

# Interprofessional Education in Gross Anatomy: Experience With First-Year Medical and Physical Therapy Students at Mayo Clinic

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Interprofessional education (IPE) in clinical practice is believed to improve outcomes in health care delivery. Integrating teaching and learning objectives through cross discipline student interaction in basic sciences has the potential to initiate interprofessional collaboration at the early stages of health care education. Student attitudes and effectiveness of IPE in the context of a combined gross anatomy course for first-year students in Doctor of Physical Therapy (DPT) and Doctor of Medicine (MD) degrees curricula were evaluated. Integrated teams of MD and DPT students participated in part of the gross anatomy dissection course at Mayo Medical School. A survey was administered to 42 MD and 28 DPT students that assessed their attitudes toward IPE and cooperation among health care professionals. Pre- and post-experience surveys were evaluated. Positive comments were related to opportunities for developing a better understanding of the nature and scope of each other's programs, encouraging teamwork and communication, mutual respect, and reducing the perceptual divide between disciplines. Ninety-two percent of the students agreed that interprofessional learning would help them in becoming a more effective member of the health care team. This initial experience with IPE in gross anatomy provides a basis for continued development of interdisciplinary educational strategies. *Anat Sci Ed* 1:258–263, 2008. © 2008 American Association of Anatomists.

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## INTRODUCTION

Interprofessional collaboration and its role in health care delivery is gaining interest, as the concept of working in interdisciplinary teams has been shown to positively impact patient care (Rubin et al., 1975; Areskog, 1988; Goelen et al., 2006; Kirch, 2008) and to promote the effective and efficient use of health care resources (McNair, 2005; Ho

et al., 2008). Consequently, the rapid shift toward team-based health care delivery has highlighted the importance of health care workers learning to function within a multidisciplinary team in the clinical environment (McNair, 2005). Despite the fact that the roles and responsibilities of each health professional are defined separately, effective health care team members must be able to interact seamlessly with each other (Hall and Weaver, 2001; Ho et al., 2008). In today's health care system, delivering high-quality health care is not the sole domain of a single profession, but rather, the shared responsibility and privilege of all (Kirch, 2008). The various health care professionals involved in health care teams must be adaptable, flexible, and collaborative with highly developed interpersonal skills (Horsburgh et al., 2001; Ho et al., 2008). While the clinical environment does afford the best platform for interaction across disciplines, the teaching and learning environment within the current medical curriculum may provide the best opportunity for fostering appreciation for each other's profession at a much earlier stage of professional development.

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In the first published manual for interprofessional health team development, Rubin et al. (1975), recognized that even with implementing educational programs, the full team development takes a considerable amount of time (6 months to 1 year). More than a decade ago, Harden pointed out that in medical school curricula “*the multiprofessional healthcare team and multiprofessional education are very much on today’s agenda*” (Harden, 1998). It has been suggested that early exposure to and continuation of interdisciplinary interaction is a strong adjunct to later involvement with clinical teams (Gilbert, 2005; Barr, 2007). Integrating teaching and learning objectives through cross discipline student interaction in basic sciences has the potential to initiate interprofessional collaboration at early stages of health care education.

Interprofessional education (IPE) is defined as providing an opportunity for “*two or more professions to learn with, from and about each other in order to improve collaboration and the quality of care*” (Freeth et al., 2005). Rubin and Beckhard (1972) identified four key elements of interprofessional team learning. Listed in a hierarchy of importance for team effectiveness, they are as follows: (1) goals, (2) roles, (3) procedures, and (4) interpersonal issues (GRPI). These elements have been studied in detail, and their impact on team dynamics is well established (Rubin and Beckhard, 1972; Plovnick et al., 1978). Members of the interdisciplinary team are able to learn skills to become proficient in utilizing GRPI elements necessary for the team’s development and interprofessional learning process (Rubin et al., 1975). If applied effectively, IPE can serve as an important tool in achieving the objectives that engage students in teamwork, interdisciplinary interaction, reflection, and professionalism within the medical curriculum. IPE training should also provide students with understanding of values provided by other health care professional team members in obtaining optimal patient and health outcomes as well as in improving the quality of life in communities (Horsburgh et al., 2001; Barr, 2007).

Previously, allied health care professional students at the College of Medicine, Mayo Clinic, rarely interacted with one another in an educational setting. Thus, we aimed to provide an IPE opportunity to first-year physical therapy and medical students by combining a portion of their respective anatomy laboratory and lecture sessions. In the past, these two courses were entirely separate without official interaction between the students or professors of either course, despite the fact that they run concurrently in the anatomy department. The medical course is an intense, 6-week-long (120 didactic hours) course in gross anatomy and anatomical radiology integrated into the Human Structure block. Daily briefing sessions and laboratory dissections focused on relevant, clinical aspects of anatomy are held for 4 hours each morning for the duration of the course. The course utilizes technological advancements such as full body CT scans of each cadaver and interactive assessment of retention using an audience response system (ARS). The 42 students are divided into 11 dissection teams prior to the beginning of the course. The gross anatomy course in the Doctor of Physical Therapy (DPT) program is a more traditional, 4-month-long course, encompassing 135 didactic hours that include 45 hours of lectures and 90 hours of laboratory exercises, with a special focus on musculoskeletal anatomy and biomechanics. There are a total of seven dissection teams between the 28 DPT students.

The purpose of this study was to develop an interprofessional educational experience, utilizing a gross anatomy course

for first-year medical and physical therapy students and to evaluate the effectiveness of and student attitudes toward IPE.

To effectively utilize this experience, faculty was committed to aligning the approach to IPE, adopted within anatomy curricula of both programs, with the learning context of gross anatomy dissection laboratory (Harden, 1998).

## MATERIALS AND METHODS

First-year students from the Mayo Medical School Class of 2011 ( $n = 42$ ) and the Mayo School of Health Sciences, Doctor of Physical Therapy Program Class of 2010 ( $n = 28$ ) participated in the gross anatomy courses in the Fall of 2007. Preceptors from both programs organized a two-day interdisciplinary education session to take place within the gross anatomy course during the Fall of 2007. Dissection teams were integrated to allow for the most equal distribution of students from both programs within each team. An informal social event where the new anatomy groups were announced was held over the lunch hour for both schools, to facilitate cross interaction between the students and faculty and to allow them to familiarize themselves with their future dissection teams.

The two educational sessions included didactic and cadaveric dissection for 4 hours each day. Preceptors from both schools collaborated to develop the didactic sessions and shared the responsibility for giving the lectures. The content for the first day focused on the thoracic wall, pleural cavity, and lungs, while the second day involved study of the middle mediastinum and heart. Every effort was made to highlight the important clinical aspects of these anatomical regions for students of both disciplines. Time was allotted at the end of each session for assessment of retention of important concepts, utilizing the ARS and multiple choice questions, focusing on the clinical aspects of the day’s material.

### Assessment

To assess the students’ attitudes and thoughts regarding IPE, an 18-item questionnaire was compiled by both medical and physical therapy faculty based on the Readiness for Interprofessional Learning Scale (RIPLS) developed by Parsell and Bligh (1999) at the University of Liverpool, UK, to measure readiness for multiprofessional shared learning (Horsburgh et al., 2001; Curran et al., 2007). Questions were divided into five subscales based on the desired or intended positive outcomes of successful shared learning. A questionnaire was administered to the students of each program at the initial social event and after the final interdisciplinary laboratory session. Students were asked to indicate which program they were enrolled in (MD or DPT) and to rate their level of agreement, with each statement on a five-point Likert scale (Table 1). The second questionnaire also included four open-ended questions, asking students what they liked and did not like about the experience, suggestions for future improvement, and the three most positive aspects of interprofessional learning in their careers. Student responses to ARS questions were graded and analyzed within each program. Approval for this study was granted by the Mayo Foundation Institutional Review Board, protocol #07-008189.

### Data Analysis

Five general subscales assessing different aspects of interprofessional teamwork and education were identified from the

**Table 1.**

Questionnaire Administered Both Before and After the IPE Experience

Interprofessional Teamwork and Education—Baseline Questionnaire							
	☐ Medical Student			☐ Physical Therapy Student			
	Strongly Disagree	1	2	3	4	5	Strongly Agree
1. Learning with other students will help me become a more effective member of a health care team	1	2	3	4	5		
2. Patients would ultimately benefit if health care students worked together to solve patient problems	1	2	3	4	5		
3. Shared learning with other health care students will increase my ability to understand clinical problems	1	2	3	4	5		
4. Communication skills should be learned with other health care students	1	2	3	4	5		
5. Shared learning will help me to think positively about other professionals	1	2	3	4	5		
6. For small group learning to work, students need to trust and respect each other	1	2	3	4	5		
7. Team-working skills are essential for all health care students to learn	1	2	3	4	5		
8. Shared learning will help me to understand my own limitations	1	2	3	4	5		
9. I do not want to waste my time learning with other health care students	1	2	3	4	5		
10. It is not necessary for health care students to learn together	1	2	3	4	5		
11. Clinical problem-solving skills can only be learned with students from my own program	1	2	3	4	5		
12. Shared learning with other health care students will help me to communicate better with patients and other professionals	1	2	3	4	5		
13. I would welcome the opportunity to work on small-group projects with other health care students	1	2	3	4	5		
14. Shared learning will help to clarify the nature of patient problems	1	2	3	4	5		
15. The function of physical therapists is mainly to provide support for doctors	1	2	3	4	5		
16. Students in my professional group would benefit from working on small-group projects with other health care students	1	2	3	4	5		
17. Communication skills should be learned with integrated classes of health care students	1	2	3	4	5		
18. Interprofessional learning will help students to understand their own professional limitations	1	2	3	4	5		

questionnaire. These included teamwork and collaboration (questions 1, 13, 14, 16, 17), cross-discipline learning (questions 9, 10, 11, 15), shared learning (questions 3, 5, 7), cross-discipline respect and communication (questions 2, 4, 6), and professional limitations (questions 8, 18). To examine differences in attitudes toward IPE between the MD students and DPT students, and to examine differences in pre- and post-experience attitudes, we conducted a two-way multivariate analysis of variance (MANOVA) on each subscale of the questionnaire. When the MANOVA indicated a significant difference, either between groups or between the pre- and post-experience measures, a two-way analysis of variance (ANOVA) was conducted on each item within the subscale. An  $\alpha$  value of 0.05 was used for all statistical comparisons. Data were analyzed with the Statistical Package for the Social Sciences (SPSS), version 15.0 for Windows (SPSS, Inc., Chicago, IL).

## RESULTS

Thirty-five MD students and 28 DPT students completed the questionnaire prior to the interprofessional learning experience, and 40 MD students and 28 DPT students completed the questionnaire after the experience. Since more participants completed the post-experience questionnaire, we conducted the factor analysis based on post-experience responses. Student responses to each of these items are summarized in Table 2.

Two sets of subscale responses had statistically significant MANOVA results that indicated either differences in responses between MD and DPT students or differences before and after the interdisciplinary learning experience. Group differences were present in subscale 2, the cross-discipline learning component. Specifically, items 10 and 15 had

**Table 2.**

Mean Scored Responses and Standard Deviations from Pre- and Post-experience Questionnaires for MD and DPT Students

Subscale	Pre-experience		Post-experience	
	MD students	DPT students	MD students	DPT students
I. Teamwork and collaboration				
Item 1	4.49 ± 0.78	4.61 ± 0.57	4.25 ± 0.84	4.32 ± 0.77
Item 13	4.20 ± 0.80	4.35 ± 0.63	3.87 ± 0.98	3.96 ± 1.00
Item 14	4.11 ± 0.76	4.27 ± 0.60	3.97 ± 0.74	4.18 ± 0.67
Item 16	4.31 ± 0.76	4.31 ± 0.62	4.05 ± 0.83	4.14 ± 0.97
Item 17	4.14 ± 0.85	4.31 ± 0.62	3.92 ± 0.90	3.96 ± 1.00
II. Cross-discipline learning				
Item 9	1.69 ± 0.99	1.38 ± 0.50	1.90 ± 1.10	1.79 ± 1.03
Item 10 <sup>a</sup>	1.71 ± 0.79	1.38 ± 0.50	2.00 ± 1.12	1.61 ± 0.63
Item 11	1.86 ± 1.14	1.58 ± 0.86	1.82 ± 1.21	1.82 ± 0.82
Item 15 <sup>b</sup>	1.94 ± 0.97	1.42 ± 0.58	2.08 ± 1.36	1.43 ± 0.63
III. Shared learning				
Item 3 <sup>c,d</sup>	4.26 ± 0.82	4.65 ± 0.49	3.95 ± 1.00	4.29 ± 0.53
Item 5	4.29 ± 0.83	4.27 ± 0.60	4.21 ± 0.86	3.82 ± 0.98
Item 7	4.54 ± 0.78	4.65 ± 0.56	4.54 ± 0.68	4.79 ± 0.42
IV. Cross-discipline respect and communication				
Item 2	4.63 ± 0.60	4.88 ± 0.33	4.56 ± 0.60	4.68 ± 0.48
Item 4	4.29 ± 0.99	4.65 ± 0.56	4.31 ± 0.80	4.54 ± 0.58
Item 6	4.54 ± 0.66	4.54 ± 0.51	4.51 ± 0.60	4.75 ± 0.52
V. Professional limitations				
Item 8	4.03 ± 0.98	4.00 ± 0.69	3.82 ± 0.94	4.14 ± 0.71
Item 18	4.14 ± 0.85	3.96 ± 0.96	3.97 ± 0.74	4.00 ± 0.77

<sup>a</sup>The difference between MD and DPT students is significant ( $F_{1,127} = 5.397, P = 0.022$ ).

<sup>b</sup>The difference between MD and DPT students is significant ( $F_{1,127} = 9.682, P = 0.002$ ).

<sup>c</sup>The difference between MD and DPT students is significant ( $F_{1,129} = 7.375, P = 0.008$ ).

<sup>d</sup>Across groups, the difference between pre- and post-experience scores is significant ( $F_{1,129} = 6.267, P = 0.014$ ).

group-effect differences. The DPT students' mean score ( $1.52 \pm 0.57$ ) was lower than the MD students' mean score ( $1.87 \pm 0.98$ ) on item 10, the negatively phrased statement, "It is not necessary for health care students to learn together" ( $F_{1,127} = 5.397, P = 0.022$ ). Additionally, the DPT students' mean score ( $1.46 \pm 0.63$ ) was lower than the MD students' mean score ( $2.01 \pm 1.18$ ) on item 15, the statement, "The function of physical therapists is mainly to provide support for doctors" ( $F_{1,127} = 9.682, P = 0.002$ ). Subscale 3 (shared learning) also differed between the two groups as well as

with time. On further analysis of the effects, item 3 had both a group effect and a time effect. The DPT students' mean score ( $4.48 \pm 0.54$ ) was greater than the MD students' mean score ( $4.10 \pm 0.91$ ) on item 3, the statement, "shared learning with other health care students will increase my ability to understand clinical problems" ( $F_{1,129} = 7.375, P < 0.001$ ). Across groups, the mean score on this item decreased after the interprofessional learning experience (DPT student pre- and post-experience mean scores were  $4.68 \pm 0.48$  and  $4.29 \pm 0.53$ , respectively; MD student pre- and post-experience

mean scores were  $4.26 \pm 0.82$  and  $3.98 \pm 0.98$ , respectively) by a magnitude that was statistically significant ( $F_{1,129} = 6.267, P = 0.014$ ).

## DISCUSSION

We sought to integrate medical and physical therapy students early in the first year of their training to emphasize the importance of working in interdisciplinary teams. Studies have shown that early exposure to IPE followed by regular reinforcement is the most effective method to implement these concepts into everyday practice (Anvaripour et al., 1991; Horak et al., 1998; Lumague et al., 2006; Barr, 2007).

Additionally, we believe that the interaction between these two groups to be especially important, as physical therapists and physicians often work together in the care of patients with musculoskeletal and neurologic ailments. Both groups of students must develop an intimate understanding of human anatomy and its role in the pathogenesis of disease.

Student responses to this interprofessional learning experience were generally positive. Ninety-two percent of all students agreed that interprofessional learning would help them interact with other professionals in the future. Responses to the majority of the questions in the survey did not change following this experience; there was significant change in one item related to shared learning. Similarly, responses between students from each program were comparable. The two items with significant differences between programs pertained to cross-discipline learning.

When asked what they liked best about this experience, many students responded that they enjoyed “a different perspective on the course material” and the opportunity to develop a “mutual understanding and teamwork” with the other health care students. One MD student commented that the experience developed increased respect for the DPT students’ training. In suggesting improvements for interdisciplinary education in the future, many students commented that the integration should be longer than two days.

Additionally, both MD and DPT students independently developed student-led interdisciplinary study sessions following this experience to prepare for upcoming examinations. DPT students, who had recently completed a dissection and an examination on upper extremity anatomy, volunteered to lead study sessions focusing on the musculoskeletal anatomy of the upper limb, whereas MD students offered input on cardiovascular and respiratory anatomy and its relevance to physiology. These optional sessions were well attended by both classes, displaying the positive results achieved by the two-day experience.

Interactions between both classes continued later in the year in preparation for the Convocation of Thanks, a formal ceremony celebrating life and the gift of anatomical donation. This event is organized by students from both programs and gave students the chance to thank the families of those individuals who were generous enough to donate their bodies as an anatomical gift to the Mayo Clinic Bequest Program for the purposes of medical science and education.

It must be recognized that there are many points during medical training at which interprofessional learning can take place. In this instance, the opportunity for cross-disciplinary interaction was identified in the basic sciences, as it offers a common discipline for all health care professionals by providing a unifying knowledge base with the potential for clinical

application. In this way, students across disciplines are able to appreciate the sharing of common goals, while extending their understanding to discipline-specific applications and sharing this knowledge within a multidisciplinary team.

The implementation of IPE in the early years of the medical curriculum is a relatively new practice and, as such, will take time to become an established method of fostering collaboration between professions. In line with Gilbert’s (2005) discussion regarding higher education structural barriers to the achievement of IPE, our early experience highlights three essential factors for a successful IPE:

- existence of a core faculty in both DPT and MD programs committed to engaging in interdisciplinary collaboration,
- space and time in the medical and physical therapy curriculum that allows students to participate,
- formal and informal student interaction between disciplines.

The model of team teaching plays an important role in IPE. In this study, we explored the delivery of key concepts by both DPT and MD faculty during a common session. Not only was it important for students to interact within small learning groups, but also for them to appreciate the complementary nature of team teaching. Another important factor in designing this session was the issue of coordinating topic and class schedules. Choosing the right time and right topic was essential, to the session being meaningful to both groups. Taking into consideration the importance of allowing for the establishment of professional identity (Gilbert, 2005), it may be beneficial to engage in an IPE activity toward the middle of a learning block. In this way, the students would have already formed mindsets about their roles in the future health care environment and be able to associate with each other through mutual respect and appreciation for their respective professions.

In addition, creating the time for students to interact in a social atmosphere allowed them the opportunity to learn about each other under more relaxed circumstances. In this way, they were able to develop a rapport that was reinforced in a more professional manner during the formal learning sessions.

Overall, this experience was deemed positive by both students and educators. Ideas for improving future attempts of IPE include adding additional days to the experience, initiating interprofessional experiences in not only the classroom, but also the clinic, and the incorporation of a group project during the experience. One future goal stemming from this experience is continued opportunities for the two groups of students to interact and work together during their later years of training.

## CONCLUSIONS

Our experience with the integration of a first-year gross anatomy course between physical therapy and medical students has been encouraging. Students from both programs recognized the importance of teamwork across disciplines by providing opportunities to learn from each other and to share responsibilities for patient care. The experience resulted in the students independently planning informal study sessions and other interdisciplinary interactions. The positive results of this pilot experience will be used to develop future interprofessional experiences between MD and DPT students.

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