



Ten years of interfaculty pain curriculum at the University of Toronto: impact on student learning

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Abstract

Introduction: Delivery of interprofessional pain education for prelicensure healthcare professionals is strongly recommended to advance a workforce ready for collaborative practice and to improve the quality and outcomes of pain care.

Objectives: We report a 10-year (2009–2019) longitudinal evaluation of a 20-hour undergraduate Interfaculty Pain Curriculum (IPC) delivered to students in the Faculties of Dentistry, Nursing, Pharmacy, and Medicine (also including the Departments of Physical Therapy, Occupational Therapy and Physician Assistant) at the University of Toronto, Canada. The IPC follows a constructivist approach to facilitate interactive and multifaceted learning.

Methods: Evaluation methods based on the Kirkpatrick model were used to appraise changes in participating students' pain knowledge and beliefs and their ability to collaboratively develop an interprofessional pain management plan.

Results: A total of 10,693 students participated over the 10-year study period. The mean annual attendance was 972 students and participation to the program increased significantly over the years. Overall, the IPC was effective in improving students' mean pain knowledge and beliefs scores; however, the mean knowledge score gains were negatively correlated with time, likely related to increased unprofessional pain education. Although an increasing trend in mean interprofessional pain management plan scores was observed, the scores were not significantly correlated with time.

Conclusions: The interactive and multifaceted IPC is consistently effective in improving knowledge and beliefs and interprofessional pain management care plan development among participating student cohorts. Future inquiry is required to better understand the mechanisms behind student learning in interprofessional pain education to enhance pain curriculum development and delivery.

Keywords: Clinical competencies, Curriculum, Interprofessional education, Interprofessional teamwork, Pain, Prelicensure

1. Introduction

Pain poses a major problem for individuals, families, and society, with an increasing prevalence, impact on quality of life, and economic burden.²⁰ Owing to the intricacies of pain conditions, treatments, and outcomes, pain management can be complex and requires a patient-partnered, interprofessional approach. To this end, transformations in prelicensure health professional pain education have shifted from unprofessional to interprofessional

learning.² The overall goal of interprofessional pain education is to improve knowledge and collaboration by expanding shared learning opportunities among trainees from different healthcare professions.⁹ Interprofessional education (IPE), defined as when 2 or more professions learn with, from, and about each other, has been widely recognized as a critical step in ensuring that future healthcare practitioners will be competent in patient-centered collaboration.³⁴

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In Canada, 1 in 5 individuals suffers from chronic pain resulting in immense healthcare costs, which include out-of-pocket expenses, informal care, clinical care, and direct productivity loss (~60 billion per year).³³ Given the growing individual and societal burden of pain, it is undeniably necessary to increase awareness about pain and enhance formal prelicensure health professional pain education to advance a practice-ready workforce.⁷ To meet these needs, the University of Toronto Centre for the Study of Pain (UTCSP) was created in 1999 through the collaboration among the Faculties of Medicine, Nursing, and Dentistry, with the Faculty of Pharmacy joining in 2000. The UTCSP (<http://sites.utoronto.ca/pain/about-us/mision.html>) is a multidisciplinary, multifaculty or departmental research and education unit designed to foster education, research, and improved clinical practice in pain prevention and treatment.

The flagship educational initiative of the UTCSP is the internationally recognized Interfaculty Pain Curriculum (IPC). The overall aim of the IPC is to prepare prelicensure health professional students with the knowledge and skills to provide pain care as part of an interprofessional team.²⁹ The IPC is a 20-hour pain curriculum developed and delivered by a group of faculty, researchers, and clinicians with expertise in pain. The IPC was first offered in March 2002 and became a mandatory part of the healthcare-related prequalification curricula across 4 Faculties at the University of Toronto in 2004 (Nursing, Dentistry, Pharmacy, and Medicine, which includes the Departments of Occupational Science and Occupational Therapy, Physical Therapy, and the Physician Assistant Program). Since 2002, 16,752 trainees have participated in the program with 10,693 being included in the 10-year study period.

Longitudinal studies of prelicensure student education have shown a positive impact of IPE on students' attitudes towards interprofessional practice.¹² Given the significant investment in interprofessional curriculum development and delivery, research is needed to demonstrate durable improvements in knowledge and skills acquisition.⁵ In 2008, members of the IPC committee published a report about the first 6 years of the IPC (2002–2008), which highlighted that pain knowledge of students participating in the IPC increased significantly over all years, and that trainees highly valued participating in an IPE opportunity.¹³ In this report, we aimed to measure the longitudinal impact of the UTCSP-IPC on students' pain knowledge and beliefs and ability to develop interprofessional care plans from 2009 to 2019.

2. Methods

2.1. Design

We used a longitudinal approach to evaluate the impact of the UTCSP-IPC on students' pain knowledge and beliefs and ability to develop interprofessional care plans from 2009 to 2019. Evaluation included structured questionnaires with standardized measures gathered annually at 2 points in time (before-and-after each IPC) and a graded interprofessional pain management plan (IPMP).

2.2. Curriculum

The IPC is designed to increase students' awareness and knowledge of the biopsychosocial mechanisms, clinical complexity, social impact, and ethical issues pertinent to pain assessment and management. A guiding concept within the curriculum is that pain is a unique and frequently encountered

problem that requires comprehensive interprofessional management for people experiencing it. The IPC assists students to move from pain theory to active decision making through the collaborative development of an interprofessional care plan.²⁸ It is based on the educational guidelines published by the International Association for the Study of Pain (IASP) and is a core module of the University of Toronto IPE Curriculum. The learning objectives of the IPC have been updated over time (**Table 1**) to reflect the IASP Pain Curriculum objectives³⁰ and to highlight the importance of interprofessional care.

The components or sessions of the IPC are outlined in **Table 2**. The IPC in its current form includes (1) large group sessions (eg, patient panel and interprofessional panel), (2) 6 to 8 concurrent clinically based medium-sized group sessions reflecting the latest evidence, (3) facilitated small interprofessional groups that use several patient-oriented case studies for students to develop comprehensive pain management plans, (4) 2 self-study modules on "*pain mechanisms and manifestations*" and on "*opioids as a component of pain management, an interprofessional responsibility*" created by interprofessional teams of clinicians and scholars, and (5) discipline-specific content that faculties provide to their students during a 3-hour session, embedded within the curriculum. Facilitators and lecturers involved in the UTCSP-IPC are healthcare professionals from each participating faculty and have extensive experience in pain management. Most facilitators or lecturers are educators or clinician scientists and teach at the University of Toronto or affiliated hospitals. To ensure that the sessions are interprofessional, facilitators are randomly assigned to interprofessional student teams (see **Table 2**, interprofessional small group sessions).

Although the IPC continues to be a 20-hour curriculum, the schedule has shifted from being spread over 5 half days in 2002 to 3.5 days in 2008 and more recently to 3 days to preserve time for students to return to usual faculty scheduling. Recently, the IPC has strived to incorporate technology to improve program delivery. In 2016, the opioid and pain mechanisms' lectures were replaced by self-study online interactive modules. In 2018, the primary IPC case study transitioned to a virtual interactive case for improved simulation of information gathering in a clinical environment.

The IPC curriculum is revised and updated every year. The IPC committee, which includes members from each participating faculty, meets monthly to discuss and review the curriculum content and assist in the development of the evaluation methods described in this article. Specifically, the UTCSP-IPC is overseen by the IPC committee and 7 working groups (ie, (1) pain mechanisms and manifestations, (2) opioids, (3) patient panel and concurrent sessions, (4) clinical cases, (5) facilitators, (6) evaluation, and (7) knowledge translation working groups). The IPC committee and working groups review the curriculum based on facilitator evaluation, feedback from the IPC and IPE committee members, health profession faculties, and participating trainees (by exit surveys). The review process from the IPC committee and working groups is specifically targeted to capture the evolving clinical and societal perspectives on pain care and opioid use. For example, relevant additions reflecting changes in the clinical and societal context include optional sessions on *cannabis for pain* and *mindfulness for pain*. Opioid-related content and clinical cases are updated as well to respond to the changing landscape in line with information and guidelines provided by the Canadian Special Advisory Committee on the Epidemic of Opioid Overdoses and the Canadian Pain Task Force. In addition, interprofessional panels of health professionals have been introduced to the program to reflect the importance of

Table 1**University of Toronto Interfaculty Pain Curriculum learning objectives.**

On completion of the interprofessional pain curriculum, prelicensure health professions students will be able to:

1. Describe the biopsychosocial basis of pain and its impact on people living with pain and their communities,
2. Apply clinical assessment and measurement tools used to evaluate the pain experience and treatment outcomes,
3. Describe common misconceptions in pain management,
4. Describe multiprofessional and interprofessional management strategies for the planning, treatment, and monitoring of pain in a patient-centered context,
5. Formulate, as part of an interprofessional student team, a comprehensive patient-centered pain assessment and management plan,
6. Explain how ethical, cultural, social, and political aspects can contribute to poor pain assessment and management, and
7. Discuss the role of the person in pain as a member of the interprofessional team.

an interactive team approach in pain care. Both formative and summative evaluations are conducted on-line and in-person to capture the key outcomes of the IPC. Outcomes focused on interprofessional pain care planning, pain knowledge, and beliefs and feedback about the implementation of the IPC (process, content, and format) are used to refine the curriculum to ensure that trainees receive the most updated information based on research evidence.

2.3. Participants

Students participating in each IPC cohort were full-time accelerated, graduate, or second entry undergraduate trainees with previous degrees from a variety of disciplines. They were in their second or third year of study in their professional program depending on the length of their program and their faculty's schedule in their overall curriculum. Ethical approval for all evaluative methods was obtained yearly from the University of

Toronto Research Ethics Board. Students received information regarding the research evaluation component of the IPC and that consent to participate was voluntary and anonymity guaranteed in completing the questionnaires.

2.4. Procedure

Students were automatically enrolled in a web-based learning management system to access the IPC schedule of events, curriculum objectives, required readings, interprofessional student team appointments, and learning outcome evaluation. Each student was invited to answer a pre-IPC questionnaire before participating in the curriculum and the post-IPC one during the last day of the scheduled activities (Pre-IPC and Post-IPC *Pain Knowledge and Beliefs Questionnaires—PKBQs*). All answers were submitted online, and students were given a maximum of 20 minutes to respond. Interprofessional student teams from the small groups presented an IPMP for one designated patient case

Table 2**Overview of the components of the University of Toronto Centre for The Study of Pain Interfaculty Pain Curriculum in 2019.**

Component	Content and process	Teaching–learning strategies	Student participation
Multiprofessional, large group session	Person-centered approach to pain assessment and management, interprofessional collaboration, and communication in pain care	<i>Patient panel:</i> people with lived experience (acute TMJ pain, acute and sickle cell-related pain, and chronic neuropathic pain) <i>Interprofessional panel:</i> interprofessional specialty pain team (physiatrist, nurse, physical therapist, and pharmacist) <i>Panels</i> are facilitated by IPC co-chair, interaction facilitated with students using technology	Approximately 500–1000 students/year
Multiprofessional, medium group concurrent sessions	<i>“Hot” Clinical Topics:</i> Addressing the current opioid crisis, issues, and challenges in cancer pain, headaches, pharmacology of pain, cannabis for pain, osteoarthritis, and mindfulness for pain management	Students select 2 didactic presentations. <i>Presenters</i> from different professions for each topic, recognized as experts	Approximately 30–100 students/year per session depending on student selection
Uniprofessional large group sessions	Discussion of profession-specific topics related to pain assessment and management	Strategies vary by year and program: Faculty members and invited guest speakers, including people with lived experience with pain, provide didactic, case-based workshop or panel presentations on different topics	Approximately 30–300 students/year depending on each faculty participating pool
Interprofessional, small group sessions	Interprofessional, team discussion of virtual interactive case (VIC) based discussions of acute and persistent pain assessment and management	Faculty-affiliated clinician and scientist facilitators	Interprofessional teams of 10 students each
Self-study, online modules	One-hour long online modules on foundational topics: <i>opioids, pain mechanisms, and manifestations</i>	Asynchronous online modules. The opioid module includes interprofessional and profession specific perspectives and is case based	Single students

on the last day of activities. This document was electronically submitted for evaluation.

2.5. Evaluation

To structure a comprehensive evaluation we used the Kirkpatrick (1967) 4 level framework¹⁵ as expanded by Barr et al. (1999).^{4,10} For the purposes of this report, we focused on levels 2 (modification of attitudes and beliefs and acquisition of knowledge) and 3 (modification of behaviour) (Table 3).

To evaluate the impact of the IPC on students' pain knowledge and beliefs, PKBQs were developed by a working group of the IPC committee. Over time, there has been extensive work by the IPC Evaluation working group to review and update questions as needed for clinical relevance and based on their performance across tests. Curriculum content is scrutinized and mapped by UTCSP-IPC learning objectives (Table 1) to identify domains for evaluation. Other domains are identified in line with the IASP Interprofessional Pain Curriculum. Pretest and posttest PKBQs were written by members of the evaluation working group. Questions included in the pretest and -posttest questionnaires investigated similar domains and were matched for topic and complexity and included true or false or multiple-choice questions. All members of the committee examined the questions for face and content validity. The questionnaire included 30 to 40 items that asked about students' pain knowledge and beliefs and approach to interprofessional collaboration in pain assessment and management.

A rubric was created by the IPC evaluation working group for assessment of the IPMP (IPMP, see supplementary table, available at <http://links.lww.com/PR9/A137>). Annually, 2 or 3 committee members independently rated a random selection of 30 care plan across 4 domains (*quality, management goals, overall management plan, and implementation or follow-up*) for a total possible score from 0 to 13 points, where 0 represented the lowest and 13 represented the highest possible care plan rating. A score from 0 to 2 was allocated to the *quality* of the case summary (the maximum score was given if all pertinent information was included in the case summary, and the information was accurate, and the summary was well organized). Similarly, a score from 0 to 2 was allocated to score the *management goals* (the maximum score was given if a complete set of appropriate management goals were identified and if the management goals were all patient centered). A score from 0 to 7 was used to score the *overall management plan*. The maximum score was given if (1) each patient goal was addressed with the

management plan, (2) the management plan was comprehensive and appropriate, (3) the management plan was realistic and practical within the patient context, (4) it identified the most responsible professionals for each item, (5) it was completely patient centered, (6) it clearly demonstrated interprofessional collaboration, and (7) it was well organized. Finally, a score from 0 to 2 was allocated to evaluate *implementation and follow-up* (the maximum score was given if the management plan had an appropriate timeframe, and follow-up plans were all appropriate). The final care plan rating was the average of the independent scores.

2.6. Data analysis

Data were exported in comma-separated values datasheets in Microsoft Excel, processed, and analyzed using SPSS version 26 (IBM Corp. Released 2019. IBM SPSS Statistics for Windows, Version 26.0. Armonk, NY: IBM Corp). Statistical significance was set at $P < 0.05$.

Confidentiality was maintained at all times as questionnaires were anonymous, and student identification numbers were automatically assigned by the online system. Descriptive statistics for PKBQ pretests and posttests scores and students' IPMP scores were computed for each IPC student cohort (from 2009 to 2019). These scores indicated the relative percentage of correct answers to PKBQ tests and IPMP ratings, respectively. Student-matched PKBQ pretest and posttest scores were used to compute a PKBQ knowledge gain score (PKBQ posttest score—PKBQ pretest score) for each student. A paired t test was used to compare PKBQ pretest and posttest scores. Pearson correlations (2-tailed) were performed to test the relationship between time (years 2009–2019) and PKBQ mean knowledge gain scores of each year's student cohort and between-time and IPMP scores. One-tailed Pearson correlation was performed to test the relationship between time (years 2009–2019) and student participation in the IPC.

3. Results

A total of 10,693 students from 4 health science faculties participated in the IPC from 2009 to 2019. The mean annual attendance over the study period was 972 students (\pm SD:102). Participation in the IPC increased significantly from 2009 ($n = 879$) to 2019 ($n = 1014$; $r = 0.608$, $P = 0.024$, Fig. 1), with a peak in 2016 ($n = 1252$) because of the transition within the Leslie Dan Faculty of Pharmacy to an entry-level PharmD program, resulting in a double cohort of pharmacy students for one year alone.

3.1. Pain knowledge and beliefs

Pretest and posttest PKBQs were completed by an average of 576 students/year (\pm SD:160; $58.5 \pm 13.1\%$ of the annual participating pool; range 33.9%–81.3%). Pain Knowledge and Beliefs Questionnaire pretest scores ranged from 63.0% to 78.8%, whereas posttest scores ranged from 75.9% to 85.5% (Fig. 2). Overall, based on this measure, the IPC was effective in improving students' knowledge as mean PKBQ scores were higher for the posttest (mean \pm SD: $81.6 \pm 2.8\%$) than the pretest ($71.9 \pm 4.2\%$; $P < 0.001$). However, PKBQ knowledge score gains decreased significantly with time, from 2009 (+14.4%) to 2019 (+1.8%). Pain Knowledge and Beliefs Questionnaire mean knowledge score gains were negatively correlated with time ($r = -0.749$, $P = 0.009$; Fig. 3).

Table 3

Summary of evaluation measures in relation to the Kirkpatrick or Barr et al. framework (Barr et al., 1999). 4

Level	Evaluation strategies
Level 2a: Modification of attitudes and beliefs Changes in reciprocal attitudes or perceptions about a condition, circumstance, care, and treatment	1. Pain Knowledge and Belief Questionnaire (PKBQ) scores
Level 2b: Acquisition of knowledge or skills Concepts, procedures, principles, and skills	2. Pain Knowledge and Belief Questionnaire (PKBQ) scores
Level 3: Change in behaviour Behavioural change in the planned delivery of care, attributable to an educational program	3. Interprofessional pain management plan

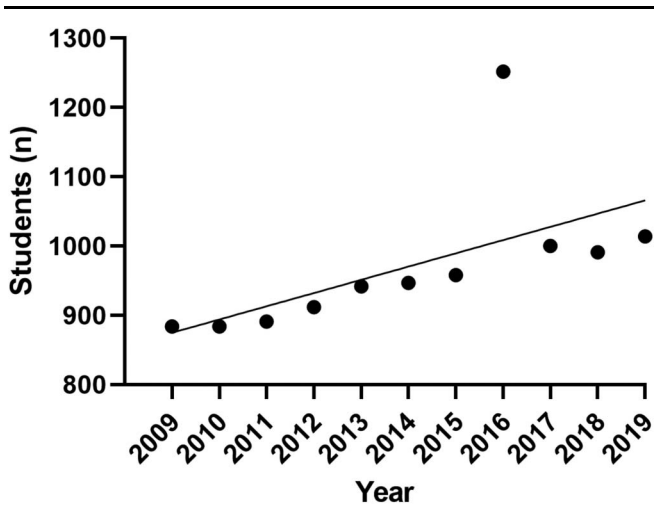


Figure 1. Student participation (n/year) in the IPC from 2009 to 2019. Note that in 2016 a double cohort from the Faculty of Pharmacy was included. IPC, Interfaculty Pain Curriculum.

3.2. Interprofessional pain management

Over the period 2009 to 2019, IPMPs were completed by 1064 interprofessional teams, each including an average of 10 students from the different disciplines (1 or 2 students per discipline). The IPC committee members evaluated 292 care plans: 22 in 2009 and 30/year for the period 2011 to 2019. In 2010, IPMPs were not marked. Scores were satisfactory in all IPC years and ranged from (mean, \pm SD) 69.3 \pm 1.4% in 2009 to 85.1 \pm 3.3% in 2018 (Fig. 4). Although an increasing trend in IPMP scores was observed across the years, the scores were not significantly correlated with time ($r = 0.386$, $P = 0.271$).

4. Discussion

In this article, we reported on the longitudinal impact of the UTCSP-IPC on students' pain knowledge and beliefs and ability to develop interprofessional care plans from 2009 to 2019. Across the 10-year evaluation period, 10,693

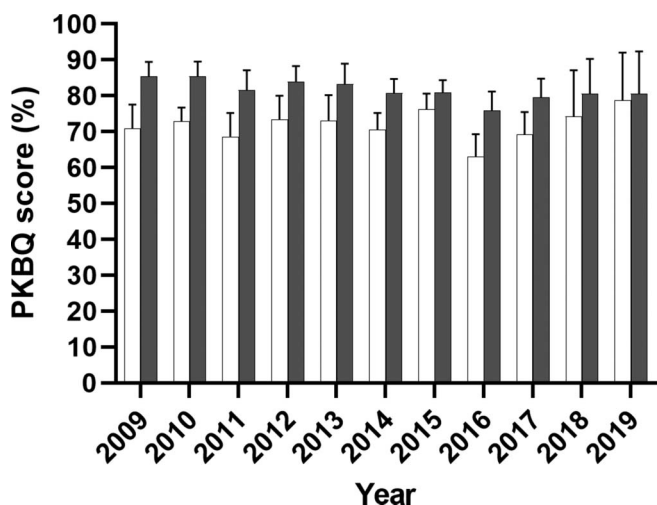


Figure 2. Mean \pm SD IPC Pain Knowledge and Beliefs Questionnaire (PKBQ) prequestionnaire (white) and postquestionnaire (gray) scores (0%–100%) from 2009 to 2019. IPC, Interfaculty Pain Curriculum.

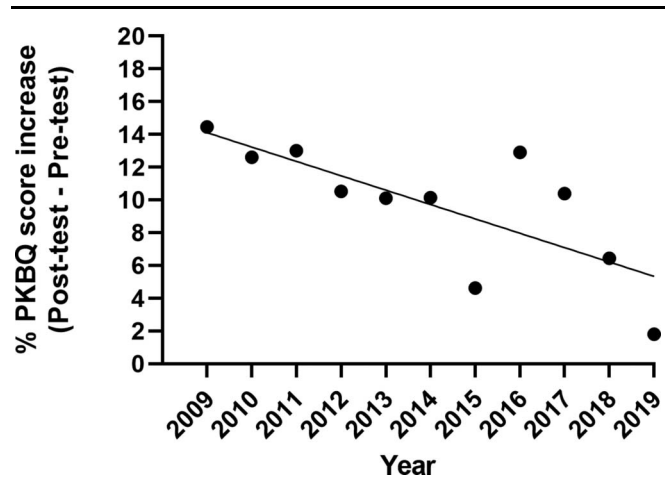


Figure 3. Mean IPC Pain Knowledge and Beliefs Questionnaire (PKBQ) score gains (PKBQ posttest score—PKBQ pretest score) from 2009 to 2019. IPC, Interfaculty Pain Curriculum.

prelicensure students across 4 health science faculties attended the 20-hour IPC. We observed a slight increase in student participation over time, reflecting individual faculty program changes. This increase was also a function of the total number of students being capped at approximately 1000 each year given faculty and space constraints. Annual student cohorts attending the IPC demonstrated gains in mean PKBQ scores, reflecting the positive impact of the educational curriculum. However, the proportional increase in PKBQ score gains decreased significantly with time. By contrast, we observed a trend toward higher mean IPMP scores, suggesting improvement in evidence-based pain management content, the interprofessional nature of the plans, and their patient centeredness.

Evidence of a positive impact of the IPC on the pain knowledge and beliefs of annual student cohorts may be explained in part by the constructivist framework guiding the curriculum.²⁵ The constructivist view of learning considers the student as an active rather than a passive agent in the process of new knowledge acquisition.³ Goals of constructivist learning addressed in the IPC include the development of opportunities to engage different perspectives (eg, patient panels), social experiences (eg, interprofessional care plan development),

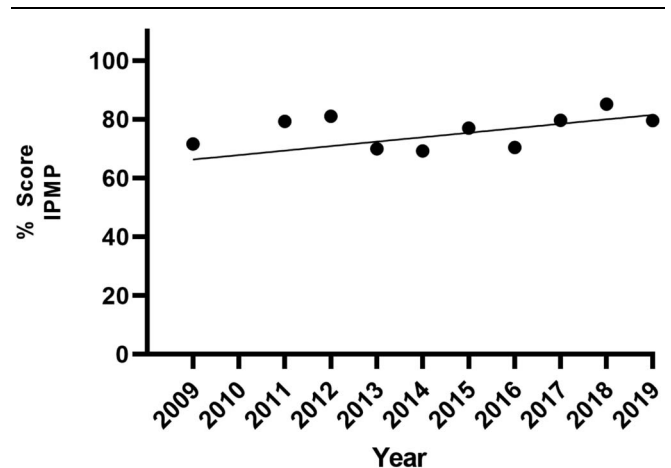


Figure 4. Mean interprofessional pain management plan (IPMP) scores (0%–100%) from 2009 to 2019. Data from 2010 are missing.

learning choice (eg, student selection of presentation topics), multiple modes of presentation (eg, online and in-person), and awareness of knowledge development (eg, active reflection).²⁷ Students in constructivist learning environments acquire more diversified knowledge, better understand the material, and report higher learning self-efficacy when compared with students who learn under traditional teaching environments.²⁷ The primary responsibility of the IPC in this framework has been to create and maintain an active learning environment. This has required an iterative process to identify opportunities for content and process modification to incorporate pain competencies, scientific advances in pain knowledge, and faculty commitment to the curriculum.

A longitudinal view to pain knowledge and belief evaluation revealed a gradual decrease in the mean student score gain over time. This unexpected outcome may be explained by changes in the larger organizational and societal context of the IPC. Enhancement of pain content within individual faculty courses and time allotted to uniprofessional content in the IPC means that student participants in recent years have had a greater baseline knowledge of pain. This may have resulted in a ceiling effect in knowledge and belief scores, whereby test items are not challenging enough for the students. As well, advancement in public awareness of pain as an important phenomenon may have influenced baseline student knowledge.¹¹ For example, the expanding opioid crisis in Canada and internationally has resulted in growing public awareness of overdose deaths and the limitations of opioids for managing pain.^{14,31} Population growth, aging, and sedentary lifestyles have contributed to the growing incidence of chronic pain.^{3,16,23} To address this, we will continue to increase the complexity of the PKBQ questions, patient pain cases, and concurrent topic sessions and to examine their relevance to current evidence and clinical practice that is dynamic and ever changing.

The integration of an expanded IPE curriculum may have had a significant effect on students' abilities to work collaboratively on pain management plans. The observed trend toward higher mean interprofessional care plan scores can indirectly serve as an indicator of new collaborative competencies developed through IPC participation. Pedagogically, small group care planning provides an excellent platform for interprofessional teaching and learning.²² This includes opportunities to better understand the roles, responsibilities, and competence of others in relation to one's own.³⁰ Moreover, it involves an occasion to learn the same language, reinforce new understandings of pain mechanisms and manifestations, and principles of biopsychosocial pain management.²⁴ Care planning sessions in the IPC are most frequently facilitated by working health professionals who can help student groups reach consensus and model interprofessional communication skills. In turn, this may contribute to evidence-based care plans that are realistic, patient centered, and interprofessional in nature. The integration of patient panels and the close interaction between facilitators and trainees in the small group sessions may have contributed to increasing trainees' awareness about the challenges of patients suffering from chronic pain, thereby leading to more patient-centred pain management plans.

Our results add to a growing body of empirical work demonstrating that interprofessional educational interventions can have a beneficial impact on undergraduate students' attitudes, knowledge, and skills in pain assessment and management.^{17,19} The delivery of the IPC curriculum across large numbers of students from the participating health

science faculties can be difficult to achieve because of scheduling and other organizational challenges.³² This includes curriculum delivery within an evolving context of uniprofessional curriculum requirements and pressure to reallocate student time to other learning objectives. We have shown that a dynamic 20-hour curriculum comprising multiple modes of learning is effective and sustainable. The timing of the IPC follows recommendations for the early integration of pain education in health professional training to avoid development of inaccurate or value-laden beliefs about pain that may obstruct interprofessional team treatment and relief from pain.⁶

To the best of our knowledge, this is the first 10-year evaluation of a university-based interprofessional pain educational curriculum among prelicensure health professional students. The results indicate that the UTCSP-IPC is consistently responsive to current needs to improve knowledge and beliefs and interprofessional pain management care plan development among participating student cohorts. However, it is important to note that increased knowledge is not sufficient to change practice. Reeves et al.¹⁸ describe the IPE evaluation literature as replete with studies reporting short-term changes in attitudes, knowledge, and skills of student cohorts. Thus, there is a need for other modes of long-term evaluation including those targeting interprofessional collaborative behaviours in the workplace, quality of patient care, and improvement in patient outcomes.¹² This evaluation study complements the findings of previous research reporting that IPE can have a beneficial impact on learners' attitudes, knowledge, and skill development for pain practice.^{21,24} Students who have participated in interprofessional educational programs have reported other positive effects such as improved understanding of other professional healthcare roles, a positive attitude toward IPE, and perceived readiness to work in interprofessional teams.^{1,13}

Based on our experience, we recommend that pain curriculum developers, facilitators, and researchers undertake annual and longitudinal evaluation to consider patterns in learning outcomes and reflect on the larger learning context. Constructivist evaluation frequently focuses on student ability to apply new knowledge in real-world situations.³ Rather than a sole reliance on summative evaluation (eg, test scores), we recommend a parallel focus on process and context to identify areas for innovation in active learning. By combining constructivist approaches to the UTCSP-IPC, our students have acquired more than basic pain knowledge; other acquisitions include skills in collaborative care planning, whereby multiple health professionals from different backgrounds can work together to plan a high quality of pain care.²⁶ Future qualitative inquiry is required to better understand the mechanism behind student learning in IPE to further enhance curriculum development and delivery.

Although our study outcomes indicate that the UTCSP-IPC positively affected student learning, it must be noted that such a curriculum requires a robust organization with a stable committee structure and active commitment from the participating faculties, which are not easy to implement. The synergistic work of the UTCSP, which is responsible for content and delivery of the IPC, and the Centre for IPE, which oversees the governance of IPE at the University of Toronto, and the continuous engagement of IPC representatives from each participating faculty, are essential. Notably, the UTCSP-IPC is managed by a full-time coordinator and other staff who work the entire academic year to ensure that the curriculum is properly organized and delivered. One of the most challenging

aspects of the UTCSP-IPC is scheduling participating faculties, lecturers, and facilitators and organizing training or orientation sessions and materials for facilitators and students. Other than needing administrative work, such activities require infrastructure and logistics. Above all, we believe that implementing an educational enterprise, such as the UTCSP-IPC, requires solid leadership and a hierarchical framework with centralized mechanisms and strong support from the participating faculties. One key to success is the continuous engagement of pain professionals and faculty members throughout the year. We firmly believe that such engagement can be achieved if the curriculum is founded on solid educational objectives shared and supported by the participating faculties' leaderships.

In the next few years, to improve the UTCSP-IPC, we will continue to review patient pain cases and propose new concurrent topic sessions in line with changes in research evidence, clinical practice, and evolving population needs. Future changes to the IPC will aim at enhancing interactive learning opportunities to potentially engage other national and international institutions.

In conclusion, we identified the positive impact of the UTCSP-IPC on students' pain knowledge and beliefs and ability to develop interprofessional care plans from 2009 to 2019. While learning persists, the proportional gains in knowledge and beliefs have decreased over time. Results indicate the need for continuous evaluation of learning outcomes, processes, and contexts to enhance student experiences and development of interprofessional pain competencies.

Disclosures

The authors have no conflicts of interest to declare.

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Data availability statement: The data that support the findings of this study are available from the University of Toronto Centre for the Study of Pain. Restrictions apply to the availability of these data. Requests to access the data may be submitted by the corresponding author to the University of Toronto Centre for the Study of Pain for review.

Appendix A. Supplemental digital content

Supplemental digital content associated with this article can be found online at <http://links.lww.com/PR9/A137>.

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