Abstract

BACKGROUND

The current complex environment of healthcare demands a comprehensive approach where teamwork and communication are paramount. Interprofessional education (IPE) is one avenue to promote collaboration. Our objective was to determine the attitudes of Clinical Laboratory Science (CLS) students toward IPE.

METHODS

The revised Readiness for Interprofessional Learning Scale (RIPLS) was chosen to assess CLS student's attitudes toward IPE after participating in an interprofessional simulation. In addition to the RIPLS items, demographics, and previous experience in healthcare and interprofessional simulation were collected.

RESULTS

Fifty participants had an average age of 26.7 years (SD = 5.25), 70% were female and 46% were white. In addition, 26% had experience in interprofessional simulation, while 48% had worked in healthcare. Students' scores were high in all questions of RIPLS subscales except for the questions belonging to the Negative Professional ID (inverted scale) and for the Roles and Responsibilities subscales.

CONCLUSION

UAB CLS students have a positive attitude about interprofessional education. Faculty in CLS programs should provide interprofessional experiences for their students.

Introduction

As healthcare becomes more complex, the need for a more comprehensive, collaborative approach to healthcare is brought to the forefront. The entire process of healthcare must be built on a platform of trust, teamwork, and collaboration. This needs to include physicians, nurses, pharmacists, laboratory professionals, respiratory therapists, radiology technicians, social workers, physician assistants, patients, and others.[1] The number one recommendation by the National Academy of Medicine (formally the Institute of Medicine) report on *Improving Diagnosis in Healthcare* is to "Facilitate more effective teamwork in the diagnostic process among healthcare professionals, patients, and their families."[2] In addition to the National Academy of Medicine, the World Health Organization, in their report *Framework for Action on Interprofessional Education and Collaborative Practice* emphasizes the importance of teamwork in healthcare by stating, "Interprofessional education and collaborative practice can positively contribute to some of the world's most urgent health challenges."[3] Working in teams translated into reduced diagnostic error and improved patient safety. Therefore, it is essential for Clinical Laboratory Science (CLS) educators to teach students to work in interprofessional teams.[4,5]

Interprofessional education (IPE) is defined as people from different vocations learning about, from, and with each other.[3] This is in contrast with multiprofessional education, where students learn side by side, but interaction or learning from each other is not required. IPE is also distinct from interdisciplinary education where different *disciplines* work together toward a common goal. As student's progress through their curricula, they need to move beyond knowledge and application of knowledge to working on relationships and collaborative behaviors. This includes peers in the laboratory as well as other professionals in the healthcare

system. Introducing learners to IPE early in their curriculum is associated with positive learning outcomes.[6,7]

Simulation is one option for conducting interprofessional education for healthcare professionals.[8] By coupling IPE and simulation it is possible to increase students view on the value of team work.[9,10] However, there are many barriers to creating and participating in meaningful, collaborative interprofessional simulation experiences. Simulation is resource intensive in terms of faculty, equipment, and time. Additionally, there may be a lack of support and funding from administration.[11] Laboratory science programs traditionally do not include interprofessional education and simulation. Due to the short nature of many simulation scenarios, which run for a range of 10-20 minutes, there is often not enough time to include laboratory testing. It is important for programs to overcome these barriers so that students learn to be part of an interprofessional team prior to joining the workforce.[5]

Before implementing IPE into the curriculum, it is important to determine readiness to participate in interprofessional education. Students must first value teamwork and collaboration, have a positive professional identity, and understand their role on the healthcare team. Given the significant amount of support for interprofessional education (IPE) in healthcare and the minimal amount of literature supporting the involvement of the clinical laboratory**,** the objective of this study was to assess the attitudes of UAB Clinical Laboratory Science students toward interprofessional education using the Readiness for Interprofessional Learning Scale (RIPLS).

Methods

Setting and Participants

The University of Alabama at Birmingham (UAB) offers an entry level Master's degree in CLS. The program is accredited by the National Accrediting Agency for Clinical Laboratory Science (NAACLS). The study took place at UAB in 2015 and 2016. A total of 50 students from 2 cohorts participated in the study. Data for this study was generated from an anonymous survey using convenience sampling. Participation in the simulation by CLS students was part of regular course activities. Students provided informed consent prior to the simulation and could opt out of having their data used for research purposes. This study was approved by the UAB institutional review board protocol # E150601001.

Simulation

There were 194 students from 7 professions, both undergraduate and graduate programs, who participated in the intensive care unit simulations: CLS, physician assistant, respiratory therapy, nurse practitioner, medicine, nuclear medicine technology, and physical therapy. Each simulation lasted two hours and was conducted six times in order to accommodate the number of students. There was a 15 minute prebrief performed at the beginning of each session. The scenarios (Table 1) ran for 45 minutes and concluded with a three-tiered debriefing – an in-room debriefing to focus on case specific information, a whole group debriefing to focus on interprofessional concepts, and a profession-specific debriefing to allow students to discuss the simulation with their faculty.

Readiness for Interprofessional Learning Scale

The adapted Readiness for Interprofessional Learning Scale (RIPLS) was chosen to assess CLS student's attitudes toward interprofessional education after participating in an interprofessional simulation. Even though there are additional instruments available to measure perceptions of interprofessional education, in most cases, these other scales were tailored toward

learners outside of the laboratory profession (ie, direct patient care), others included assessment of institutional support, a construct we did not want to measure.[12-18] RIPLS was chosen for its application to CLS students and simulation and it's frequency in health professions educational literature.

The original RIPLS scale was developed by Parsell et al and had 19 items divided into 4 domains: teamwork/collaboration, negative professional identity, positive professional identity, and roles and responsibilities.[19] RIPLS has been adapted for use with additional professions, a wide variety of situations, and different cultures, resulting in many modified versions.[20-22] The version of RIPLS used in this study was adapted by LaTrobe Health Service and the Health and Social Care Interprofessional Network, Victoria. This adapted RIPLS tool is publically available on the National Center for Interprofessional Practice and Education website.[23,24]

Data Collection and Analysis

Researchers met with students prior to the ICU simulation to discuss the purpose of the study and obtain informed consent. The adapted RIPLS scale was then administered to the group of learners and handwritten anonymous responses were collected. We also asked for the student's year of birth, gender, and race. In addition to the RIPLS items and demographics, we asked if they had previous experience with interprofessional simulation, and if they had previous work experience in healthcare, since previous involvement with interprofessional simulation and experience working in healthcare may influence their readiness for learning in an interprofessional setting.

Data was entered and analyzed using SAS 9.4. Demographic variables were expressed as mean (continuous variable) and standard deviation in case of age and as proportions (categorical variables) in the case of race, gender, previous experience in interprofessional simulation, and

worked in health care (Table 2). Counts of how many students answered at each level of the Likert scale and the median score for each question were computed (Table 3). Mean and median scores were calculated. However, median scores are more appropriate for these data because tests for normality determined these data were not normally distributed. The 95% confidence intervals for median scores were calculated using a distribution-free approach.[25]

Results

Our student population had an average age of 26.7 years (SD = 5.25 years), was 70% female and 46% White. In addition, 26% had experience in interprofessional simulation, while 48% had previous work experience in healthcare (Table 1).

Students' median responses were high (ranging from 4-5) for all questions of RIPLS except for the questions #10-12 related to the negative professional identification (measured in an inverted scale; value of "2") and for questions #18-19 related to the roles and responsibilities (values of "2" and "3" respectively; Table 2). The vast majority of students responded with strongly agree or agree to the questions #1-9 which relate to teamwork and collaboration and questions #13-17 which relate to professional identity. Regarding questions #10-12 and #18, which are measured in an inverted scale, the majority of the students responded disagree or highly disagree. Interestingly, responses for question #19 related to professional role, varied the most with 34% answering strongly agree or agree, 30% responding neutral, and 36% responding disagree and strongly disagree (Table 2).

Discussion

This study, based on self-reported data on perceptions of participation in interprofessional education, determined that CLS students have a positive attitude toward IPE. As mentioned in the methods sections, RIPLS has 19 items that con be subdivided into four domains addressing the concepts of teamwork/collaboration, negative professional identity, positive professional identity, and roles and responsibilities.[19] The UAB CLS students had a higher median score (4 or 5) on all questions (#1-9, and #13-17) related to teamwork, collaboration, and positive professional identity and a lower median score on questions measured on an inverted scale (#10-12 and #18-19) related to negative professional identity and roles and responsibilities. In our CLS program, we regularly discuss the lab's transition from being behind the scenes to a more prominent, vocal role on the larger healthcare team. This may have influenced the student's responses with respect to their role. The lower median score may reflect these discussions of changing roles for laboratorians. Item #19 stated "I have to acquire much more knowledge and skill than other students/professionals in my own faculty/organization." Interestingly, this item had the widest range of responses. Faculty in the CLS program at UAB do not feel CLS students need to acquire more skills and knowledge than students in other healthcare professional programs. The wide range of responses to this item could indicate that we need to include more interprofessional education in order to clarify roles of other professions. CLS students may not understand the roles and scope of practice of other professions well.

As mentioned, there is a paucity of reports and research in which IPE has been incorporated into the CLS curriculum. Due to this scarcity of empirical data, it is difficult to make a comparison between UAB CLS students and students from other CLS programs. However, there have been a few studies published. Al-Qahtani et al determined that undergraduate CLS students in Saudi Arabia felt that they were ready to learn in

interprofessional teams.[26] Data analyzed as domains and not individual questions, collected from undergraduate students in 2nd, 3rd, and 4th year, and with an 88% participation rate showed that CLS students in this study were reportedly confident in their roles and responsibilities and had a strong positive professional identity. Our study at UAB had similar findings in graduate level CLS students.

In another study using the RIPLS tool, researchers found that student's attitudes toward interprofessional education in general (not CLS specific) deteriorated after participating in a semester-long course focused on interprofessional education.[27] The pre-post response rate for CLS students in that study was 82%. The researchers attributed their findings to early professional identity formation. We feel this could also be due to the type of interprofessional activity that was used – online case studies to be discussed electronically by teams of students from a variety of professions. It is vital that faculty consider strong approaches to interprofessional education such as well-designed simulation, for example.

Strengths and limitations

To our knowledge this is the first study to assess the attitudes of clinical laboratory science students toward IPE. Along with its novelty, another strength of our study is the fact that we had 100% student participation (50 students).

Our study also has some limitations. For example, social desirability bias is a possible factor with completion of this scale. Faculty in the UAB CLS program often discuss the importance of working in interprofessional teams. Students in this study were not naïve to the role of the laboratory on the greater medical team. Prior to this large-scale interprofessional ICU simulation, the CLS students had observed an interprofessional panel of professionals demonstrating teamwork in healthcare through a simulated rounding on a patient. This panel

consisted of a clinical laboratory scientist, nurse, physician assistant, physician, respiratory therapist, genetic counselor, and nuclear medicine technologist. The CLS students also participated in an activity during their blood bank course in which they were provided with a brief patient history and an antibody workup. They had to evaluate the panel and determine what additional testing was necessary. This was a single profession simulation demonstrating a handoff between laboratorians.

Conclusions

Our study demonstrates the UAB Clinical Laboratory Science students have a positive attitude toward learning in interprofessional teams. Faculty in Clinical Laboratory Science programs should reach out to other professions and collaborate to provide interprofessional experiences for their students. Given our sample size, study limitations, and representation of the attitudes of a single CLS program in the US, more research should be done to better determine the attitudes of CLS students towards IPE. Multiple studies have demonstrated the feasibility and the need for incorporating CLS students into interprofessional simulation.[4,5,9,10] However, there is still a lack of data of CLS-specific data about student readiness for participating in interprofessional simulation. It is vital that we teach our students to emphasize the role of the laboratory in patient care.

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Table 1. Overview of Scenarios in the Intensive Care Unit Simulations.

Case 1	*62 year old male* Admitted with a gastrointestinal bleed, liver failure, and has transfusion reaction
Case 2	*78 year old female* Admitted with sepsis, pulmonary embolus, and cardiac arrest
Case 3	*68 year old female* Admitted with chronic obstructive pulmonary disease exacerbation, and has questionable advance directives
Case 4	*58 year old male* Admitted with pneumonia, respiratory failure, and has a nuclear medicine test at the bedside that results in a radioactive spill
Case 5	*42 year old female* Admitted with postpartum disseminated intravascular coagulation, delivered this morning, and has excessive vaginal bleeding
Case 6	*48 year old female* Admitted with diabetic ketoacidosis, previous cardiovascular accident, and suffers from an acute chest pain event

Table 2. Characteristics of University of Alabama Birmingham (UAB) Clinical Laboratory Science (CLS) Students (N=50) Completing the Readiness for Interprofessional Learning Scale (RIPLS) Survey.

Characteristic	N	%
Gender		

	Male	15	30
	Female	35	70
Race			
	White	23	46
	African-Americans or Asian**	27	54
Experience in Interprofessional Simulation			
	Yes	13	26
	No	37	74
Work experience in Healthcare			
	Yes	24	48
	No	26	52

Legend: *one age value missing; **only one Asian student

Table 3. Attitude of University of Alabama Birmingham (UAB) Clinical Laboratory Science (CLS) Students (N=50) toward Interprofessional Education Measured by the Readiness for Interprofessional Learning Scale (RIPLS).

RIPLS Question	Number (%) of students who responded "5"	Number (%) of students who responded "4"	Number (%) of students who responded "3"	Number (%) of students who responded "2"	Number (%) of students who responded "1"	Median Score (95% CI)	Mean Score (SD)
1. Learning with other students / professionals will make me a more effective member of a health and social care team	34 (68)	15 (30)	1 (2)	0 (0)	0 (0)	5 (5-5)	4.7 (0.52)
2. Patients would ultimately benefit if health and social care students / professionals worked together	40 (80)	10 (20)	0 (0)	0 (0)	0 (0)	5 (5-5)	4.8 (0.40)
3. Shared learning with other health and social care students / professionals will increase my ability to understand clinical problems	32 (64)	16 (32)	2 (4)	0 (0)	0 (0)	5 (5-5)	4.6 (0.57)
4. Communications skills should be learned with other health and social care students / professionals	32 (64)	17 (34)	1 (2)	0 (0)	0 (0)	5 (5-5)	4.6 (0.53)
5. Team-working skills are vital for all health and social care students / professionals to learn	43 (86)	7 (14)	0 (0)	0 (0)	0 (0)	5 (5-5)	4.9 (0.35)
6. Shared learning will help me to understand my own professional limitations	21 (42)	24 (48)	5 (10)	0 (0)	0 (0)	4 (4-5)	4.3 (0.65)
7. Learning between health and social care students before qualification and for professionals after qualification would improve working relationships after qualification / collaborative practice	25 (50)	18 (36)	7 (14)	0 (0)	0 (0)	4.5 (4-5)	4.4 (0.72)
8. Shared learning will help me think positively about other health and social care professionals	23 (46)	18 (36)	9 (18)	0 (0)	0 (0)	4 (4-5)	4.3 (0.76)
9. For small-group learning to work, students / professionals need to respect and trust each other	40 (80)	9 (18)	1 (2)	0 (0)	0 (0)	5 (5-5)	4.8 (0.46)

10. I don't want to waste time learning with other health and social care students /	1 (2)	1 (2)	6 (12)	23 (46)	19 (38)	2 (1-2)	1.8 (0.87)
11. It is not necessary for undergraduate / postgraduate health and social care students / professionals to learn together	1 (2)	4 (8)	2 (4)	23 (46)	20 (40)	2 (1-2)	1.9 (0.97)
12. Clinical problem solving can only be learned effectively with students / professionals from my own school / organization	1 (2)	3 (6)	5 (10)	25 (50)	16 (32)	2 (2-2)	2.0 (0.92)
13. Shared learning with other health and social care professionals will help me to communicate better with patients and other professionals	24 (48)	25 (50)	1 (2)	0 (0)	0 (0)	4 (4-5)	4.5 (0.54)
14. I would welcome the opportunity to work on small group projects with other health and social care students / professionals	17 (34)	23 (46)	7 (14)	3 (6)	0 (0)	4 (4-4)	4.1 (0.85)
15. I would welcome the opportunity to share some generic lectures, tutorials or workshops with other health and social care students / professionals	18 (36)	26 (52)	5 (10)	1 (2)	0 (0)	4 (4-5)	4.2 (0.71)
16. Shared learning and practice will help me clarify the nature of patients' or clients' problems	23 (46)	23 (46)	4 (8)	0 (0)	0 (0)	4 (4-5)	4.4 (0.64)
17. Shared learning before and after qualification will help me become a better team worker	25 (50)	23 (46)	2 (4)	0 (0)	0 (0)	4.5 (4-5)	4.5 (0.58)
18. I am not sure what my professional role will be / is	0 (0)	3 (6)	5 (10)	20 (40)	22 (44)	2 (1-2)	1.8 (0.86)
19. I have to acquire much more knowledge and skill than other students / professionals in my own faculty / organization	3 (6)	14 (28)	15 (30)	15 (30)	3 (6)	3 (3-3)	3.0 (1.04)
Legend: "5" = strongly agree, "4" = agree, "3" = neutral, "2" = disagree, "1" = strongly disagree; N = 50; CI = confidence interval; SD= Standard deviation.							

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