Interprofessional Collaboration in Health Science Education
(To err may be human, but together we can do something about it!)

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Abstract:

To prepare tomorrow’s healthcare practitioners for challenges in medicine and to make the healthcare environment safer, the University of Florida Colleges of Medicine, Nursing and Pharmacy have combined forces to develop novel teaching strategies. The institution devised a four-hour series of learning activities designed to heighten awareness of medical errors and patient safety with core sessions involving interprofessional teams composed of students from each discipline. High-fidelity simulation techniques were employed to provide experiential learning and opportunities for self-discovery in a safe training environment. Attitudes, skills and behaviors were assessed and analyzed. Common themes included teamwork, communication and patient-centered care. Preliminary results demonstrated that interprofessional simulation as a training activity among health science students was both well-received and effective. This article discusses the issues and ideology that led to this endeavor as well as future directions.

Introduction

It is critical that all healthcare providers understand the prevalence of medical errors and the dramatic headlines they create.¹ ² Errors are not suffered lightly. In 1996, the Institute of Medicine (IOM) launched the first phase of its Quality Chasm series, aimed at documenting the significant toll medical errors placed on human health. Headlines describing how 44,000 to 99,000 die each year from medical errors made for sobering news for both public and health professionals.³ Subsequent phases highlighted actions to take in the practice environment, education reform, changes in nursing practice, and enacting a vision for the future. Despite the focus, medical errors are now the third leading cause of death in hospitals and healthcare facilities² with estimates of such deaths as high as 400,000 per year.⁴ The cost of such errors is staggering with a 2010 report estimating $19.5 billion was spent due to medical errors on direct
costs\textsuperscript{5}, while a 2012 report estimates lost years of life costs were as high as $187.5 billion to $250 billion.\textsuperscript{6}

Such errors are divided into five categories: diagnostic errors, errors of commission, errors of omission, context, and communication.\textsuperscript{1} Many sources contribute to such errors, including care complexity, staffing issues, patient acuity and production demands in cost-driven institutions.\textsuperscript{4} Of the five categories, however, erroneous communication is considered the leading cause of medical errors.\textsuperscript{2}

Communication errors can occur between two or more healthcare providers, or between healthcare providers and the patient. Information transfers are a significant source of communication gaps that lead to errors. These often occur at times of rapid communication (associated with quick judgment calls, prompted by time pressures) and during more formal conversations (shift sign outs, patient hand-offs, consultations, discharge discussions).\textsuperscript{7,8,9} Compounding this, education is often conducted in “silos” within professional schools with limited contact with students outside the college’s boundaries. Additionally, colleges have separate faculty, educational levels, and schedules, which foster differing philosophies and approaches to care. Interprofessional training is more often conducted post-graduation, where high levels of cooperation are already required among the disciplines to safely care for patients.

The reality is that healthcare professionals need to be the masters of their domain. It is incumbent on physicians and others in the health care setting to do everything they can to minimize misjudgments, mistakes and errors. While a standard business model would dictate that such professionals should just work harder and be smarter, in healthcare that approach is difficult to implement, and such strategies actually have minimal power to reduce error.\textsuperscript{10} While there are many efforts to make delivery of care more effective, efficient, and safe, achieving those goals requires more than simply working as hard as possible, or being as smart as possible. Consequently, current research is dedicated to elucidating when and where mistakes happen.\textsuperscript{10,11,12,13}

Rapid clinical judgments can be double checked by other members of the care team when those team members are empowered to bring their perspective to the decision-making process. (Think NASA: following the Challenger disaster, decision making became a more collaborative process—anyone can stop the space launch today if they see something concerning). In fact, safety-based process design throughout healthcare today relies heavily on lessons learned in the aviation industry, including crew resource management (CRM) and safety management systems (SMS).\textsuperscript{14}

Information transfers are greatly improved by formal training in the use of structured communication tools including the following:

- **IPASS**- Illness severity, Patient summary, Action list, Situation awareness, Contingency planning\textsuperscript{15}
- **TeamSTEPPS®**- Team Strategies and Tools to Enhance Performance and Patient Safety\textsuperscript{16, 17}
- **SBAR**- Situation, Background, Assessment, Recommendation\textsuperscript{18}
For instance, SBAR guides the provider to succinctly describe a patient’s situation, relevant background information, focused assessment data, and recommendation for what is needed to manage any problem that has arisen. Such strategies help reduce intimidation in the workplace while closing communication gaps to promote not only critical information transfer but timely interventions. While challenges exist in retraining current healthcare providers across the country, their student counterparts are ripe for indoctrination into these interprofessional communication approaches. Such was the impetus for the University of Florida, College of Medicine to pursue an interprofessional education activity that focused on communication skills in the interest of preventing medical errors.

**Background**

Before a disparate group of siloed faculty members from the colleges of pharmacy, nursing and medicine could bring an understanding of inter-professionalism to the students, the group had to work to understand what they each brought to the table. Beginning in 2014, faculty from the College of Pharmacy wanted to expose their students to inter-professional learning opportunities. Lacking a cohort of similarly prepared students in other healthcare professions on the Jacksonville campus, a faculty member from the College of Nursing was invited to help facilitate a community-based interprofessional health promotion activity. That faculty member was able to bring the nursing perspective to pharmacy students as they worked to design and implement a health promotion activity for an assigned family in the surrounding community. It was during that collaboration that faculty from the two colleges proposed completing a project focused on end-of-life (EOL) care, a growing area of need for pharmacist involvement. Desiring to find a way to provide the activity across all the campuses (Jacksonville, Orlando, Gainesville, and St. Petersburg), the project developed into a comparison of simulated versus paper-based case studies on student attitudes toward EOL care.

With growth came the need for more faculty; therefore, a PhD prepared pharmacist and a nursing faculty member with simulation experience were integrated into the team. It was during this growth phase that the team ironically developed a keen appreciation for some of the challenges inherent in interprofessional collaboration. Scheduling meetings proved especially difficult as clinician members of the team had patients to see, faculty members had students to teach, and administrators had conflicting meetings to attend. In addition to being flexible, the team realized it needed to accept a commitment. They decided to meet on Tuesdays at 10 am and with a set day and time, the meetings became sacrosanct. However, other communication challenges arose throughout the process. The team had to maximize the use of tools like “reply all” in emails, or else some of the messages would get lost in the threads. Simple mistakes can cause big setbacks!

Task delegation by the pharmacy leader was key as was playing to each team member’s individual strength. While the simulation expert focused on scenarios, another member keyed in on the budget, and a third arranged space to carry out the simulation. The team members were surprised to learn just what the other profession could offer. From writing skills and data analysis to simulation pedagogy and outcome evaluation, they found the team had a wealth of skills on which to draw. When the day finally came to implement the EOL simulations, they all had trepidation as the experience got underway. Two hours later, with the last post-experience survey
completed, the team was excited at the success of the program and already looking forward to the next opportunity to collaborate.

That opportunity included work on a collaborative presentation, publication and two grant writing efforts. They also decided to send an invitation to faculty members from medicine to join the team. The goal was the pursuit of a truly interprofessional simulation effort focused on preventing medication errors. Starting in 2016, faculty members from the colleges of pharmacy, nursing, and medicine were ready to collaborate on an interprofessional effort to enhance communication skills necessary in the medication management process. Recognizing the roles that each played in that process (eg. prescribing by medicine, dispensing by pharmacy, administration by nursing, and monitoring by all), the faculty undertook an effort to bring groups of these professional students together to collaborate on patient care decisions related to medications.

The group developed a collection of commonly encountered medication management scenarios to facilitate teamwork and communication skills enhancement in students from the colleges of pharmacy, nursing, and medicine (both MD and Physician Assistant (PA) students). The team proposed that being able to foster acceptance and use of these practices at a grass roots level, would sow the seeds of success in tomorrow’s healthcare teams.

**Design**

A pre/post design was used to assess the impact of a *teamwork-based education intervention* and *exposure to team-based simulated scenarios* on attitudes toward teamwork. The education intervention was a series of four scenarios involving the medication management process. Within each scenario was a potential medication error that needed to be identified, prevented, and/or mitigated. Scenarios were identified from the literature or were developed by the authors. The focus was on some of the most common types of errors identified in the literature and included errors based on distraction, antibiotic cross reactions, antibiotic resistance, and toxicity.

**Methods**

Students from UF College of Pharmacy, Nursing, and Medicine participated in interprofessional training sessions as part of their senior level clinical experiences. MD and PA students were engaged in their senior year Emergency Medicine rotation at UF Health Jacksonville. Accelerated second degree nursing students were in the third semester of their five-semester program, and pharmacy students were in either their second or third year of their four-year training program. All students were consented. Participation by the medical, PA and pharmacy students was voluntary, but mandatory for the nursing students as it is a component of a clinical course. While participation was required for the nursing students, grades were not otherwise impacted. Students were divided into four-member teams with at least one representative from each specialty.

Each training session consisted of a one-hour large group introduction, including a pre-session survey. Students were provided a description of the learning activity and consented for a survey tool at the start of the activity. The survey tool, the Teamwork Attitudes Questionnaire (T-TAQ)
is a 30-item validated tool that assesses changes in attitudes toward five teamwork constructs (team structure, leadership, situation monitoring, mutual support, and communication).\textsuperscript{17}

A brief team building activity (Figure 1) was held with students being divided into teams of four and performing a timed cooperative-task exercise of building construction paper chains with each member using only their non-dominant hand. Despite the hilarity, members began to grasp the importance (and challenges) of clear verbal communication in accomplishing complex team behaviors. This was followed by a 45-minute presentation on TeamSTEPPS® competencies which broached the topic of medical errors and set the tone for the day.\textsuperscript{17,22}

The following two hours consisted of the teams rotating through four separate simulated clinical scenarios (Figures 2a and 2b). Each 30-minute station was designed to highlight a specific aspect/issue in the team approach to medical care. Instructors played roles as patients, family members, or ancillary medical staff. A timekeeper maintained the start and stop time. Following a very brief “setting of the stage,” 15-20 minutes were allotted for the students to be engaged in playing out the simulated scenario. This was followed by a 10-minute debriefing and discussion before moving on to the next station. The debriefing could be modified to focus on aspects that a particular team had either performed especially well or had struggled with. Both self-reflection and instructor-guided analysis was used to direct the discussion and to highlight key points. After rotating through all stations, students returned to the classroom for a large group debriefing, culminating in once again completing the T-TAQ tool.

Pre and post T-TAQ scores were analyzed with descriptive statistics utilizing SAS® v9.3. Comparisons were carried out for the entire T-TAQ questionnaire and at subgroups level. A p-value <.05 on Wilcoxon Rank Sum test was considered statistically significant.

**Results**

Pre-intervention scores on the T-TAQ indicated that while students entered the education session already perceiving teamwork as a positive aspect of safe care delivery, significant improvement in attitudes was seen across all five constructs. The greatest degree of improvement was seen in the Situation Monitoring and Communication domains. This appears especially significant given the role communication gaps play in medication errors.\textsuperscript{2}

Interestingly, the different types of students (pharmacy, nursing, medicine) demonstrated significant changes in disparate aspects of the T-TAQ instrument (Table 1). For instance, while all three professional student types showed significant improvement in the communication domain, for medical/PA students it was the only domain in which attitudes improved (p<.04). Comparatively, pharmacy students demonstrated significant attitude improvements in the domains of situation monitoring (p<.0003), mutual support (p<.03) and communication (p<.003). For nursing students, the team structure (p<.002) and leadership (p<.005) domains showed the most profound levels of improvement, in addition to those seen in communication (p<.02).

Additional information was gleaned from students during the post-session large group debrief. When asked to describe the experience in one word, terms ranged from “humbling,” “scary,” and
“overwhelming,” to “enlightening,” “fun,” and “educational.” Commonly expressed feedback during debriefing included a greater understanding of each other’s roles and what each profession brought to the bedside. Medical students identified an unspoken assumption that the leadership role was theirs to assume. A sizeable focus of conversation was on the role pharmacy students played as a vital information resource for the team. Additional take home lessons included:

1) Importance of nonjudgmental (and non-hierarchical) communication in the team approach to issues.
2) Awareness that commonplace mistakes are easily made.
3) Insight into what patients want to know about medical errors and patient safety.

Discussion

The faculty team spent considerable time in the design phase of this project. Having previously conducted a similar End-of-Life simulation for pharmacy and advanced practice nursing students, the team recognized the need for detailed simulation scenario development, a team-based approach to implementation, and a well-structured outcome evaluation plan. Simulation was the pedagogy selected to deliver the scenarios as opposed to paper-based case studies due to its focus on active learning. Simulation offers students the opportunity to “assemble” or organize learned facts and past experiences within the context of the novel problems the scenario offers. Communicating that information with each other helped the team reconfigure the data, use their cognitive power to form logical conclusions, and act on those conclusions to make patient care decisions.

Each student brought something different to the patient’s bedside. The pharmacy students had a particularly focused area of medication knowledge that was critical for nursing and medical students, including medication interactions, interpreting an antibiogram, and recognizing when assessment findings were medication based. Nursing students focused on gathering assessment data and conveying that information to their medical student team member, who saw their role to be interpretation of the data. Team members then had to collaborate in decision-making and formulate a plan of care.

Traditional views of healthcare provider roles likely explain the differences in which constructs of teamwork were most significantly changed for each professional student group. Significant changes in perceptions toward the role that communication played across all three student groups is easily understandable, as that was the major focus of the pre-simulation work. Other explanations may exist for the attitude transformations regarding the other constructs. For medical students, their easy assumption of the leadership role during the simulations perhaps reflects their real-life presumption that they are the leader of the care team in the clinical setting. Their pre and post scores were equally high, hence no significant change occurred. Nursing students however had significantly favorable changes in their perceptions about the leadership construct. This is hopefully due to the opportunities that arose during the scenarios for any of the students to assume the leadership role, which was also emphasized in the pre-simulation activity.
Another interesting finding involved provider perception toward team structure. Nursing students scored highest on the construct “Patients are a critical component on the care team” compared to medical and pharmacy students. Attitude changes in this area are important. Nurses often provide the lion’s share of the face-to-face contact time with the patient. In today’s environment of patient-centered care, a healthy respect for the role the patient plays as a vital team member is critical. Seeing this belief develop in nursing students was quite rewarding.

The fact that pharmacy students changed their attitude significantly toward support is probably best understood from a performance perspective. Supporting their team members with their ability to look up drug interactions, calculate the creatinine clearance, or find alternative medication choices was the most frequently seen behavior by these students. The fact that they also significantly changed their attitude toward monitoring was an unexpected but welcome observation. Empowering these students to assume a role often taken on by the nurse or physician adds another level of safety and situational awareness. Part of the original impetus to include pharmacy students was the increasing evidence that pharmacists reduce medication errors when they are present in ICUs, ERs and other acute care settings.23

Finally, the employment of blended scenarios (both manikin and human role playing) provided an uncommonly suitable venue for exploring the hidden curriculum parameters of professionalism and respect. For example, in one scenario that involved the team recognizing failed outpatient antibiotic treatment of cellulitis, the team was reporting to a “supervising physician” who was friendly, supportive and lovable, but also stepped some professionalism boundaries regarding patient privacy, language choice, etc. The patient was a somewhat irascible, yet not unreasonable fellow, who was a bit fed up with the fact that he wasn’t getting better quickly. Providers face subtle, yet important and ubiquitous, challenges like these daily. Approaches and answers are not found in textbooks, and live clinical scenarios provide very awkward venues to critically assess and teach approaches to these situations. Simulation provides a valuable safe harbor to explore this. Having the opportunity to dissect these situations allowed for student reflection on ways to navigate these minefields and provided mentoring from experienced teachers to help students build and refine their skill sets.

Conclusion

The information age has lifted the veil on many of the mysteries of healthcare. Gone are the days of the doctor telling the patient what’s best for him or her and having the patient take that on blind faith. Today’s Internet-informed healthcare consumers have greater agency in all aspects of their healthcare, including not only the “medicine” but also the behaviors of their providers. This is clearly a good thing, but will necessitate changes in how healthcare providers, interact with patients (dare we say, consumers?). The savvy physician has evolved beyond the antiquated expectation that pharmacists, nurses, and others should merely be expected to follow orders. Instead, healthcare teams composed of a variety of professionals must cooperate and collaborate to provide safe, high-quality care. The goal of this collaboration was to introduce some of these changes at a grass roots level in order to instill some of these basic tenets, at early levels of training, in tomorrow’s healthcare professionals. The project also attempted to develop interactive and experiential techniques to keep learners involved and make the training as lifelike as possible.
Further goals include expanding these sessions to include trainees in Gainesville and Orlando and to increase the number of scenarios to include other (novel) sources of medical errors or communication errors or teamwork challenges.

Figure 1. Teams struggle to make paper chains using only their non-dominant hands.
Figures 2a and 2b. Team members partner to develop diagnostic and treatment strategies or debrief to discuss potential medical errors.

Table 1. Changes in constructs between pre and post T-TAQ surveys.

<table>
<thead>
<tr>
<th></th>
<th>Team Structure</th>
<th>Leadership</th>
<th>Situation Monitoring</th>
<th>Mutual Support</th>
<th>Communication</th>
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<tr>
<td>Medical/PA</td>
<td>NS</td>
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<td>Pharmacy</td>
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<td>NS</td>
<td>p&lt;0.003</td>
<td>p&lt;0.03</td>
<td>p&lt;0.003</td>
</tr>
</tbody>
</table>

NS = not significant
REFERENCES


2. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. BMJ. 2016 May 3;353:i2139.


1. A MAJOR goal of interprofessional collaboration is to:
   a. demonstrate that healthcare professionals can cooperate with each other
   b. maintain a hierarchical relationship between the professions
   c. improve revenue for participating healthcare providers
   d. achieve high-quality safe client care

2. Interprofessional collaboration:
   a. is relevant only in primary care settings
   b. may involve physicians, nurses, pharmacists, patients and anyone else on the healthcare team
   c. generally does not involve patients and their families
   d. is replacing patient-centered care as a care model

3. Which of the following strategies is most likely to reduce error caused by rapid clinical judgments?
   a. Allow any member of the team to ask for a pause if they have concerns
   b. Designate the most experienced member of the team to make all important decisions
   c. Suspend the use of clinical algorithms when decisions need to be made urgently
   d. Utilize single-profession healthcare teams to ensure their ability to work together

4. Which of the following is the best approach to improving the quality of medical decision making?
   a. Ask the patient to designate which team member they would like to make important decisions about their care
   b. Ensure that the physician in charge of the patient’s care makes all important decisions
   c. Regularly utilize input from different professions to make important decisions
   d. Rely on the wishes of family members as the primary factor in making important decisions

5. Which of the following is considered to be the leading cause of medical errors?
   a. Diagnostic errors
   b. Errors of omission
   c. Context errors
   d. Communication

6. In regards to education of healthcare professionals, which of the following may have the greatest impact in helping reduce medical errors in the long term?
   a. Educating professionals in isolation from other professions in order to enhance focus on that particular profession’s needs
   b. Limiting discussions regarding communication in order to allow health professionals to focus solely on management of the patient
   c. Creating opportunities for professionals from various colleges to collaborate together from an early point in their education
   d. Teach students to work harder and be smarter

(test continued on following page)
7. Which of the following structured communication tools can improve information transfer?

a. IPASS  
b. SBAR  
c. TeamSTEPPS  
d. All of the above

8. Which of the following contributes to communication gaps among healthcare professionals which could lead to errors?

a. Physicians, pharmacists, and nurses are all trained together prior to graduation  
b. Educational levels are similar between professionals post-graduation  
c. Pre-graduate training is often conducted in "silos"  
d. A shared philosophy in communication among healthcare professionals

9. Who is in the best position to take the reins in limiting communication-related medical errors?

a. Healthcare providers, and those who train them  
b. The patients  
c. Hospital administrators  
d. Government agencies and accrediting bodies

10. Common areas of communication-based medical errors include:

a. Rapid communication during high-pressure quickly-changing scenarios  
b. Formalized communications (such as consultations and shift sign-overs)  
c. Discussion between the healthcare team and the patient or family  
d. All of the above

EVALUATION:
1. What will you do differently as a result of this information?

______________________________________________________________________________________________
______________________________________________________________________________________________

2. How will you apply what you learned to your practice?

______________________________________________________________________________________________
______________________________________________________________________________________________

Please evaluate this article. Circle one number using this scale: 1= Strongly Agree to 5= Strongly Disagree

The article met the stated objectives: 1 2 3 4 5
The article was appropriate to my practice: 1 2 3 4 5
The topic was current and well presented: 1 2 3 4 5