)	47 (100.0)	89 (100.0)	60 (100.0)	
Total number of interactions	122 (100.0)	38 (100.0)	44 (100.0)	40 (100.0)	

Table 1. *Types of learning during interprofessional interactions (n = 122)**
*Each interprofessional interaction can involve more than one type of learning
**Chi square
†Column percent

	Total Students	MD Students (n = 5)	PharmD Students (n = 3)	RN Students (n = 5)	p-value*
With whom did interactions occur?	n (%)†	n (%)†	n (%)†	n (%)†	
Faculty or staff	92 (74.2)	35 (89.7)	23 (51.1)	34 (85.0)	
Student	30 (24.2)	4 (10.3)	21 (46.7)	5 (12.5)	<0.001
Other	2 (1.6)	0 (0.0)	1 (2.2)	1 (2.5)	
Total number of interaction partners identified	124 (100.0)	39 (100.0)	45 (100.0)	40 (100.0)	

Table 2. *Interaction Partners Among Interprofessional Health Students*
*Fisher's Exact Test
†Column percent

fessional interactions as positive in terms of role clarity (86.9%; n=106), and being trusting and collegial (Table 3) with a range of 78.9% (n=30) for medical students to 93% (n=40) for pharmacy students. Fourteen encounters (11.5%; n=14) were reported as neutral or as expected and collegial, and one (1.6%) was reported as negative or having generated feelings of disrespect, negative stereotypes or that work was done in silos. In terms of value of the interactions, 62.6% (n=77) were reported as valuable or extremely valuable (Table 4). Pharmacy students rated value highest (81.8%; n=36) compared to medical (56.3%; n=22) and nursing students (47.5%; n=19; p<0.001).

Responses to the open-ended question, "What, if anything, prevented you from engaging more with the healthcare team as part of the interaction?" appeared to differ according to type of learner, with the pharmacy students tending to voice time constraints (Table 5). Aspects related to being a student were voiced by medical and nursing students, and time constraints was mentioned but less frequently.

	Total Students	MD Students (n = 5)	PharmD Students (n = 3)	RN Students (n = 5)	*p* value*
Interaction Rating:	*n (%)†*	n (%)†	n (%)†	n (%)†	
Positive: Role clarity occurred, and/or interaction was trusting and collegial	*106 (86.9)*	30 (78.9)	40 (93.0)	36 (90.0)	
Neutral: Neither positive nor negative and/or interaction was as expected and collegial	*14 (11.5)*	8 (21.1)	3 (7.0)	3 (7.5)	0.11
Negative: I felt disrespected, noticed negative stereotypes, and/or work was done in silos	*1 (1.6)*	0 (0.0)	0 (0.0)	1 (2.5)	
Total number of interactions rated	*121 (100.0)*	*38 (100.0)*	*43 (100.0)*	*40 (100.0)*	

Table 3. *Positive, Negative & Neutral Ratings of Interprofessional Interactions (n = 121)*
*Fisher's Exact Test
†Column percent

	Total Students	MD Students (n = 5)	PharmD Students (n = 3)	RN Students (n = 5)	*p* value*
How valuable was the interaction in helping you function as a member of an interprofessional team in the future?	*n (%)†*	n (%)†	n (%)†	n (%)†	
Not at all valuable	*3 (2.4)*	1 (2.6)	1 (2.3)	1 (2.5)	
Somewhat valuable	*15 (12.2)*	9 (23.1)	3 (6.8)	3 (7.5)	
Moderately valuable	*28 (22.8)*	7 (18.0)	4 (9.1)	17 (42.5)	< 0.001
Very valuable	*55 (44.7)*	21 (53.8)	20 (45.4)	14 (35.0)	
Extremely valuable	*22 (17.9)*	1 (2.5)	16 (36.4)	5 (12.5)	
Total number of interactions rated	*123 (100.0)*	*39 (100.0)*	*44 (100.0)*	*40 (100.0)*	

Table 4. *Value ratings of interprofessional interactions (n = 123)*
*Fisher's Exact Test
†Column percent

Day 1

MD	Being the student in the interaction made me slightly less engaging.
	I didn't feel like I knew the patient we were discussing and didn't know the medical knowledge necessary to join the discussion.
	Nursing staff had more pediatrics experience than myself.
PharmD	Establishing relationship w/ new attending.
RN	Limited availability of physician.
	Patient was discharging the same day so there was a time constraint to the number of interactions.

Day 2

MD	Nothing; no real medical need for the interaction so it was short.
PharmD	Limited role working as a student within specialty fields your only exposed to for weeks to months compared to faculty who have spent years in that area.
	Busy schedule.
	Initial time meeting.
	As I am relatively new to medical teams, I feel as though I am still determining how to best interact with attendings. Some intimidation is a factor.
	Limited duration of interaction.

Day 3

MD	Being a student.
	I felt like the other individual automatically viewed me in a hostile way and was questioning my input and directions, so I thought it would be best to have a more senior person (rather than a student) finish the interaction in the interest of getting our task done quickly.
PharmD	Time constraints.
	Limited duration of interaction.

Day 4

PharmD	Clinic was very busy today, had to stay focused on required activities to get through patients in timely manner.
	Time.
	Time.
RN	Time restrictions.

Day 5

MD	We were rounding and had a lot of patients, so we were trying to be efficient.
	Nothing, I learned a lot about what public safety can and can't offer to help with behavioral health patients who are escalating.
PharmD	Limited time.
RN	As the visit was prompted due to a verbal confrontation with the RN, I didn't engage as much as I would like to as a way to not add any additional strain onto the situation.

Table 5. *Students' text Responses to the Open-Ended Question, "What, if anything, prevented you from engaging more with the healthcare team as part of the interaction?" According to Day Recorded and student profession*

Qualitative Analyses of Focus Groups

In response to the question, "*What observations did you make about how interprofessional teams function?*", participants indicated they learned about the team members' specific roles. Students on pediatric rotations reported feeling more supported and that their input was more valued than typically occurs during other rotations, in part, because teams on other rotations are less interprofessional compared to pediatric teams. The pharmacy student noted the importance of talking with team members early in the rotation to get to know them and set expectations. She acknowledged this can be hard to do as a student, but when possible, taking the time to get to know other team members made her feel like she was part of the team and that the other team members knew how to connect with her when they had questions.

In response to the question, "*What kinds of interprofessional interactions did you find most valuable in terms of patient care,*" medical students indicated that interactions with pharmacy and nursing were both valuable (e.g., a medical student described getting help from a pharmacist on antibiotics for a patient and with drug interactions). Students indicated they felt better able to participate on rounds in pediatrics compared to other rotations, due to a standardized rounding schedule and greater emphasis on family-centered rounds than adult rotations. The types of interactions mentioned most frequently were those with other students. Overall, students greatly valued interacting with each other, both within their disciplines and across other disciplines for several reasons. Interactions with other students were more open and conversational and students were less concerned about "wasting someone's time" when interacting with another student compared to interactions with residents or attending physicians. For example, one student noted that when one asks a question of an attending physician, it should be a "good" question. Interactions with pharmacy students were particularly helpful in this regard because students felt more comfortable about not knowing something when they interacted with another student compared to interacting with faculty and residents. In summary, working with other students was collaborative in that they enjoyed "figuring it out together."

In response to a probe, "*What could you have done to become more integrated into the healthcare team,*"

students indicated that at the beginning of the rotation integrating themselves into the team was challenging. They felt they needed to understand the "politics, hierarchy and culture of the team" before they felt comfortable contributing. Students reported that cultivating this understanding is an ongoing process, as significant variability exists in team culture across units. "Settling-in" can be further complicated by changes among team members during the rotation (a frequent occurrence), being on a larger inpatient service, and when expectations differed or were unclear across different services. Students indicated that asking about expectations at the beginning of the rotation was helpful; however, they were cautious about doing so, due either to fear that their questions may reveal they did not know something that they should know or concerns that being assertive would be perceived as "sucking up" to faculty or residents. They noted the power differential between students and faculty (e.g., faculty grade student performance). It was also difficult to make or find time for interactions on a busy service. Medical students indicated that a 2-minute orientation with their resident or attending physician would have been helpful in establishing expectations. This orientation could serve to explain the flow of the day and provide an opportunity to discuss how best to deliver feedback, which was important because students wanted reassurance about their interactions with the residents, faculty and staff.

Although there were several challenges to integrating themselves into the health care team on a new rotation, students indicated this process went more smoothly when they had prior experience with some team members because those individuals knew they could depend on and trust the students. Students also reported integrating with the team was easier when they were encouraged to take "ownership" of their patients, with another saying that they were treated more like interns than sub-interns on their pediatrics rotation (e.g., when a nurse paged the medical student rather than the intern about a patient matter).

In response to the question about the *kinds of interprofessional interactions students found most valuable in terms of their education*, we learned that students valued unanticipated interactions that were not part of the formal curriculum. For example, one student experienced an unexpected interaction with a safety officer regarding a behaviorally-challenged patient. This

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interaction represented a new educational experience and was very informative because the safety officer explained his role and what he was and was not allowed to do for the patient. Other students described similar unexpected or unplanned events as being very powerful, because they represent valuable educational experiences that cannot take place in the classroom. They noted these types of events 'really illuminated' what everyone's role was (e.g., charge nurse, nurse manager, patient advocacy), particularly when they involved unhappy patients or family members and advocacy was required. The nursing student reflected on one such experience and noted that his contributions during a patient episode were such that while the patient and family accepted him, they would not interact with other members of the team that had been involved, which enabled him to understand what he had "done right" to gain their confidence.

In response to the question, "*What kinds of interprofessional interactions were less valuable for either patient care or education?*" students reported that it was difficult when team members didn't have all the information they needed during rounds and/or when all the people needed for a huddle were not present. A medical student added that missing information can create difficulties later when, for example, a resident receives a page in the middle of the night, which could have been avoided if the team member had all of the patient information they needed.

In response to the question, *How do interprofessional experiences best prepare you to become active members of a healthcare team?"*, one student noted having non-MD preceptors helped to clarify other's roles (e.g., in the cystic fibrosis clinic with a nurse educator). They liked the continuity of following complex patients across all the services they received, which also crystalized the roles of all team members. Sometimes this experience happened in the context of an elective (e.g., care for medically fragile children) rather than on a required rotation. Students reported these experiences resulted in increases in their confidence about their own role and in terms of what to take responsibility for and what to delegate. They also reported it increased their confidence in communicating with others outside their disciplines (e.g., calling the pharmacy and lab, calling consults).

One medical student noted that working with other dis-

ciplines (particularly students) made them aware and appreciative of other disciplines' training (e.g., four years of pharmacy school then residency for pharmacists). The pharmacy student indicated the feedback received during her rotation helped her to develop confidence both in herself and how to approach other team members. She further indicated that the experience was a good foundational experience upon which to build future interactions.

In response to the question, "*How did this inpatient rotation compare to others in terms of helping you learn to function on an interprofessional team?*", students reported that during this rotation they felt they were not just learners but were really contributing importantly to patient care. These contributions were possible, in part, due to their standing as senior students, and that earlier in training they might not have been able to contribute as much. They understood expectations and felt valued, trusted and welcomed, which supported their desire to do their jobs well. Students indicated that trust was demonstrated, for example, when they were called or paged for patient care issues, which led to increased feelings of ownership over the care of the patient compared to other rounds. In addition, students reported that such actions gave them more confidence in their interactions with other professions. Also unique to the rotations on pediatric units was the desire to ensure nurses and other healthcare professionals were included on medical rounds, something the students indicated would be very beneficial if it were to happen more frequently on all units.

In response to the question, "*How do you plan to implement what you have learned about team-based care in your next rotation?*", students indicated feeling more confident about actively calling for consults and calling pharmacy. They reported being more comfortable with their scope in terms of responsibilities as a learner. They also reported that finding opportunities or time to round with other professions (e.g., nursing, pharmacy, medicine) was important because it is such a valuable experience.

Lastly, when asked about their experiences using the Interprofessional Encounter Assessment Tool students indicated that it was easy to use and took a reasonable amount of time to complete following their clinical rotations. Students indicated they reported on between 75 to 80% of their interprofessional interactions.

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DISCUSSION

In this exploratory study, we established the feasibility of collecting interprofessional encounter data during clinical rotations. We developed a survey, the Interprofessional Encounter Assessment Tool, that was quick and easy for students to use, which allowed us to identify the frequency, quality, and types of interprofessional interactions that occur among medicine, pharmacy and nursing students as well as encounters occurring between students, staff and faculty members from different professions. We found that meaningful interprofessional interactions occurred frequently among these students during their inpatient rotations. These informal interactions were overwhelmingly rated by students as positive (e.g., characterized by role clarity, trust and collegiality) and the majority of students rated their interactions as valuable or extremely valuable in terms of helping them function as members of interprofessional teams in the future.

We did find, however, differences existed among learners, with pharmacy students reporting interactions as valuable more frequently than medical or nursing students and pharmacy students had statistically more interactions with other students compared to medical or nursing students. There were also significant differences among learners for the types of learning that occurred during interactions. While the interaction, "patient care was discussed with many contributing opinions and ideas" occurred most frequently in all groups, pharmacy students reported that they "taught others something about patient care" with much greater frequency than medical and nursing students. It is possible that in teaching others about patient care, pharmacy students also found these types of interprofessional interactions more valuable. Or because pharmacy students have specialized training in pharmacology compared to other learners they were tapped more often, especially by other students, to engage in interactions to share their knowledge. Further investigation into the differential experiences for learners across programs is warranted. Empowering students of any profession to share their knowledge should be a goal of any IPE experience, and particularly one that occurs in the clinical setting. One way to encourage this may be through the use of more "social" IPE experiences outside of the clinical environment, which can help break down barriers between learners and lead to more authentic and open interactions (Stilp & Reynolds, 2019).

There were several ideas that emerged in the focus group discussions that illuminated how students learn and what they found most valuable during interprofessional interactions. The first of these is the importance of interprofessional learning that takes place between and among students. Central to these interactions was the greater comfort level students expressed when interacting with other students as opposed to staff or faculty from other professions. Students felt this comfort level was due to being able to interact in a more "open and conversational" manner, which may be due to the lack of hierarchy in student-student interactions, compared to student-staff interactions. Students reported feeling less self-conscious when asking other students questions when they did not know the answer. Part of this approachability may be a consequence of the IPE course all students are required to take early in their training. This preclinical course likely contributed to enhancing the IPE and IPL experiences students reported. As recommended and demonstrated by others (Acquavita, Lewis, Aparicio, & Pecukonis, 2014; Barzansky et al., 2019; Dugani & McGuire, 2011; World Health Organization, 2010; Haggarty & Dalcin, 2014), students' discussion of their interactions with one another illustrates the value of creating learning experiences, such as preclinical IPE courses and clinical rotations, that bring students of multiple professions together in meaningful ways.

A second finding from the focus groups was the importance of good communication and preparation when students were being integrated into the healthcare team. This process is one all learners reported as being challenging, yet they perceived it as critical, since being an active learner on a team is more difficult without a clear understanding of the team culture or what is expected of the learner. Students noted that when they have more familiarity with team members before starting the rotation, the transition is smoother. However, ensuring such familiarity represents a challenge to teaching in the clinical environment, where the faculty, residents and staff a student may work with can change daily. To address team continuity, students indicated a brief orientation from a team leader at the start of the rotation would help them feel more integrated, know their roles on the team and clarify expectations. Such an orientation could be done virtually or in-person, synchronously or asynchronously. Acheiving greater continuity of all members of the healthcare team would not

only benefit student learning (Hirsh, Ogur, Thibault, & Cox, 2007; Irby, 2007), it may also improve the quality of patient care by reducing handoffs between providers (Yoshida et al., 2019). This intersection of IPE and patient safety deserves further study.

Regarding learner integration onto a team, students reported that, as they were given more ownership of their patients, they were able to better integrate into the team, and have more meaningful interactions with members of other professions. This ownership helped students build confidence in patient care as well as strengthening their interactions with other team members. They acknowledged that having this autonomy was easier being senior students, when their skillset was more advanced, than earlier in training, which emphasizes the importance of aligning learning activities with learner skill level (Joynes et al., 2017; Reeves, Freeth, McCrorie, & Perry, 2002). This finding also suggests that if students can be given autonomy and ownership over tasks, even simple tasks, earlier in training, it may help foster integration into teams. This thinking is consistent with research on workplace-based learning where comfort with the people and environment contributes to the ability of learners to feel confident taking on more authentic roles (Michael Eraut, 2004; Liljedahl, Boman, Fält, & Bolander Laksov, 2015).

Creating more welcoming workplace environments, empowering students to take ownership of patient care and emphasizing social cohesion between members of the interprofessional team may further enhance IPE opportunities for students. The most overt way this could be accomplished is through the formation of practice-based IPE experiences (Naumann et al., 2020; O'Leary, Salmon, & Clifford, 2021). However, as noted by O'Leary et al, this can be a daunting task since it involves carving out educational time in the curriculum of multiple professions and training both students and staff in IPE concepts to fully realize the educational potential of such experiences (O'Leary, Salmon, & Clifford, 2020). Another approach involves enhancing informal IPE. One way to accomplish is to involve students in interprofessional team meetings, such as huddles, care conferences and rounds (Nisbet, Dunn, & Lincoln, 2015). In this model, such meetings, which already exist as a function of patient care, can be used to demonstrate and teach IPE concepts to learners and staff alike. Additionally, involving patients and families in informal IPE has been described as a useful

way to both teach IPE and enhance patient care (van Dongen, Habets, Beurskens, & van Bokhoven, 2017). Our study provides a framework for documenting such IPE encounters in order track and better design clinical experiences that enhance informal IPE.

Finally, students reported that some of the most valuable IPE learning experiences were unanticipated and spontaneous. The value students found in these experiences emphasizes the importance of training in real world settings where the unexpected can occur. These experiences also reflect the power of the informal and hidden curricula in shaping the way students see their roles and the roles of others (Hafferty, 1998; Hafferty & Franks, 1994). This finding also highlights the importance of positive role modeling as well as creating a welcoming clinical environment in order to encourage optimal informal IPE experiences (Austin, 2015).

Limitations of this exploratory study include that it was conducted at a single institution and involved small numbers of students, which limits its power and generalizability. Furthermore, because this was an exploratory study, we decided not to include a control group, as it would have been impossible to capture data without using the tool we developed for this specific purpose, which is an intervention in and of itself. Though we did not formally validate the Interprofessional Encounter Assessment Tool, we did pilot test it and monitored study data in real time to ensure data received were stable. We plan to use multiple observer techniques in a future larger study to validate it using the kappa coefficient for inter-observed agreement. Additionally, most interactions took place on a pediatric unit, which the students noted was a unique environment in terms of the degree to which interprofessional practice may be inherent to pediatrics as compared to other units. Future research into the cultural differences between hospital units (e.g. pediatric versus adult; surgical versus medical) and how these differences influence IPE would be fruitful. Qualitative data, including focus groups, were collected on small numbers of subjects, which limited our report of findings as descriptive. Achieving thematic saturation and developing broader themes was not possible. Lastly, the lack of planned educational interactions as part of this exploratory study did not align well with educational IPE theory, so this study was not guided by any specific educational framework. In fact, we believe that more theory development is needed to fully understand spontaneous or

informal IPE. For example, our findings suggest that adaptation of social network theory, which studies how people or groups interact within a network, may help to understand how interactive relationships form among learners and clinicians from different disciplines (Saqr & Alamro, 2019).

Despite these limitations, this study demonstrates that informal interprofessional education experiences provided students the opportunity to learn with, from and about students and staff of different professions. In doing so, these experiences helped students better understand their own roles and the roles of other professions. Further, these experiences may form the basis for developing competence in collaborative practice before graduation. That these experiences took place on rotations not specifically designed to encourage interprofessional education is consistent with previous work (Hagg-Martinell et al., 2019), and may provide a framework for providing interprofessional education on standard clinical rotations. Importantly, these findings may obviate the need for creating "new" interprofessional education rotations, particularly in academic programs with limited flexibility.

In conclusion, we have demonstrated the feasibility of collecting interprofessional encounter data during clinical rotations to identify the frequency, quality, and types of informal interprofessional interactions that occur among and between students and staff of different professions. Furthermore, learners uniformly reported meaningful informal interprofessional educational interactions on rotations not specifically designed to emphasize interprofessional education. These findings may have implications in curricular design related to clinical interprofessional education.

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