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Implementation of interprofessional education (IPE) in 16 U.S. medical schools: Common practices, barriers and facilitators

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ABSTRACT

Background: Enhanced patient outcomes and accreditation criteria have led schools to integrate interprofessional education (IPE). While several studies describe IPE curricula at individual institutions, few examine practices across multiple institutions.
Purpose: To examine the IPE integration at different institutions and determine gaps where there is potential for improvement.
Method: In this mixed methods study, we obtained survey results from 16 U.S. medical schools, 14 of which reported IPE activities.
Results: The most common collaboration was between medical and nursing schools (93%). The prevalent format was shared curriculum, often including integrated modules (57%). Small group activities represented the majority (64%) of event settings, and simulation-based learning, games and role-play (71%) were the most utilized learning methods. Thirteen schools (81.3%) reported teaching IPE competencies, but significant variation existed. Gaps and barriers in the study include limitations of using a convenience sample, limited qualitative analysis, and survey by self-report.
Conclusions: Most IPE activities focused on the physician role. Implementation challenges included scheduling, logistics and financial support. A need for effective faculty development as well as measures to examine the link between IPE learning outcomes and patient outcomes were identified.

Introduction

The Triple Aim Framework for population health strives to enhance the health of the population, to improve patient outcomes, and to reduce the cost of health care.[1] While a multi-focal approach is needed to accomplish this aim, better training for physicians is

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essential if they are to successfully address the social and behavioral factors that lead to premature morbidity and mortality.[2–4] In 2004, an IOM report found that undergraduate medical education curricula lacked specific behavioral and social science domains like physician role and behavior and physician–patient interaction.[3] In addition, as most medical errors resulting in patient harm are due to communication problems[5,6]; addressing these areas in physician training could further reduce mortality.[7]

Collaborative practice by health professionals has been shown to improve blood pressure[8], Hemoglobin A1c, and LDL cholesterol control,[9] leading to reduced mortality. These outcomes in addition to accreditation requirements,[10] and changes in health care delivery,[11] have led to greater integration of interprofessional education (IPE) into the training of physicians, nurses, pharmacists, and social workers.[12] In 2011, the Interprofessional Education Collaborative (IPEC) introduced four IPE core competencies to guide the development of curricula at health professional schools: 1) values and ethics for interprofessional practice, 2) roles and responsibilities, 3) interprofessional communication, and 4) teams and teamwork. These competencies were used as the conceptual framework for the study.

Several studies describe interprofessional curricular activities offered at individual institutions as well as lessons learned.[13–16] However, in depth examinations of IPE practices across multiple institutions are limited to two published reports.[17,18] The investigation of theoretical approaches in IPE is also limited[19,20] and there are few clear conceptualizations of IPE activities.[20] There is a need to identify IPE theoretical approaches (cooperative, collaborative, or social learning; experiential learning; education of the reflective practitioner; epistemology and ontology of interdisciplinary inquiry)[21], and collect details of IPE interventions.[20] The purpose of this study was to examine the IPE curricular integration or practices at different academic institutions and determine gaps where future initiatives may be planned in order to help other institutions develop, implement, sustain, and move their IPE activities forward.

Methods

In 2004, the Institute of Medicine released a report indicating that U.S. medical schools were not providing adequate physician training in the social and behavioral sciences, which is significant given the extent of morbidity and mortality related to adverse health behaviors.[3] This stimulated the National Institutes of Health to create an initiative through the Office of Behavioral and Social Science Research to study improved integration of social and behavioral science education, including IPE into health professions training. This initiative resulted in nine medical schools being funded in an initial round via a K07 mechanism and a renewal resulted in 16 medical schools receiving funding through an R25 mechanism. All the schools tested different approaches for integrating nine aspects of social and behavioral science education into their respective curricula, including: 1) Mind–Body Interactions in Health and Disease, 2) Patient Behavior, 3) Physician Role and Behavior, 4) Physician–Patient Interactions, 5) Social and Cultural Issues in Health Care, and 6) Health Policy and Economics. As part of this work, an IPE working group was formed, which undertook this specific study.

Study design and participants

This mixed-methods study used an observational cross-sectional design with a convenience sample. This convergent design[19] was selected in order to have a more in depth understanding of IPE activities across schools. Every Principal Investigator (PI) from the 16 medical schools was invited to participate. Surveys were completed by either the PI or designee with working knowledge of existing IPE practices at their respective institutions. The characteristics of the schools vary (Table 1). For example, some schools have several disciplines within a campus while other schools depend on other nearby institutions to incorporate IPE. The 16 schools also make up a consortium that includes a work group dedicated to IPE. While some of the schools' IPE activities are funded by the NIH grant, not all of the IPE projects are a result of grant consortium participation. Institutional Review Board review and approval was obtained for study activities at Texas A&M University.

Data collection

The NIH R25 IPE workgroup designed, pilot-tested, and refined a survey to identify and describe each school's IPE practice including objectives, competency alignment, instructional design modalities, theoretical frameworks, barriers and solutions, and sustainability. To improve the instrument's validity and reliability, we conducted a literature review to inform the content of the survey, asked experts to critically review it, and completed iterative revisions after pilot testing. The final survey was sent electronically through Qualtrics survey software in Bryan, Texas to the PIs of the 16, R25 grant consortium schools. The PIs or designated individuals identified by the PIs were then asked to complete the survey. The response rate was 100%.

Data analysis

The data analysis approach utilized descriptive statistics to examine similarities and differences in IPE activities and qualitative

Table 1
Characteristics of participating medical schools at time of survey.

Characteristics	$n = 16$	%
Ownership		
Public	9	56.25
Private	7	43.75
Region of the country[a]		
Northeast	4	25.00
Mid-Atlantic	2	12.50
Southeast	0	0.00
Great Lakes	1	6.25
Mississippi Valley	1	6.25
Plains States	3	18.75
Rocky Mountain States	0	0.00
Pacific Northwest	1	6.25
Pacific Southwest	4	25.00
Class size[b]		
<100	1	6.25
100–150	7	43.75
151–200	7	43.75
>200	1	6.25
Configuration educational settings		
Medical school only	2	12.50
Medical & public health school	1	12.50
Medical & nursing school	1	6.25
Medical & pharmacy	1	6.25
Medical, nursing, public health	2	12.50
Medical, nursing, dentistry	1	6.25
Medical, nursing, dental, public health	3	18.75
Medical, nursing, dentistry, pharmacy	2	12.50
Medical, nursing, dentistry, pharmacy, public health	2	12.50
Age of medical school		
<30 years	0	0.00
31–50 years	3	18.75
51–70 years	3	18.75
>70 years	10	62.50

[a] National Weather Service regional designations.
[b] Based on incoming class size.

analysis to help explain, illuminate, and better understand the findings. Descriptive statistics were used to characterize quantitative variables reflecting the IPE activities underway at each study school, such as IPE format, disciplines involved, settings, and theoretical framework. Key IPE education components were assessed using the items included in the four domains of the IPEC 2011 document: values and ethics (n = 11 items), roles and responsibilities (n = 10 items), communication (n = 9 items), and teamwork (n = 12 items) for a total of 42 items. Data on these key components were tallied and presented as percent of items addressed within each domain by medical school (the numerator was the total items addressed and the denominator was the total items available). The free text written responses to open-ended survey questions were qualitatively analyzed using classical content analysis techniques,[22] including categorical aggregation[23] and clustering.[24] Data were independently coded by four authors (R.T.P., M.F.M., E.K.T., P.A.C.) and emergent themes were agreed upon at consensus meetings.

Results

All 16 medical schools provided responses to the online survey regarding IPE activities at their institutions. While participating medical schools were fairly evenly distributed in terms of public versus private, region of the country represented, class size, and age (Table 1), all schools were located in urban areas. Over 18% had educational settings that included schools of medicine, nursing, dentistry and pharmacy, although many configurations were represented.

Of the 16 medical schools, 14 (87.5%) reported having IPE activities underway. The vast majority of activities (93%) represented collaborations among schools of medicine and nursing, with pharmacy included in 57% of schools (Fig. 1). A composite "Other" category contained multiple disciplines, such as social work, physical and occupational therapy (see full list in legend on Fig. 1), which were represented in 64% of schools.

Fig. 2 illustrates the best-fit guiding theoretical frameworks[21] used by the 14 schools with active IPE activities in place, revealing that 43% used collaborative, cooperative or social learning and 29% used experiential learning frameworks.

Fig. 3 outlines the various types of educational formats for IPE activities, with 57% having a common curriculum across professions and/or integrating modules into either new or existing curriculum and 36% having team-based learning or simulation. Clinical practice, e-Learning or work-based educational formats were present in only 14% of schools.

Small-group activities or live simulation events represented the majority of settings where IPE activities took place at 64% and 50%, respectively (Fig. 4).

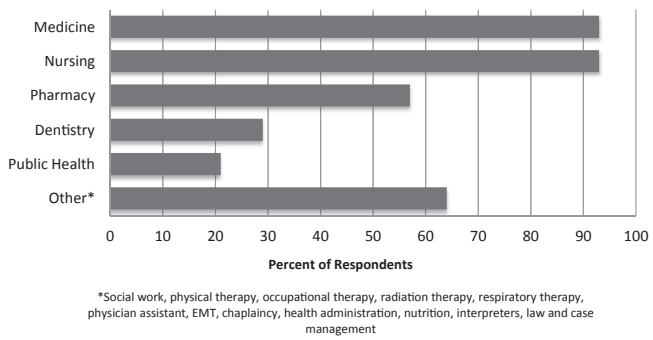

Fig. 1. Disciplines involved in IPE activity (n =14).

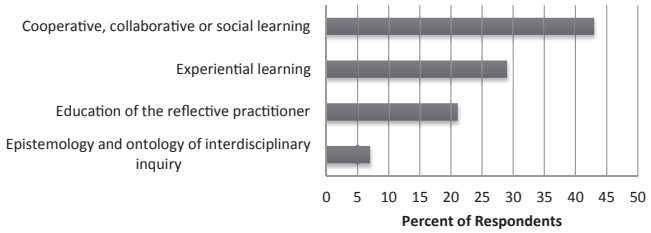

Fig. 2. Best fit IPE theoretical frameworks (n = 14).

Fig. 5 illustrates the type of IPE learning methods that were included, which tended to involve more simulation, games and role-plays (71%) or exchange-based learning and case discussions (50%) than didactic lectures (14%).

Thirteen of the 16 schools reported on key IPE competencies taught as part of their curriculum (81.3%) (Table 2). The range in scores in these four competency domains (values/ethics, roles/responsibilities, communication, and teamwork) was broad (range = 0%–100% for all domains). Of note is that four medical schools (#4, #12, #13, and #14) achieved > 75% in all these areas (see Appendix A for individual items used in this scoring metric). An additional school achieved >50% for values/ethics (#9), roles/responsibilities (#5), and teamwork (#1). Nine of the 13 schools reporting on competencies taught achieved >50% for communication (#1, #4, #5, #8, #9, #11, #12, #13, #14).

Appendix B presents findings from our content analysis of text responses to the survey. Schools provided information on both IPE tools and educational processes involved in delivering IPE curriculum, including didactic, and active team-based learning and simulations. Most IPE activities described address physician role and behavior as a primary social and behavioral science activity, and many curricular objectives were designed to address the IHI's Triple Aim Initiative (2015), including improving care quality and costs of health care, as well as patient safety.

Challenges experienced in implementing IPE activities included scheduling and logistics, and financial support. Schools often, but not always, used validated measures and/or checklists, such as the TeamSTEPPs[25] or the Readiness for Interprofessional Learning Scale (RIPLS)[26] to summatively evaluate IPE efforts (Appendix B). Formative techniques included self-reported clinical behaviors, direct observations, or team-based and self-assessments, typically developed by faculty at respective institutions. Faculty development efforts ranged from limited or non-existent, to very sophisticated; however, the schools uniformly expressed the need for faculty development resources. Among schools that did have faculty development activities, programmatic themes were quite variable and ranged from 1-h sessions, peer observations, and debriefings in small groups, to day-long seminars, task forces and comprehensive IPE centers. An additional key finding from the qualitative analysis is that IPE efforts serve to perpetuate new work in the form of highly valued scholarship, conversations and relationships.

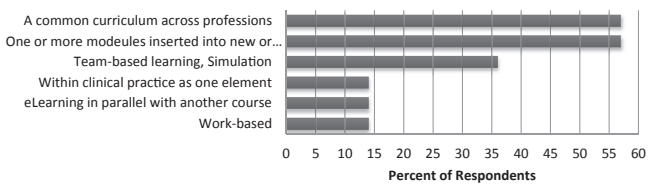

Fig. 3. Type of interprofessional education format (n = 14).

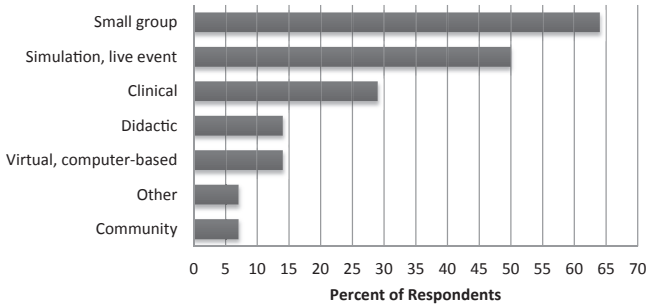

Fig. 4. Setting of the IPE Activity ($n = 14$).

Discussion

To our knowledge, this is the most recent national study examining IPE activities in medical schools. While several research projects[27–29] have examined similar components such as IPE participants, methods, barriers, and implementation, our study is only one of three that has a national sample,[27,30] and one of two that is focused on IPE in preclerkship training in medical education.[27] Therefore, this study, which yielded a 100% response rate, can be viewed as a needed follow up to the national study by Blue et al in 2010 that provided national baseline data.

We found that the majority of participating schools reported providing IPE within a medical school curriculum. The format of IPE varied and included simulation, team-based learning and/or some type of didactic instruction related to IPE. Shared didactic instruction may provide the common foundational knowledge necessary to engage in patient care, but does not create interactive learning and allows each discipline to stay within their silo. Even shared didactic instruction poses challenges to meeting the instructional needs of each discipline and requires faculty development. Team-based learning and simulation are popular IPE methods since these strategies engage students in teams and are conducive to role exploration, application of various communication techniques and "hands-on" team development. For these activities, more faculty development in team building is needed to foster successful achievement of curricular goals. Our findings are consistent with other studies that have reported on IPE activities and challenges in schools of health professions training.[13–16] The finding that barriers to implementing IPE reported years ago appear to still exist underscores the importance of focused efforts to provide the resources or infrastructure needed to eliminate these challenges.

The theoretical frameworks[21] that were identified as being utilized most were collaborative, cooperative, or social learning, and experiental learning. Since the learning methods identified most commonly were simulation-based learning, exchange-based learning, and action-based learning, it suggests that these two theoretical frameworks provide a sound foundation for pre-licensure IPE. However, we recognize that the potential IPE theoretical approaches identified by Clark[21] do not encompass all of the ones used in prior studies.[20] Furthermore, the theoretical framework data was gathered in a quantitative manner. While a more encompassing and in-depth qualitative examination is needed in future studies, our work adds to the body of knowledge related to IPE in pre-licensure settings.[20] The quantitative findings (Figs. 1–5 and Tables 1 and 2) and qualitative details of the IPE interventions (Appendix B) are presented in a manner that can be easily referenced and utilized to inform practice.

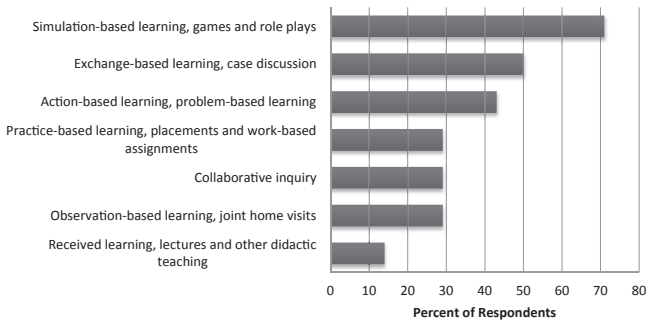

Fig. 5. IPE learning method ($n = 14$).

We found the majority of medical schools reported including nursing or pharmacy in their IPE activities. This may be related to the structure of the curriculum, accreditation standards requiring IPE activities, or the size and proximity of these schools to the medical school or health system. Nursing schools often include experiential training very early in the curriculum, providing greater opportunities for students to engage in IPE activities. The most common IPE activities included bringing together a team of residents and nursing students in one format or another. Some had specific meeting times together, while others participated in rounding at the patient bedside together. In most cases, some training prior to these activities occurred. Ethics and team-based standardized patient activities were often utilized and followed by debriefing with feedback from instructors and self-critique by team members. Simulation activities such as multi-modal simulation, half-day sessions, and a large scale Disaster Day, were another common method for delivery of IPE.

The Triple Aim initiative is an Institute of Healthcare Improvement (IHI) framework for optimizing health system performance. The Triple Aim refers to the improvement of the patient care experience, improving the health of populations, and reducing the per capita cost of health care. The effort began in 2007 with a group of 15 organizations in the United States, England, and Sweden. It has grown to over 150 organizations focused on of developing respect and relationships, patient safety concerns, and helping all participants to be engaged in effective decision-making.[1] Schools determined if learners met these objectives using formative techniques such as self-reported clinical behaviors, observations, team-based assessments and self-assessments.

Despite the availability of validated instruments, there is no broad acceptance or adoption of measures of IP collaboration.[31,32] The lack of broad acceptance occurs because many instruments measure short term benefits of IPE. Other challenges in implementing specific instruments include locating tools with established validity for use with various patient populations and/or with multiple health care disciplines. However, consensus measures are necessary to establish a direct relationship between IPE and patient outcomes. Wagner and Reeves[33] recently published a paper on entrustable professional activities (EPAs) and IPE and proposed a two-phase study designed to: identify possible EPAs for IPE based on existing milestones (Phase 1) and create specific EPAs for an IPE curriculum at their institution to provide a rigorous approach to assessment. It will be important to read the results of this study. For now, we recommend collaboration among consortium schools to generate consensus on outcome measures for IPE, which include the immediate learner outcomes and longer-term health and system outcomes as suggested by the IOM report on IPE[31]. A strength of large multi-institution collaboratives is the ability to apply a common set of measures across schools and determine which approaches appear to be associated with better learner outcomes. Too often, efforts are undertaken at a single institution or a small non-representative set of institutions, which limits what can be learned.

Table 2
Summary scores for key interprofessional education components.[a]

Institution	Values/ethics summary score ($n = 10$)	Roles/responsibilities summary score ($n = 9$)	Communication summary score ($n = 8$)	Teamwork summary score ($n = 11$)
1	4 (40.0%)	4 (44.4%)	7 (87.5%)	7 (63.6%)
2	0 (0%)	0 (0.0%)	2 (25.0%)	0 (0%)
3	2 (20.0%)	2 (22.2%)	3 (37.5%)	0 (0%)
4	8 (80.0%)	9 (100%)	8 (100%)	9 (81.8%)
5	1 (10.0%)	5 (55.6%)	4 (50.0%)	3 (27.3%)
6	4 (40.0%)	2 (22.2%)	3 (37.5%)	2 (18.2%)
7	1 (10.0%)	0 (0.0%)	0 (0%)	0 (0%)
8	0 (0%)	1 (11.1%)	4 (50.0%)	2 (18.2%)
9	5 (50.0%)	4 (44.4%)	4 (50.0%)	3 (27.3%)
10	N/A[b]	N/A	N/A	N/A
11	1 (10.0%)	3 (33.3%)	4 (50.0%)	1 (9.1%)
12	10 (100%)	9 (100%)	7 (87.5%)	11 (100%)
13	10 (100%)	9 (100%)	6 (75.0%)	9 (81.8%)
14	9 (90.0%)	9 (100%)	8 (100%)	11 (100%)
15	N/A	N/A	N/A	N/A
16	–[c]	–	–	–

[a] See Appendix A for variables that represent core IPE competencies.
[b] N/A = not applicable – these schools reported no IPE activities were occurring.
[c] Reported IPE activities but left this portion of the survey blank.

One of the most interesting themes identified in this study was the vast difference in IPE faculty development opportunities and the need to enhance faculty development in IPE. These findings are consistent with prior studies[27–29] which indicated that while faculty development is crucial,[29] it is not receiving enough attention or resources.[28] A standardized, user-friendly approach for faculty development where learners are actively engaged in the process is essential. Institutions should consider the suggestion made by Everard et al[28] which is to utilize the conceptual framework identified by Silver and Leslie[34] when planning faculty development. Because IPE is both interactive and constructivist in nature, it requires specific facilitation skills on the part of faculty to engage participants in learning from each other. Importantly, Sargent, Hill and Breau[35] published a study that reported on the validity and reliability of the Interprofessional Facilitation Scale (IPFS), to assess skills in facilitating IPE. The 18 item IPFS can be used in facilitator development as a concise guide to IPE facilitation skills and for assessment and further enhancement of IP facilitation competencies. The authors, having seen this theme in the process at their own institutions, have determined to move forward to develop specific IPE faculty development programs. Our plan is to engage partnering health systems with academic institutions to encompass all faculty to bridge the gap in measuring the impact of IPE on patient outcomes[32] using the IPFS.

The survey has provided a view of what exists, what is particularly weak, and how successful strategies could be useful to others. The collaborative effort clearly demonstrates the value of what we can learn from each other and the professional networking that has occurred over the topic of IPE. This can only strengthen our efforts to determine and implement IPE opportunities across institutions.

There are several limitations of this study. This study was conducted using a survey of schools funded by the NIH and represents a convenience sample. However, the participating institutions provided a good geographic representation and most commonly medical schools are located in urban areas. Secondly, we are limited in our qualitative analysis since we surveyed individual institutions. Conducting focus group discussions would have provided more robust data on challenges surrounding IPE implementation and faculty development. Lastly, the survey involved self-reported information which may be affected by recall or social response bias. Despite these limitations, this study provides insights into the implementation of IPE activities in medical schools across the country.

Conclusion

In conclusion, vast differences in IPE practices exist in health professions education. The most common IPE programs included medical students with students from schools of nursing and pharmacy, and used collaborative or experiential learning. Financial payment structures and differences in professional and organizational cultures are implementation challenges. Future research should examine the types of IPE faculty development that are most effective, and which training techniques, modalities, and materials are most transferrable to practice settings to enable researchers to more directly examine the relationship between IPE training and patient outcomes. Collaborative research and publication efforts across disciplines[29] are also encouraged in an effort to share innovative practices and move IPE forward.

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Appendix A
Core IPE competencies according to domain represented in summary scores.

Domain label/definition	Variable item
Values/ethics – Work with individuals of other professions to maintain a climate of mutual respect and shared values.	
1	Place the interests of patients and populations at the center of interprofessional (IPE) health care delivery.
2	Respect the dignity and privacy of patients while maintaining confidentiality in the delivery of team-based care.
3	Embrace the cultural diversity and individual differences that characterize patients, populations, and the health care team.
4	Respect the unique cultures, values, roles/responsibilities, and expertise of other health professions.
5	Work in cooperation with those who receive care, those who provide care, and others who contribute to or support the delivery of prevention and health services.
6	Develop a trusting relationship with patients, families, and other team members (CIHC, 2010).
7	Demonstrate high standards of ethical conduct and quality of care in one's contributions to team-based care.
8	Manage ethical dilemmas specific to IPE patient/population centered care situations.
9	Act with honesty and integrity in relationships with patients, families, and other team members
10	Maintain competence in one's own profession appropriate to scope of practice.
Roles/responsibilities - Use the knowledge of one's own role and those of other professions to appropriately assess and address the health care needs of the patients and populations served.	
1	Communicate one's roles and responsibilities clearly to patients, families, and other professionals.
2	Recognize one's limitations in skills, knowledge, and abilities.
3	Engage diverse health care professionals who complement one's own professional expertise, as well as associated resources, to develop strategies to meet specific patient care needs.
4	Explain the roles and responsibilities of other care providers and how the team works together to provide care.
5	Use the full scope of knowledge, skills, and abilities of available health professionals and health care workers to provide care that is safe, timely, efficient, effective, and equitable.
6	Communicate with team members to clarify each member's responsibility in executing components of a treatment plan or public health intervention.
7	Forge interdependent relationships with other professions to improve care and advance learning.
8	Engage in continuous professional and IPE development to enhance team performance.
9	Use unique and complementary abilities of all members of the team to optimize patient care.
Communication – Communicate with patients, families, communities, and other health professionals in a responsive and responsible manner that supports a team approach to the maintenance of health and the treatment of disease.	
1	Choose effective communication tools and techniques, including information systems and communication technologies, to facilitate discussions and interactions that enhance team function.
2	Organize and communicate information with patients, families, and health care team members in a form that is understandable, avoiding discipline-specific terminology when possible.
3	Express one's knowledge and opinions to team members involved in patient care with confidence, clarity, and respect, working to ensure common understanding of information and treatment and care decisions.
4	Listen actively, and encourage ideas and opinions of other team members.
5	Give timely, sensitive, instructive feedback to others about their performance on the team, responding respectfully as a team member to feedback from others.
6	Use respectful language appropriate for a given difficult situation, crucial conversation, or IPE conflict.
7	Recognize how one's own uniqueness, including experience level, expertise, culture, power, and hierarchy within the health care team, contributes to effective communication, conflict resolution, and positive IPE working relationships (University of Toronto, 2008).
8	Communicate consistently the importance of teamwork in patient-centered and community focused care.
Team/teamwork – Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles to plan and deliver patient-/population-centered care that is safe, timely, efficient, effective, and equitable.	
1	Describe the process of team development and the roles and practices of effective teams.
2	Develop consensus on the ethical principles to guide all aspects of patient care and teamwork.
3	Engage other health professionals—appropriate to the specific care situation—in shared patient-centered problem-solving.
4	Integrate the knowledge and experience of other professions—appropriate to the specific care situation—to inform care decisions, while respecting patient and community values and priorities/preferences for care.
5	Apply leadership practices that support collaborative practice and team effectiveness.
6	Engage self and others to constructively manage disagreements about values, roles, goals, and actions that arise among health care professionals and with patients and families.
7	Share accountability with other professions, patients, and communities for outcomes relevant to prevention and health care.
8	Reflect on individual and team performance for individual, as well as team, performance improvement.
9	Use process improvement strategies to increase the effectiveness of IPE teamwork and team-based care.
10	Use available evidence to inform effective teamwork and team-based practices.
11	Perform effectively on teams and in different team roles in a variety of settings.

Appendix B
Results of content analysis derived from open-ended survey questions.

Question/prompt	Emergent themes and definitions	Exemplars	Interpretive comments
Common IPE practices			
	Simulation	• Interprofessional simulation • 3D virtual teams • Sub-I IPE simulation/encounter	Themes capture references to IPE tools and processes of care. Specific titles are diverse and reflect partial details on tools or processes schools are using.
	Didactic	• Systems-based health care • Humanities/social science seminars for medical students	Describes titles for traditional didactic approaches to IPE instruction.
	Team-based learning	• Team-based learning sessions • Team-based activities	References to team-based approaches to instruction.
Description of IPE Activities			
	Varied learner levels	• Medicine residents and nursing students form teams. • Medical and nursing students meet once a week for 2 h over 3 weeks as part of a 4 week clerkship in family medicine • Allow medical and nursing student teams to round at patient and families' bedsides	A broad perspective is represented in terms of content, exercises and learning strategies for IPE. IPE activities targeted at a mix of clinical students, residents and practitioners.
	Team-based training	• Faculty and students from dental, medical, nursing, and public health schools enroll in intensive semester-long seminars in topics important to health care teamwork • Paper-based cases that examine ethics and high health care utilizers and team-based standardized patient activities. After feedback from an instructor and self-critique by team members, learners respond to a similar case to see how working as a team and having feedback impacts their individual and group performance.	Several active learning activities are included in team-based training.
	Simulation activity	• Multi-modal simulation includes a standardized patient experiencing an acute myocardial infarction who presents to clinic and is triaged by a group of medical and nursing students. • Students come together in our simulation center for a half-day session. • Disaster day is a large-scale disaster simulation that has grows in the number and types of participants each year.	Many programs deliver IPE via simulation.
Three to five objectives of IPE activities			
	Triple aim	• Deliver patient-/population-centered care that is safe, timely, efficient, effective, and equitable. • Discuss ways interprofessional teams can be used to decrease health care costs and increase health care quality	Most of what is conveyed addresses physician role and behavior as the primary behavior and social science activity. Several objectives describe principles related to the Triple Aim initiative.
	Developing discourse, respect, relationship	• Work with individuals of other professions to maintain a climate of mutual respect and shared values. • Collaborate with students from other health care professions to develop a team care plan for a patient with chronic illness, to improve learners' communication skills.	Several objectives describe tenants of productive collaboration with interprofessional peers.
	Patient safety, centeredness	• Explain the relationship between teamwork and patient safety. • Students describe techniques to disclose errors to patients and their families, as part of an interprofessional team. • Able to collaborate with patients & other members of health care team.	A focus of patient safety is apparent in several objectives.
	Team-ness	• Apply relationship-building values and the principles of team dynamics to perform effectively in different team roles. • Our graduates are skilled in the collaborative processes by which patients and interprofessional teams create and implement integrative care plans. • Participate in effective decision-making in IP teamwork utilizing judgment and critical thinking to optimize health outcomes and safety.	Team-ness and teamwork is emphasized in many objectives.
Top 2 challenges and how these were overcome			
	Structural solutions	• We built workshops into existing curricular time where many faculty are already present and used these faculty to facilitate the workshops. • Discussed a manner to have 90 nursing students work with 187 medical students. • The nursing school assigned a subgroup to attend each 4-week family medicine clerkship group all year round.	Many schools adjust scheduling and curriculum to solve their challenges
	Structural challenge (logistics, scheduling. faculty & student time/availability. securing partnerships. curricular streamlining.)	• Conducting large scale IPE – the logistics of moving 300 students through a simulation event. • Curriculum streamlining, fitting IPE into the curriculum for three different schools – 2 public and 1 private University. • Faculty time is always an issue; • Getting all appropriate members to the bedside – studies show that the most important person for family centered rounds is the bedside nurse; yet in the beginning, it was hard to free up the nurses to attend family centered rounds.	Several schools describe logistical, structural challenges to meeting their IPE goals.

(*Continued on next page*)

Appendix B (*continued*)

Question/prompt	Emergent themes and definitions	Exemplars	Interpretive comments
	Financial support	• Funding to expand the exercise to all students. • Obtaining funding to develop the virtual platform.	Financial support is a challenge for several institutions' IPE efforts.
How schools determined learners are meeting planned objectives			
	Instrumental measures	• We are developing and testing interprofessional tools for observation in clinical settings, an Implicit Association Test, and a multiple choice question test. • Assessment of teamwork attitudes before and after the intervention using the TeamSTEPPS teamwork attitudes questionnaire. • We developed 3 instruments derived from the IPEC competencies: a) an observation instrument, b) a team and self-evaluation, and c) an SP instrument. • The evaluation includes standardized measures, such as the readiness for interprofessional learning scale and a validated bedside rounds checklist	Many institutions use validated instruments/tools/checklists to evaluate IPE efforts.
	Formative measures	• To measure learners' communication skills, we use structured clinical observations. We also use feedback/evaluations from residents/fellows/faculty. • Faculty observation of individual performance and the team's performance. • At the end of the simulation, each group convenes in a 60-min debriefing session led by facilitators using the GOE technique (good, opportunities and expectations). Additionally, each school held a large class debriefing to review content areas specific to each discipline.	Many institutions use formative techniques (self-reported clinical behaviors, observations, team-based and self-assessments) to evaluate IPE efforts.
Type of faculty development is provided for IPE			
	No commitment	• None • None at present of which I am aware.	Describes institutions with non-existent approaches to IPE faculty development.
	Limited commitment (one hour sessions, peer observations on rounds, debriefing and small group discussion)	• This is limited – some discussion of IPE in Academy of Educators, which organizes faculty development events & series. • Occasional Educational Grand Rounds (EGRs) and workshops. The IPE Committee recently had an IPE day and there is another internal grant that will focus on IPE faculty development for TeamSTEPPS and EBP (Evidence-based Practice). • Unfortunately, not much. We've put together a faculty guide for each of these workshops and meet with faculty briefly (approximately 1 h) to discuss how to run these sessions.	Describes institutions with current or planned limited, "one-off" approaches to IPE faculty development.
	Strong commitment (day long seminar or workshop, task force, IPE center)	• We are in the process of creating a robust faculty development program for IPE facilitators that will include both on-line and face-to-face offerings. Faculty will be able to get a "teaching certificate" in IPE. • A new center for interprofessional education has been established at our school to foster collaboration and faculty development. • The interprofessional initiative steering committee, task forces, and work groups are faculty driven. Each foundations session as 1.5-h facilitator training sessions and a detailed facilitator guide with associated reading and videos. • We had one IPE faculty development day for all clerkship directors and invited IPE experts and faculty. Although we developed many IPE initiatives across clerkships, we need a lot more faculty development resources.	Describes institutions with current or planned strong, sustained approaches to IPE faculty development.
Describe faculty development strategies or programs related to IPE that have been particularly effective			
	Developing strategies	• This is a particularly weak area for us and something we are looking to build upon moving forward with a series of IPE initiatives in the next one to two years. • Currently in development – inadequate experience to-date. • Clerkship retreat worked well for our faculty. We had clerkship directors complete a curriculum design assignment in advance of the session and each presented to the entire group. • Identifying and nurturing an IPE "core faculty" is an ongoing process.	Describes effective strategies that are developing.
	Established strategies	• Training sessions have been highly rated and successful. • Faculty development programs that have been interdisciplinary in nature have been particularly effective. • Longitudinal continuous seminar format for multi-professional group of faculty.	Described effective strategies that are established.
Additional comments about best IPE practices			
	Perpetuating new work	• We have developed several other IPE sessions. • Some of the best outcomes from interprofessional conversations in these seminars include more nuanced, wide-ranging, penetrating critical analysis of institutional cultures, and systems. • Below is a list of some of the papers that have been published from our work.	IPE efforts serve to perpetuate new work in the form of scholarship, conversations & relationships (i.e., 1 site listed several publications on IPE, patient safety).