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ORIGINAL ARTICLE

An interprofessional approach to collaborative management of low-back pain in primary care: A scholarly analysis of a successful educational module for prelicensure learners

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ABSTRACT

Objective: In 2008, an interprofessional education (IPE) working group was formed to develop a module on interdisciplinary low-back pain management to fill a curricular gap at our institution. This article describes the program evaluation outcomes and highlights factors contributing to its successful implementation over 8 years through reference to Brigg's Presage-Process-Product (3-P) Model of Teaching and Learning.

Methods: Program evaluation occurred through administration of a pre- and postmodule Health Professional Collaborative Competency Perception Scale, with scores compared using paired *t* tests. Descriptive statistics were analyzed from 5-point Likert scales for module session components.

Results: A total of 853 students from 9 health care occupations (medicine, chiropractic, physiotherapy, pharmacy, nursing, nurse practitioner, occupational therapy, physiotherapy assistants, and occupational therapist assistants) participated in 51 iterations of the module from 2011 to 2019, averaging 16 participants each session. All Health Professional Collaborative Competency Perception Scale items significantly improved from pre- to postintervention ($p < .001$) for learners from 6 health professions. Module components were rated highly, with the majority of learners rating these as 4 (*helpful*) or 5 (*very helpful*) for their learning. Participants also improved their scores in perceived history and physical exam comfort, knowledge of pharmacotherapy, management options, and attitudes regarding an interprofessional approach to back pain ($p < .001$).

Conclusion: This article describes the presage, process factors, and products of this model IPE program that provides learners from various health care professions with an opportunity to gain a deeper understanding of the interdisciplinary management of low-back pain, as demonstrated through improvement in collaborative competencies.

Key Indexing Terms: Interprofessional Education; Low-Back Pain; Primary Health Care; Chiropractic; Education

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INTRODUCTION

Low-back pain (LBP) remains the leading cause of disability globally.[1] Patients experiencing LBP may present to a number of allopathic and allied health care providers, such as medical doctors, doctors of chiropractic, and physical therapists, for care.[2] However, management of LBP has been dictated by differences in the training, education, and scope of practice of these providers.[2] Chiropractors play an important front-line role in the management of back pain in North America. However, most of the current training programs are in isolation and not part of a larger health sciences university or college system; hence, there is little opportunity for chiropractic prelicensure students to participate in interprofessional learning.[3] Effective primary care management of low-back pain can be challenging, and evidence-based care often requires the collaborative expertise of professionals from a range of health disciplines.[4] A competent health workforce is required with the skills and ability to support the implementation of such integrated models of care.[4]

The interprofessional nature of LBP care serves as a natural context for interprofessional education (IPE), when students from "two or more professions learn about, from and with each other to enable effective collaboration and improve health outcomes."[4–6] Chehade et al[7] proposed that an emphasis on the interprofessional training of health care professionals is required to ensure the attainment of competencies to deliver collaborative, patient-centered care. This supports the World Health Organization's prioritization of IPE as a model of education to help address current health

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system fragmentation through integrated care and to meet global health workforce needs.[4] However, effective ways to develop and disseminate an IPE model can vary.

It has been suggested that scholarly approaches to education encompass "creative teaching with effectiveness that is rigorously substantiated, educational leadership with results that are demonstrable and broadly felt, and educational methods that advance the learner's knowledge."[8] Scholarly innovations in IPE will both use best practice teaching methods to achieve significant educational results and also effectively share outcomes for peer review, to enable others to learn from and further build upon successful work. Reference to education evaluation models, such as the Brigg's Presage-Process-Product (3-P) model of teaching and learning, provides a structure for analyzing influences upon and within learning opportunities that promote successful education innovation.[9] In the 3-P model, presage factors are contextual, teacher, and learner characteristics that influence the planning and implementation of learning experiences.[9] The process factors of facilitating learning, which can be complex and interwoven, outline the planning and delivery of educational interventions that will ultimately lead to the product.[9] In IPE, the intended products of these activities can include discipline-specific knowledge, attitudes and behaviors, impact on service delivery, and patient/client outcomes.[9]

Some examples of IPE for LBP care have been described for professionals in practice.[5,10] Other publications describe primary care or community-based IPE experience for prelicensure students[11–14] but are not specific to musculoskeletal care. The purpose of this article is dual-fold: (1) to describe an example of a successful IPE module on the interdisciplinary management of LBP offered at our teaching hospital and (2) to utilize Brigg's 3-P model to highlight the contextual features (presage), teaching approaches (process), and program outcomes (product) that have enabled the sustained and successful delivery of this program over time. It is our hope that this scholarly analysis will demonstrate our program as a model of IPE innovation that may encourage others to create similar educational experiences to further promote collaborative competencies for health providers in LBP care.

METHODS

Program Development

The setting for this program is an inner-city, academic family health team (FHT) that provides clinical primary care and serves as a teaching site for multiple academic programs and institutions. In St. Michael's Hospital, Unity Health Toronto, FHTs are primary health care organizations that include a team of family physicians, nurse practitioners (NPs), registered nurses, social workers, dietitians, and other professionals who work together to provide primary health care for their community.[15] They work to ensure that people receive the care they need in their communities, and each team is set up based on local health and community needs. In our context, the clinical care team is composed of clinician-educators from 11 different primary care health professions, including chiropractic, most of whom host students at our FHT in clinical placements over the course of an academic year.

In 2008, a curricular gap on LBP was identified by the undergraduate medical program director, and an existing departmental IPE committee was approached for assistance with curriculum development. An initial working group was formed with clinician-educators from medicine, chiropractic, physiotherapy (PT), and pharmacy, and over time, this group has expanded to include nursing, NP, and occupational therapy (OT) representation. All program materials were, and continue to be, co-developed by the multidisciplinary teaching team, with early content negotiated over many meetings to come to agreement by consensus. More recent iterations of program content have evolved to align with a province-wide strategy for management of LBP.[16,17]

The 4-hour module starts with an icebreaker, followed by an interprofessional case-based discussion and physical exam practice in small mixed-learner groups. The 2nd half of the module is run in small, mixed-learner groups and includes a pharmacotherapy review of over-the-counter pain medications, discussion on pain and rehabilitation self-management strategies with an NP and OT facilitators, and an interactive presentation on evidence-based manual therapies for LBP co-taught by PT and chiropractic facilitators.

Given the variability in student placement schedules among different training programs at our institution, the program faced a challenge of inconsistent learner cohorts in the unit from some learning groups. To address this, a commitment was made to run the program as a mandatory component of the medical student curriculum (6 blocks per year) with opportunistic recruitment of other students through hospital and other affiliated institutions. The program has consistently engaged chiropractic interns since program inception. Regular participation of other health professions learners included pharmacy, nursing, NP, PT, OT, physiotherapy assistant (PTA), and occupational therapist assistant (OTA) students, depending on availability. With growth in popularity and size, additional education administrative support has been required to assist with session coordination.

Module Evaluation Process

Module evaluation involves the use of 3 tools that are completed by learners pre- and postmodule.

Health Professional Collaborative Competency Perception Scale

The 1st tool is a questionnaire that students complete entitled the Health Professional Collaborative Competency Perception Scale (HPCCPS),[18] administered pre- and postmodule to measure changes in self-perception confidence to collaborate in practice. The HPCCPS is an 8-item scale (0–10 rating) with an additional construct (9th item) on the postsession application that asks about overall global change (Table 1). The instrument was created based on collaborator role competency constructs from the CanMEDs (2009) competencies framework for health professional trainees.[19] The HPCCPS was tested and validated as part of a rigorous outcome development process undertaken as a master's thesis project.[18] The HPCCPS was shown to have strong psychometric properties including good face and content validity, was highly responsive to detecting change, and had strong stability over time.[18]

Table 1 - Health Professional Collaborative Competency Perception Scale (HPCCPS)[18] Administered Pre- and Postmodule

Item	Likert Scale 0 = not at all very confident; 10 = very confident										
1. Describe your professional roles and responsibilities clearly to other professions	0	1	2	3	4	5	6	7	8	9	10
2. Recognize and observe the constraints of your role, responsibilities, and competence	0	1	2	3	4	5	6	7	8	9	10
3. Recognize and respect the roles, responsibilities, and competence of other professions in relation to your own professional role	0	1	2	3	4	5	6	7	8	9	10
4. Work with other professionals to effect change and resolve conflict in the provision of care and treatment	0	1	2	3	4	5	6	7	8	9	10
5. Work with others to assess, plan, provide, and review care for individual patients	0	1	2	3	4	5	6	7	8	9	10
6. Tolerate differences, misunderstandings, and shortcomings in other professions	0	1	2	3	4	5	6	7	8	9	10
7. Facilitate interprofessional case conferences, team meetings, etc	0	1	2	3	4	5	6	7	8	9	10
8. Enter into interdependent relations with other professions	0	1	2	3	4	5	6	7	8	9	10
Following the program											
9. After completing this program, how confident do you feel overall about your ability to perform competently as a collaborative health care professional[a]	0	1	2	3	4	5	6	7	8	9	10

[a] This item was asked only on the postmodule HPCCPS.

Perceived Comfort and Knowledge Questionnaire (2011–2014) and Perceived Usefulness Questionnaire (2014–Present)

The 2nd evaluation tool, used postmodule, includes 5-point Likert scale and open-ended free-text questions. In response to changing requirements for IPE session accreditation at the University of Toronto, the content of these questionnaires changed over time. The start of both versions included a postmodule overall global rating. This 5-point scale ranged from 1 (*poor*) to 5 (*excellent*). Early versions of the evaluation form (2011 to 2014) included a self-assessment questionnaire that elicited information on comfort level in taking a history, comfort in performing a physical exam, knowledge of conservative (nonsurgical) management options for LBP, knowledge of pharmaceutical alternatives, and attitude toward the utility of an IP approach to care. The 5-point scale ranged from 1 (*low*) to 5 (*high*). In 2014, these questions were replaced with new questions asking students to rate the usefulness of different session components; introduction and icebreaker, case and discussion, screening LBP, management, and wrap up. This 5-point scale ranged from 1 (*not helpful/useful*) to 5 (*very helpful/useful*). With both versions, students were also given the opportunity to provide free-text comments on their experience with the session. Some of the prompts for comments included "At what moment in today's session did you feel most engaged?" "What was the most important information you learned during today's session?" and "Do you have any questions about or suggestions for improvements in today's session?"

This module evaluation process was formally reviewed by institutional authorities at Unity Health Toronto and was deemed to neither require research ethics board approval nor written informed consent from participants, as the methods are consistent with usual departmental education quality assurance and improvement activities. Students were given the option to declare their profession on evaluation tools, but other personal identifying data were not collected. All evaluation results were shared with the teaching team in aggregate form so that specific comments or results were not traceable back to any individual student.

The program undergoes a continuous cycle of evaluation with yearly review of results by the whole teaching team. Adjustments are made to module content or delivery based on feedback from students and teaching faculty input and/or updated clinical practice guidelines and patterns of provincial service delivery.

Statistical Analysis

Quantitative program evaluation data shared here were from 2011 onward, covering 51 iterations of the module. Descriptive statistics were used for student professions, and ordinal data, such as postmodule overall global rating and the tool perceived helpfulness/usefulness regarding various components of the half-day module (medians and frequencies). For the HPCCPS instrument, paired *t* tests were used to evaluate any change in the pre- and postmodule scores (averages and standard deviations [SDs]), similar to the original study.[18] The recommended process for scoring the HPCCPS instrument is to add the total items out of 80 for the preintervention scale and the postintervention scale.[18] The scores are then transformed or converted to percentages using a simple math calculation.[18] Complete data sets for the HPCCPS survey were used for the analysis. Paired *t* tests were also used for the analysis of perceived knowledge and comfort prior to and following the module (averages and SD). Statistical significance was set at $p < .05$. Free-text comments from students were thematically summarized and used as descriptive support for this article.

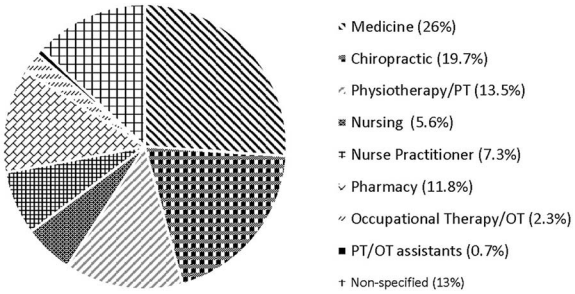

Figure 1 - Module participants organized by profession (n = 853).

RESULTS

Program evaluation results from 51 iterations of the module (2011 to 2019) are summarized here. During this time period, 853 students participated in the program. On average, there were 16 participants per session (minimum of 10, maximum of 26). As a result of missing data points on the HPCCPS survey, pre- and post-module analysis was conducted on 680 participants, with 173 data sets removed from the following learners' professions: medicine, 31; chiropractic, 24; PT, 22; nursing, 7; NP, 18; pharmacy, 22; OT, 6; OTA/PTA, 6; and unidentified profession, 43. Figure 1 displays the distribution of 680 participating students according to their profession.

HPCCPS Tool

Results of the pre- and postsurvey scores showed a statistically significant change in self-perception of collaborative care abilities. With the exception of OTA/PTA, this statistical significance was found when examining the results of individual professions (Table 2). The final item on the postmodule HPCCPS asked learners how they felt about their overall ability to perform competently as a collaborative health care professional, and the average score out of 10 for all learners was 8.36 (SD 0.98).

Overall Global Rating

Of the 680 learners included in this evaluation, 628 completed the overall global rating using a 5-point Likert scale. The median of the overall global rating was 4, with 345 learners rating the module a 4 and 237 a 5 (Fig. 2). When reviewing the various learner's professions, the overall global rating was 4, except for NPs, which was a 5 (data not shown).

Perceived Comfort, Knowledge, and Attitude Questionnaire

In earlier evaluations (n = 307), learners were asked to rate their perceived comfort, knowledge, and attitudes regarding back pain before the start of the program and immediately following on a 5-point Likert scale. Of the 296 learners who responded, significant improvements were demonstrated in postsession evaluations with respect to the respondent's comfort with taking a history and performing a physical exam, their knowledge of pharmacotherapy and management options for LBP, and their attitudes toward IPE approach ($p < .001$, for all values; Table 3).

Perceived Usefulness Questionnaire

In updated evaluations for later sessions (n = 312), learners were asked to rate various aspects of the program (out of 5), including the introduction and icebreaker, case and discussion, screening LBP, management of LBP, and wrap up. Of the 273 learners who completed this questionnaire, most of the scores for the various aspects of the program were rated as a 4 or 5 (Table 4). This finding was also consistent across learner professions (data not shown).

Table 2 - Pre- and Postmodule Health Professional Collaborative Competency Perception Scale (HPCCPS) out of 80, Overall Cohort and by Individual Profession, Average (SD) and Percentage (SD) and Overall Score Postmodule, Average (SD)

	Premodule Score		Postmodule Score			Overall Score Postmodule (out of 10)
	Average (SD)	Percentage	Average (SD)	Percentage	*p* Value	Average (SD)
Full cohort, N = 680	56.85 (8.82)	70.01 (11.03)	66.01 (7.78)	82.51 (9.73)	<.001	8.36 (0.98)
By student profession						
Medicine, n = 191	55.94 (7.47)	69.92 (9.34)	64.09 (7.30)	80.11 (9.12)	<.001	8.45 (0.92)
Chiropractic, n = 144	59.21 (8.11)	74.01 (10.13)	69.66 (6.66)	87.07 (8.32)	<.001	8.82 (0.86)
Physiotherapy, n = 92	54.24 (9.85)	60.27 (10.95)	63.28 (7.57)	79.10 (9.46)	<.001	8.12 (1.01)
Nursing, n = 41	55.88 (9.88)	69.85 (12.35)	65.78 (7.39)	82.23 (9.24)	<.001	8.33 (1.00)
Nurse practitioner, n = 44	58.95 (10.04)	73.69 (12.55)	68.02 (7.71)	85.03 (9.64)	<.001	8.57 (1.07)
Pharmacy, n = 80	56.38 (8.72)	70.48 (10.90)	65.91 (7.36)	82.39 (9.20)	<.001	8.24 (0.94
Occupational therapy, n = 15	55.53 (11.03)	69.42 (13.79)	61.27 (14.26)	76.58 (17.82)	.006	7.73 (1.44)
OTA/PTA, n = 6	61.5 (12.40)	80.21 (13.02)	65.67 (11.83)	82.08 (15.78)	.11	8.12 (1.17)
Unidentified, n = 67	57.54 (8.95)	79.92 (11.19)	67.42 (6.68)	84.27 (9.35)	<.001	8.54 (0.84)

OTA/PTA: occupational therapy assistant/physiotherapy assistant; SD: standard deviation.

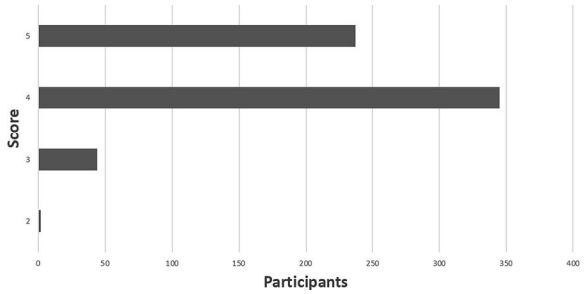

Figure 2 - Postmodule overall global rating (n = 628).

Written Comments

In written comments, learners frequently described that they enjoyed the interprofessional and interactive nature of the session, the time for hands-on practice, and learning from other health professions. Common areas of reported knowledge gained from the session included pharmacotherapy management, physical examination, and an enhanced understanding of the role and scope of other providers.

Scholarly Analysis

The 2nd purpose of this article is to describe the contextual and teaching and learning characteristics in our setting that have enabled the sustained delivery of this program at our institution for more than 8 years. Bigg's 3-P Model of Teaching and Learning is a useful framework to analyze the various influences on planned education sessions and has been adapted by Freeth and Reeves (2004) for use in the IPE context.[9] Analyzing our IPE LBP module using the 3-P model highlights several key factors that have enabled continued successful outcomes and program sustainability over time (Fig. 3).

Presage

First, presage factors (contextual factors, teacher and learner characteristics) that enable a supportive learning context include an identified common curricular gap across multiple health professional training programs and a local health system strategy that supports an interprofessional approach to LBP care.[16] In line with the academic mission of our institution, clinical educators are supported with release time to participate in both teaching and regular planning and program review. Education administrative support is also available to assist with student recruitment across several training programs. Green and Johnson (2015) highlighted the critical importance of faculty development in IPE to ensure success of these types of educational programs.[20] They also recommended the commitment of faculties to invest the needed resources to support collaborative teaching practices and the development of communities of practice among IPE teachers.[20] In our educational program, participant characteristics that were identified as essential to program success included a committed teaching faculty who have lived practice experience in a highly collaborative interprofessional primary care context. Many of our facilitators have participated in formal faculty development activities to prepare them for IPE teaching and continue to participate in and receive support from our IPE committee. Our program evaluation data reveal that learners enter this program already highly valuing interprofessional care (3.69 of 5 points), suggesting a possible high baseline readiness for interprofessional learning. Having the program as a mandatory learning experience for medical learners helps to further elevate the importance of the activity for a learning group that in other settings has been challenging to engage.[21]

Process

Teaching and learning processes for this program align with best-practice features of IPE activities[21,22] and musculoskeletal clinical skills.[23] This includes an emphasis on interactive activities with variation to suit different learner types and needs. Session content is organized around a clinical case presentation with relevance for all learning groups, and small-group activities, such as physical exam practice, allow students to learn "from" one another while practicing exam technique. Peer-assisted learning has been shown to be a helpful adjunct to clinical skills training for musculoskeletal care[24] and in this context helps to further highlight the range of expertise across professions, including chiropractic.

Product

Products (education outcomes) of this program have been sustained over time, with consistently positive evaluation results over many years. Over the 51 iterations, students described enhanced knowledge and skill in LBP assessment and management, including appreciation of the roles and scope of all providers involved in LBP care. Quantitively, this is further supported by the increased Likert scores with respect to self-perceived competencies. The consistently positive written comments and feedback from students for the program gets fed back to their training program directors, thus furthering hospital- and institutional-wide support for student recruitment.

DISCUSSION

As the literature has shown, IPE provides a route to improved interdisciplinary health professional team work.[9,25] Beyond having different disciplines sit together and listen passively to the same lecture or to different disciplines lecture to each other, IPE

Table 3 - Pre and Post Evaluation: Perceived Comfort, Knowledge, and Attitudes Regarding Low-Back Pain for a Subset of Participants (out of 5), n = 297 Average (SD)

	Comfort		Knowledge		Attitudes
	History	Physical Exam	Management	Pharmacology	IPE Approach
Pre	3.56 (1.00)	3.07 (1.21)	3.15 (1.15)	2.43 (0.95)	3.69 (1.07)
Post	4.30 (0.59)	4.07 (0.90)	4.07 (0.69)	3.81 (0.79)	4.46 (0.60)
p Value	<.001	<.001	<.001	<.001	<.001

Table 4 - Proportions (%) of Scoring for Program Components That Were Considered "Helpful/Useful" to Learners on a 5-Point Likert Scale, *n* = 273

Component of Module	1: Not Helpful/Useful	2	3: Somewhat Helpful/Useful	4	5: Very Helpful/Useful
Introduction and icebreaker	0.4	7.0	20.9	44.7	27.1
Case and discussion	0	1.83	9.16	39.9	49.1
Screening low-back pain	1.83	5.13	16.8	30.8	45.4
Management	0.4	0.73	6.2	33.3	59.3
Wrap up	0.4	4.4	18.3	44.3	32.6

is about using innovative approaches and interactive learning to help participants learn with, from and about each other.[9,25] This article describes an example of a successful IPE module on the interdisciplinary management of LBP. We assessed students' self-perception of collaborative competency, and these were found to be consistently improved through participation in the module over the multiple iterations. Specifically, statistically significant differences were found across the HPCCPS and the post-module global change scale (Table 2), indicating that learners had strengthened their "understanding of the roles and scopes of other health professionals"; "recognition of the constraints of their own roles, responsibilities and competence"; "sense of ability to work with other professions to effect change and resolve conflict in the provision of care and treatment"; "ability to work with others to plan and provide care with others and to facilitate interprofessional case conferences/team meetings"; "ability to better tolerate differences, misunderstandings and shortcomings in other professions"; and "feelings of competence to enter into interdisciplinary relations with other professionals."

The program evaluation results in our module are similar in many ways to those reported by other authors.[25–27] For example, McKinlay and Pullon (2007) found that nursing students in New Zealand who participated in IPE demonstrated increased trust, respect, and communication within interdisciplinary teams; valued disciplinary differences; had improved appreciation of the different roles and scopes of providers; and demonstrated higher rates of clinical competency when compared with a cohort of nursing students not provided with IPE.[25] Similarly, Lisi (2018) reported on the preliminary results of a novel interprofessional chiropractic clinical residency placement in veterans' hospital in the United States, finding that both learners as well as attending physicians who collaborated with the chiropractic residents provided positive reports of the interprofessional clinical learning experience.[26]

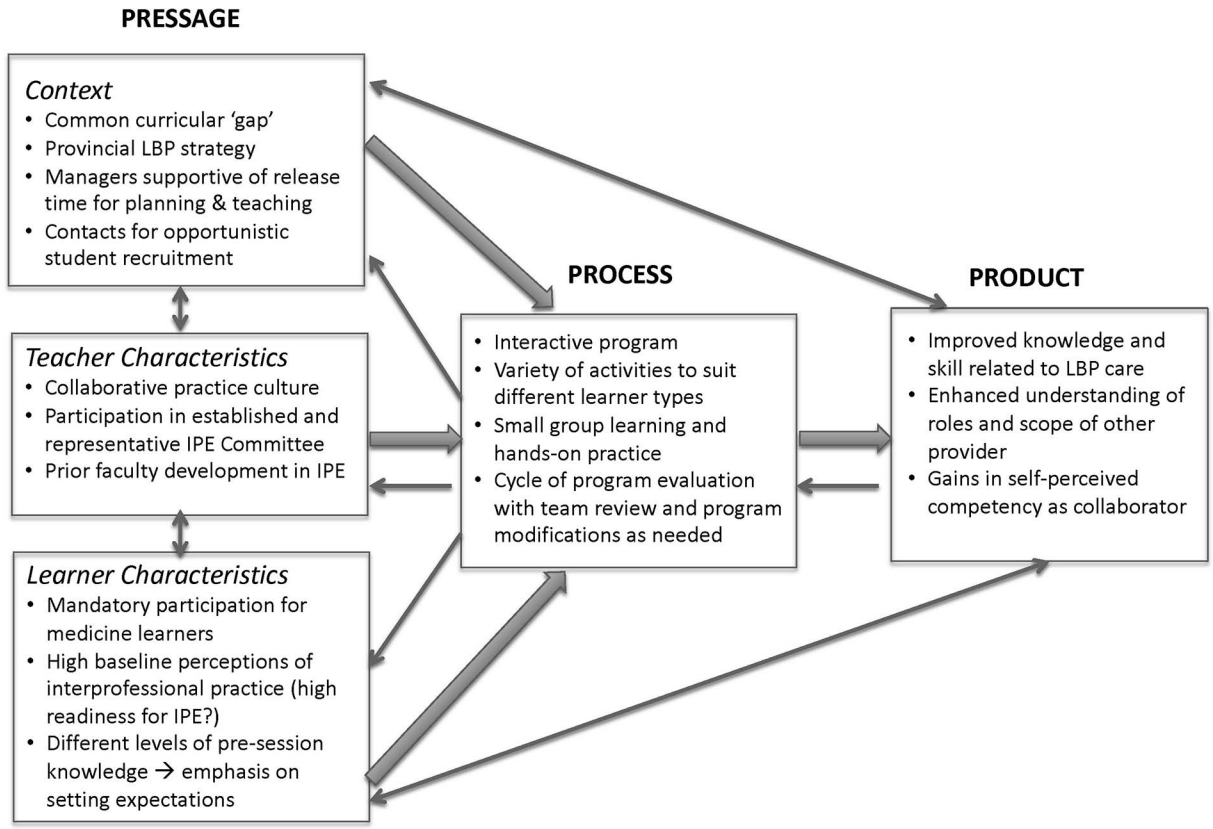

Figure 3 - Brigg's Presage-Process-Product (3-P) model of teaching and learning used for the analysis of our IPE low-back pain program.

Often, health care professionals enter health care teams with preconceived notions of their roles based on their learned culture, beliefs, and cognitive approaches.[25] One of the benefits of IPE is that it leads to collaborative clinical practice by building effective teams; establishing common values, knowledge, and skills; and fostering an understanding not only of students' own professional roles but also enhancing understanding of others' roles.[25] Green and Johnson said it best: "Times are changing, silos are falling, national health burdens are being shared, and it is going to take much more than a single practitioner or paradigm to solve the serious health care issues confronting humanity today and in the future."[20] Collaborative practice models that enable working to one's full professional scope of practice and minimization of health professional silos have been demonstrated to improve patient access to care, coordination and quality of care, efficiency of health service delivery and also the satisfaction of work-life quality of health professionals.[20,28] Similarly, the current case study analysis demonstrated statistically significant improvements by learners with respect to their perceived comfort level, knowledge, and attitudes (Table 3) regarding LBP care. Our case study helps to strengthen the fact that IPE enables effective collaborative practice, which will ultimately help to optimize health services, strengthen health systems, and improve health outcomes.[24]

Limitations

As with all research, this study has limitations. The data reported in the article were collected over a period of several years, during which time the module content was modified in an iterative manner based on learner evaluations, facilitator feedback, and evolving evidence, for the purposes of program improvement. Also, the 2nd evaluation tool required modification during this project time period to align with new requirements for IPE accreditation at the University of Toronto. However, the overall evaluation approach has remained consistent and comparable across more than 50 iterations of the module being delivered with similar results obtained from student cohorts over this extensive time frame, indicating the longevity of the module as important and relevant to student learning. It is worth noting that while the HPCCPS scale has been validated and used in different settings, it has not been extensively studied to enable normative values being established to compare against findings within a group or among groups, and as such, there are no minimal important difference standards established to which to compare results. Furthermore, just more than 20% of questionnaires were excluded from the results shared in this article due to missing data points; however, this approach did not disproportionally affect any one professional group and still retained a robust number of participants for statistical analysis. Finally, our evaluation tools rely heavily on student self-assessment and self-report of gains in learning through participation in the module, which we know may not necessarily translate into demonstrable competencies in practice.[29]

CONCLUSION

IPE has been demonstrated to help address fragmented health systems, reduce professional silos, and improve patient experience and outcomes. Primary care professions, including chiropractic, must continue to move toward enhancing the education of all health professional students by supporting opportunities for interprofessional learning as a required component of undergraduate and postgraduate training. Our program results, as described here with reference to the 3-P model, demonstrate the sustained and successful delivery of interprofessional learning on LBP care in a large academic family practice setting. This IPE module serves as model educational experience that provides learners from various health care professions with an opportunity to gain a deeper understanding of the interdisciplinary management and collaborative competencies necessary for future practice in this important clinical area.

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