

A Study of Interprofessional Collaboration in Undergraduate Medical Laboratory Science and Nursing Education

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ABSTRACT

Interprofessional collaboration in the healthcare setting has been identified as an essential component for decreasing medical errors. Interprofessional collaborative education (IPE) may ease the transition of this requirement into clinical practice. Smaller colleges and universities without medical schools or associated teaching hospitals may have spatial barriers and time constraints that interfere with the implementation of IPE. To address this need the authors constructed a realistic interdisciplinary simulation exercise for nursing and medical laboratory science (MLS) students. Three simulation groups totaling approximately 90 undergraduate students were studied over the course of three semesters. The authors arranged Deliberate Student Engagement (DSE) activities requiring student collaboration. To determine outcomes of the students' experience a pre- and post- Likert scaled survey tool was used. Data suggesting the benefits of collaborative educational exercises in the healthcare professions is presented. Details are also provided to assist colleagues at similar institutions in arranging interprofessional simulation exercises.

ABBREVIATIONS: MLS-Medical laboratory science, IOM-Institute of Medicine, AACN-Association of Colleges of Nursing, NAACLS-National Accrediting Agency for Clinical Laboratory Sciences, NLN-National League for Nursing, DSE-Deliberate Student Engagement

INDEX TERMS: Interprofessional relations; Evidence-Based Practice; Education, Students, Health Occupations; Education, Curriculum, Interdisciplinary Studies; Health Occupations

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INTRODUCTION

Over 40 years ago a group convened by the Institute of Medicine (IOM) consisting of health professionals from various disciplines began dialogue involving interprofessional collaborative education.¹ The ensuing reports inspired by this meeting focused on education as the gateway to interprofessional collaboration. This type of education could not only save money by utilizing resources more efficiently, but also save lives by using teamwork to create a patient-centered, patient-safe environment. Although interprofessional collaboration was valued, little in the way of true interprofessional, collaborative education took place in higher education between medical disciplines. Education continued to be compartmentalized and departmentalized. The issue was again brought to light in 1999 with the release of the monumental IOM report "To Err is Human."² This document unveiled and highlighted the cost of preventable medical errors. The report suggested that

ineffective systems and lack of communication between healthcare professionals were of issue. In 2001 the IOM released “Crossing the Quality Chasm.”³ It was this report that identified cooperation between clinicians as a priority. This IOM report was followed by other reports stressing the need to transform healthcare education to involve team-based learning.^{4,5,6}

Although there is an abundance of evidence supporting interprofessional education (IPE), medical and educational culture change has been slow.^{7,8,9,10} The battle to move from passive to active teaching strategies occurs daily on campuses across the nation. Developing effective teams and redesigned systems is critical to achieving care that is patient-centered, safer, timelier, and more effective, efficient, and equitable.³

Given the enormity of communication failures as an identified cause of medical errors, educational accrediting bodies and professional organizations have made practice and educational recommendations. The American Association of Colleges of Nursing (AACN) stated that interprofessional collaboration is an essential component of health professional education.¹¹ While not as direct a mandate, the National Accrediting Agency for Clinical Laboratory Science also recognized the importance of interprofessional collaboration and stated that, “Communication skills (for laboratory professionals) extend to consultative interactions with members of the healthcare team...”¹²

Definition and Goals

Collaboration by healthcare professionals is a complex process that requires intentional knowledge sharing and joint responsibility for patient care.¹³ IPE takes place “when students from two or more professions learn about, from, and with each other to enable effective collaboration and improve health outcomes”¹⁴ The goal of interprofessional collaboration is health professionals working together to build a safer, patient-centered United States (U.S.) health care system.¹⁵ In order to effectively implement the team-based collaborative model, educators of future health professionals need to collaborate in creating experiences for students to interact with each other and learn from members of each discipline. There are many examples of IPE involving nursing and medical students whose programs are housed together in a teaching hospital.^{16,17} Generally, students and faculty report positive outcomes

after participating in this type of education, though no long term studies have been conducted to indicate the benefit of such education once students enter the workforce.¹⁸ There is a notable absence of IPE at colleges and universities lacking medical schools, and particularly between MLS and nursing students. The goal of this study is to investigate the potential benefits of IPE for MLS and nursing students in the absence of medical students and a teaching hospital.

MATERIALS AND METHODS

Planning

Beginning in the fall of 2012 baccalaureate nursing and medical laboratory science faculty from a mid-size university in middle Tennessee collaborated to develop IPE activities for their students. The faculty from each discipline began planning for the implementation of the IPE simulation activities several months in advance. The activities were based upon the scenarios created by the National League of Nurses (NLN).¹⁹ The faculty decided that scenarios involving diabetes mellitus, urinary tract infection, septicemia, and blood transfusion hypersensitivity worked well from both nursing and laboratory perspectives. Modifications of the NLN scenarios were made to highlight the nursing and MLS working relationship. The modified activities were developed to require students from the two disciplines to interact and engage in clinical decision making. Pre-analytic and post-analytic errors including appropriate venipuncture site and tube section, proper urine collection from a catheterized patient, and blood product miss-labeling were included. The activities were coined deliberate student engagement (DSE) activities.

Another aspect of pre-planning involved overcoming logistical and curricular barriers, which are summarized in Table 1. Unfortunately, the nursing and MLS facilities are physically located across campus from one another. In planning the simulation exercises, the authors overcame this barrier by transporting smaller laboratory instruments such as Clinitek analyzers, microscopes, and some manual reagents to the nursing school. Testing performed on larger chemistry, immunohematology, and hematology analyzers was performed and video-recorded by MLS students in advance of the simulation. Timing the exercise to coordinate schedules between the two disciplines was also challenging. MLS students had afternoon laboratory courses which coordinated with the nursing

students' four hour simulation periods.

Table 1. Logistic and curricular barriers to simulation.

	MLS students	Nursing students
Program admission	Annually each fall	Each fall and spring semester
Basis for patient Assessment	Greater focus on laboratory data	Holistic care focus
Clinical experience prior to simulation	None	Previous clinical placements
Simulation Experience	None	Extensive
Location	East side of campus	West side of campus
Block schedule Availability	Tuesday or Thursday afternoons only	Simulations planned all day Tuesday and Wednesday
Equipment and supply availability	Difficult to transport laboratory equipment; lack of patient simulation space	Extensive patient simulation space, lack of laboratory equipment or dedicated space
Prior interaction with the other simulation group and teaching methods	None	None

Implementation

The IPE activities were completed with students over 3 semesters beginning fall 2012 to fall 2013. Activities were conducted as follows:

1. Students viewed the scenario as a group.
2. Students were divided into small groups consisting of 2 to 3 students from each discipline.
3. Students moved to the simulated medical/surgical unit and assumed patient care.
4. Nursing students began their initial assessment of the patient (high fidelity mannequin).
5. Nursing students requested laboratory tests per provider order. Often this would require a clinical decision making exchange among the students.
6. Patient specimens were collected, as appropriate, by either nursing or MLS students. This required communication and coordination between the two groups in order to determine the appropriate specimen type and collection method.

7. MLS students either performed the testing on site, if possible, or the MLS faculty provided results after the appropriate testing time interval has elapsed.
8. Throughout the IPE exercise DSE's were strategically placed to require interprofessional dialogue and clinical decision making among and between the disciplines.
9. Based on the laboratory results the nursing students decided what nursing interventions were necessary for the simulated patient. Often this required a clinical decision making exchange among the students to interpret test results and correlate testing with pathology.
10. Patient response varied based on the students' (Nursing and MLS) clinical decision making skills.
11. Upon completion of the simulated cases, students convened in the classroom.
12. Students viewed pre-recorded video footage of laboratory tests performed outside of the simulated hospital unit.
13. Students were collectively debriefed.

Survey development

In order to gauge the efficacy of the simulation activities, a Likert scaled survey (rating options of 1-6) was created based on the tool developed by McFadyen, Maclaren, & Webster.²⁰ Identical survey questions were posed to IPE participants both before and after each simulation activity. In accordance with institutional review board policy, informed consent was obtained. Further, students were allowed to opt out of the survey without penalty and anonymity of survey data was maintained. Data analysis included mean, standard deviation, and single-tailed paired student T-test. Survey questions were grouped based on evaluation of the participant's perception of their own profession or perception of the other simulation group's profession.

RESULTS

Fall 2012

Data from fall 2012 shows that the group of senior students came into the simulation exercise with a strong appreciation for interprofessional communication in healthcare. All students surveyed agreed with the following statements:

- Members of my chosen profession need to be willing to share information and resources with other healthcare professionals.
- Effective communication among healthcare

professionals is important in order to diminish risk to patient safety.

- Poor communication among healthcare professionals leads to an increase in medical error and jeopardizes patient safety.

Fall 2012 data also demonstrate that students had an improved opinion of their own profession after completing the simulation activity. (Table 2) There was a statistically significant (p value less than or equal to 0.05) increase, post simulation, in students' belief that they are:

- Well trained
- Entering a profession with positive goals
- Extremely competent
- Trustworthy in their professional judgment
- Autonomous

Table 2. Survey questions and data. Excerpt, Fall 2012. Students' perception of their own profession.

Survey question	Mean	Standard Deviation	P value
1. Students in my chosen profession are well-trained.			
Pre-simulation	5.04	0.79	
Post-simulation	5.19	0.72	0.01
5. Students in my chosen profession have a positive attitude about our professions' goals.			
Pre-simulation	3.74	1.57	
Post-simulation	4.71	1.29	0.001
10. Graduates in my chosen profession are extremely competent.			
Pre-simulation	4.85	0.99	
Post-simulation	5.03	0.79	0.006
11. Students in my chosen profession trust each other's professional judgment.			
Pre-simulation	4.46	1.05	
Post-simulation	4.85	0.89	0.0002
17. I believe it is important for students in my chosen profession to work well with students in other healthcare professions.			
Pre-simulation	5.67	0.71	
Post-simulation	5.48	0.83	0.01
18. Students in my chosen profession demonstrate a great deal of autonomy.			
Pre-simulation	4.71	1.03	
Post-simulation	5.07	0.81	0.0001

Finally, fall 2012 data demonstrated that students placed greater importance on cooperation with members of the other professional group after taking part in the simulation activity. (Table 3) After the simulation, there was a statistically significant increase in the students' agreement with the following statements:

- Students in my profession think highly of members of the other group.
- Students in my profession were able to work closely with students in the other group.
- Students in my profession need to depend on work done by other healthcare professionals.
- Students in my profession need to share information and resources with students in the other profession.
- Communication with the other group of students is important.
- Communication among healthcare professionals is important in reducing risks to patient safety.

A key challenge discovered from the fall 2012 data is the significant decrease from pre- to post- simulation survey (mean 5.67 to 5.48) in students' response to the following statement: I believe it is important for students in my chosen profession to work well with students in other healthcare professions (Question 17). This response seems to indicate that while students appreciate the need for healthcare professionals to work together on interdisciplinary teams, they do not appreciate the need to begin this type of collaboration in the classroom. There are many possibilities to explain this apparent lack of perceived value in the simulation exercise. Since this was the first attempt at interdisciplinary simulation, several areas for improvement were identified, including the low number of mannequins used (three) and, thus, larger student groups (6-7 students). As a result, all future simulations used the smaller group size of 4-5 students and six mannequins.

The fall 2012 surveys did not allow for differentiation of students based on academic major (MLS or nursing). Although the data from that first simulation was valuable, more insight could be gained if survey results could be grouped by academic major. This identifier was added to the surveys administered in spring and fall 2013.

Table 3. Survey questions and data. Excerpt, Fall 2012. Students' perception of the other profession.

Survey question	Mean	Standard Deviation	P value
9. Students in my chosen profession think highly of students in other related healthcare professions.			
Pre-simulation	3.71	1.33	0.00002
Post-simulation	4.11	1.25	
12. Students in my chosen profession are able to work closely with students in other healthcare professions.			
Pre-simulation	4.21	0.98	0.03
Post-simulation	4.33	1.05	
13. Students in my chosen profession must depend upon the work of people in other healthcare professions.			
Pre-simulation	4.82	1.23	0.006
Post-simulation	5.0	1.28	
15. Students in my chosen profession need to be willing to share information and resources with students in other healthcare professions.			
Pre-simulation	5.14	0.74	0.0003
Post-simulation	5.48	0.74	
20. Students in my chosen profession need to understand the importance of communication with students in other healthcare professions.			
Pre-simulation	5.29	0.88	0.02
Post-simulation	5.41	0.91	
21. Students need to appreciate the importance of communication among healthcare professionals in order to diminish future risks to patient safety.			
Pre-simulation	5.60	0.77	0.04
Post-simulation	5.70	0.60	

Spring 2013

The spring 2013 simulation group contained only junior level students. Aside from a slightly lower overall perception of students' own training, likely attributable to the stage of the students' academic preparation, survey results were comparable to the combined results described for fall 2012. Regardless of academic major, all students answered similarly to the previous semester. This is not surprising due to the low standard deviations seen in the majority of student responses, indicating that students answered the questions similarly to one another. One notable exception is seen in the survey results from question 17 regarding students' perception of the value of interdisciplinary simulation in the

academic setting. It appears that the efforts made by faculty to improve the quality of the simulation exercise were successful since survey responses were consistent at a mean of 5.9 in both the pre- and post- survey data. In addition to decreasing the size of the student groups by adding additional mannequins, faculty also added complications to the patient scenario. Perhaps including additional complexity increased the participation of MLS students by requiring additional laboratory tests. Further, increased communication among team members was observed.

Fall 2013

Data from fall 2013 showed that the group of senior students came into the simulation exercise with a stronger appreciation for interprofessional communication in healthcare as compared to the fall 2012 cohort. In addition to agreeing with the three statements from the fall 2012 group, all students surveyed in fall 2013 agreed with the following statements:

- Students in my chosen profession are very positive about their accomplishments and contributions to patient care.
- Students in my chosen profession need to make every effort to understand the capabilities and contributions of students in other healthcare professions.
- I believe that students in my chosen profession need to work well with each other.
- I believe it is important for students in my chosen profession to work well with students in other healthcare professions.

Because students came into the simulation with a very positive perception of both their own and the other group's profession, it is understandable that there was not a significant difference in the majority of survey results from pre- to post- simulation activity. However, the students' responses to question 17 (I believe it is important for students in my chosen profession to work well with students in other healthcare professions.) improved slightly from a mean of 5.52 to 5.54 (p value .035) compared to the decrease in mean response pre- to post- simulation seen in the fall 2012 cohort. This may indicate continued improvement to the simulation exercise and increased value of the exercise to students. Significantly, approximately one half of the MLS students in the fall 2013 cohort previously participated

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as juniors in the spring 2013 simulation. Perhaps that experience also contributed to the increased valuing of simulation exercises.

Since fall 2013 data included differentiation of MLS and nursing student survey responses, a new data set which evaluated how students felt about the way their own field is viewed by students in the other profession was created. Interestingly, while 100% of the nursing students agreed with the following statement both before and after the simulation exercise, only 85% of MLS students agreed before the simulation exercise, declining to 69% agreement after the exercise:

- Students in other healthcare profession think highly of my chosen profession. (Figure 1)

Q7. Percent of students agreeing that students in other healthcare professions think highly of the participant's chosen profession.

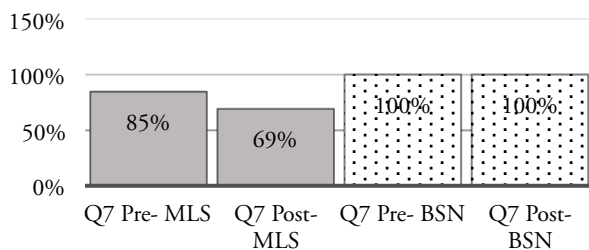


Figure 1. Fall 2013 data from survey question 7.

Similarly, while 100% of the nursing students agreed with the following statement both before and after the simulation exercise, only 69% of MLS students agreed, and did not change their opinion after the exercise:

- Students in other healthcare professions often seek the advice of students in my chosen profession. (Figure 2)

Q19. Percent of students agreeing that students in other healthcare professions often seek the advice of students in their own chosen profession.

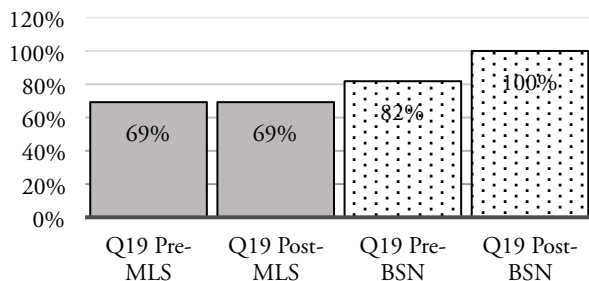


Figure 2. Fall 2013 data from survey question 19.

It appears that MLS students, in contrast to nursing students, do not feel that their profession is highly valued in the healthcare arena.

The final area for which MLS and nursing students' survey responses differed is in regard to the level of training each group receives. Before the simulation exercise, 91% of nursing students and 77% of MLS students agreed with the following statement (question 3):

- I believe that students in the other simulation group will graduate with the same level of training as students in my simulation group. (Figure 3)

Q3. Percent of students agreeing that students in the other simulation group will graduate with the same level of training as students in their own simulation group.

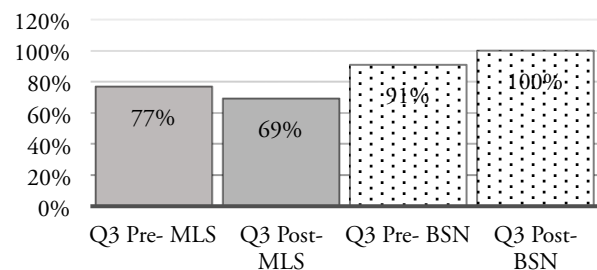


Figure 3. Fall 2013 data from survey question 3.

After the simulation, 100% of nursing students, but only 69% of MLS students, agreed with the statement. It is clear that more work needs to be done in educating these groups of students on the training required for each discipline.

DISCUSSION

Data from the simulation exercises clearly demonstrated the value of interdisciplinary collaboration between nursing and MLS students. While barriers to interdisciplinary collaboration exist in most educational settings, colleges and universities lacking a medical school or teaching university face additional challenges in terms of logistics, facilities, and student populations. Interdisciplinary collaboration with simulation exercises is a valuable tool, even in light of the formidable challenges. The data presented demonstrate an overall improvement in student perception of both healthcare fields involved in the simulation exercise.

While some of the survey questions indicate that bringing the two groups of students together for a simulation exercise increased the valuing of one group of students by the other group, other questions indicate that further work should be done to foster a positive interdisciplinary approach to education of healthcare professionals. Improved patient care can be achieved through a shared appreciation of each profession's contribution to the healthcare team. The authors hope to continue the simulation activities in future semesters with the goal of improving relationships between nursing and laboratory professionals in the workplace in order to improve patient outcomes.

Future direction

The goal of interprofessional collaboration is improved safety and patient care. Therefore, studies must be conducted to determine if participation in IPE improves communication and reduces medical errors. The authors suggest tracking graduates who have participated in IPE and following up with a workplace communication survey one year post employment. Other staff members from the same facility who did not participate in IPE would also be surveyed as a control group. A comparison of the groups' responses would provide information as to how the new professionals perceive their ability to communicate effectively with healthcare professionals in other disciplines.

It may also be useful to track medical errors resulting from miscommunication between laboratory staff and other healthcare professionals. Medical centers could provide documentation of medical errors resulting from miscommunication. Educators could then determine whether the involved personnel participated in IPE. By compiling data from several educational programs, it may be possible to determine if the rate of medical errors differs based on participation in IPE.

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