Ordering Diagnostic Imaging: A Survey of Ontario Physiotherapists' Opinions on an Expanded Scope of Practice

Jodie Ng Fuk Chong, BSc, MScPT;^{*†} Krista De Luca, BPHE (Hons), MScPT;[‡]
Sana Goldan, BSc, MScPT;[§] Abdullah Imam, BSc, MScPT;[¶] Boris Li, BSc, MScPT;^{**}
Karl Zabjek, PhD;^{††} Anna Chu, BScPT, MHSc;^{‡,††} Euson Yeung, BScPT, MEd, PhD^{††}

ABSTRACT

Purpose: To explore Ontario physiotherapists' opinions on their ability to order diagnostic imaging (DI). **Methods:** An online questionnaire was sent to all registered members of the College of Physiotherapists of Ontario. Descriptive statistics were calculated using response frequencies. Practice characteristics were compared using χ^2 tests and Wilcoxon rank-sum tests. **Results:** Of 1,574 respondents (21% response rate), 42% practised in orthopaedics and 53% in the public sector. Most physiotherapists were interested in ordering DI (72% MRI/diagnostic ultrasound, 78% X-rays/computed tomography scans). Respondents with an orthopaedic caseload of 50% or more ($p < 0.001$) and those in the private sector ($p < 0.001$) were more interested in ordering DI. Respondents preferred a DI course that combined face-to-face and Web-based components and one that was specific to their area of practice. Most respondents perceived minimal barriers to the uptake of ordering DI, and most agreed that support from other health care professionals would facilitate uptake. **Conclusion:** The majority of Ontario physiotherapists are interested in ordering DI. For successful implementation of a health care change, such as physiotherapists' ability to order DI, educational needs and barriers to and facilitators of the uptake of the authorized activity should be considered.

Key Words: diagnostic imaging; education; survey.

RÉSUMÉ

Objet: Connaître l'opinion des physiothérapeutes de l'Ontario sur leur capacité d'ordonner des imageries diagnostiques (ID). **Méthodes:** Un questionnaire en ligne a été envoyé à tous les membres enregistrés de l'Ordre des physiothérapeutes de l'Ontario. Des statistiques descriptives ont été calculées selon les fréquences des réponses obtenues. Les caractéristiques de la pratique ont été comparées au moyen de tests du chi carré et de tests de Wilcoxon. **Résultats:** Parmi les 1 574 répondants (taux de réponse de 21%), 42% pratiquent l'orthopédie et 53% travaillent dans le secteur public. La majorité des physiothérapeutes se sont dits intéressés à ordonner des ID (72% étaient intéressés par l'imagerie par résonance magnétique ou l'ultrasonographie et 78%, par les radiographies ou la tomodensitométrie). Les répondants dont la charge de travail était composée à plus de 50% de cas d'orthopédie ($p < 0.001$) et ceux qui travaillent dans le secteur public ($p < 0.001$) sont plus intéressés que les autres répondants. Les répondants ont indiqué qu'ils préfèrent un cours d'imagerie diagnostique qui combine de l'enseignement en personne et des éléments d'apprentissage en ligne et qui soit spécialisé dans leur domaine de pratique. La majorité des répondants perçoivent des obstacles minimaux au fait de prendre en charge la prescription d'ID et ont convenu qu'un soutien d'autres professionnels de la santé faciliterait cette prise en charge. **Conclusion:** La majorité des physiothérapeutes de l'Ontario se sont dits intéressés à ordonner des ID. Pour assurer la réussite de la mise en œuvre d'un changement dans le domaine de la santé, tel que la capacité des physiothérapeutes à ordonner de l'ID, il faut prendre en considération les besoins liés à la sensibilisation ainsi que les obstacles et les éléments encourageant la prise en charge de l'activité autorisée.

Lengthy wait times, rising health care costs, and human resources shortages have been driving changes in

health care delivery models in such countries as Canada, the United Kingdom, the United States, and Australia.¹⁻³

From the: *Rouge Valley Sports Injury and Wellness, Pickering; †Sunnybrook Health Sciences Centre—St. John's Rehab; ‡Steeles Family Medicine Centre, Toronto Rehab; ¶CBI Physiotherapy, Centric Health; **Liveactive Sports Medicine, MVM Clinics; ††Department of Physical Therapy, University of Toronto, Toronto, Ont.; §Twin Rinks Physiotherapy, Vancouver.

Correspondence to: Euson Yeung, Department of Physical Therapy, University of Toronto, 160–500 University Ave., Toronto, ON M5G 1V7; euson.yeung@utoronto.ca.

Contributors: All authors designed the study; collected, analyzed, and interpreted the data; drafted or critically revised the article; and approved the final draft.

Competing Interests: None declared.

Funding was provided by the Ontario Physiotherapy Association, Central Toronto District Student Research Grant. This research was completed in partial fulfillment of the requirements for an MScPT degree at the University of Toronto.

Acknowledgements: The authors acknowledge Ms. Shilo Tooze from the College of Physiotherapists of Ontario for her contribution to this study.

Physiotherapy Canada 2015; 67(2);144–156; doi:10.3138/ptc.2014-09

As primary care professionals working in all sectors of the health care system, physiotherapists are well positioned to contribute to the system's evolving needs by adopting roles beyond the traditional physiotherapy (PT) scope of practice.⁴ Successful implementation of models in which physiotherapists work beyond their traditional scope of practice has been well documented in many countries, including the United States, the United Kingdom, New Zealand, Australia, and Canada. Positive outcomes of these expanded roles include improved wait times for surgery, decreased health care costs, earlier diagnoses, fewer duplicate referrals, and increased patient satisfaction.^{5–12}

Physiotherapists practising beyond their regulated entry-level scope of practice—that is, those who have undertaken formal continuing education programs to gain additional knowledge and skills that are formally recognized¹³—are known as *advanced practitioners* in Canada, Australia, and New Zealand; the United States and the United Kingdom use the terms *extended scope physiotherapist* or *consultant*.¹⁴ In this article, we use *advanced practitioners* to describe physiotherapists practising in this capacity.

In Canada, regulations governing physiotherapists' ability to order diagnostic imaging (DI) vary across provinces. In New Brunswick, professional legislation allows physiotherapists the autonomy to order DI (magnetic resonance imaging [MRI] and diagnostic ultrasound [US]; the onus is on practitioners to ensure competency; R. Bourdage, personal communication, June 25, 2012). In Alberta, however, ordering DI is a restricted activity; practitioners must fulfill specific educational and practice requirements before receiving authorization from the province's regulatory body.¹⁴ In Ontario, work is currently underway to expand physiotherapists' scope of practice by authorizing practising physiotherapists to order DI.

At present, Ontario physiotherapists can order DI by indirect authorization via delegation, which includes the transfer of authority to perform controlled activities that are recognized by the Regulated Health Professions Act (RHPA).^{15,16} Delegations for DI are implemented through medical directives or direct orders; despite originally emerging as methods to expedite patient care, these forms of delegation may not be a sustainable solution to the evolving needs of the health care system, given the administrative load and cost of implementing, maintaining, and changing them.³

In Ontario, amendments to the RHPA and the Healing Arts and Radiation Protection Act (HARP) are in process to authorize physiotherapists to order prescribed forms of energy (MRI, diagnostic US) and X-rays (including computed tomography [CT] scans), respectively.¹⁷ These changes will enable physiotherapists to order DI autonomously, without the need for delegation.¹⁷ Ordering involves signing off on DI requisition and does not include the ability to interpret the films. Once legislation is passed,

physiotherapists may join the roster of the College of Physiotherapists of Ontario (CPO),^{3,18} which requires submitting an application including information on education undertaken to gain competence to order DI.¹⁷ The CPO roster authorizes those on the list to perform specified activities and is required for all authorized acts recognized by the CPO.¹⁷ Rostering enables the CPO to monitor the use of the authorized activities, as well as to assess practitioners' competency to perform the activity, and provides transparency for the public.¹⁷

Literature exploring knowledge dissemination in health care has identified key factors for the implementation and sustainability of changes in health care service delivery.¹⁹ One factor critical for maximizing the uptake of a change in health systems is support from the individuals who will be affected by this change.¹⁹ By examining physiotherapists' opinions regarding their ability to order DI, stakeholders such as hospital administrators may better prepare for successful implementation and integration of this skill into PT practice. Although our study is specific to Ontario regulations, knowledge dissemination transcends provincial boundaries and, thus, the results from this study may apply to other jurisdictions implementing or considering the implementation of similar new practices.¹⁹ Likewise, international literature has provided a framework for identifying and targeting key factors for successful implementation of physiotherapists' authorized activities. These factors include practitioner interest, educational needs, and barriers to and facilitators of the uptake of the new practice.^{9,20–23} Although studies have examined educational programs for DI in other provinces (e.g., Alberta, New Brunswick) and internationally,²⁴ as well as the outcomes of integrating advanced practitioners into health care systems,^{5,8,9,24–26} no studies to date have examined physiotherapists' specific interest in ordering DI.

The primary objectives of our study were (1) to examine the opinions of Ontario physiotherapists on their ability to order DI and (2) to investigate the association between Ontario physiotherapists' practice characteristics and their interest in ordering DI. Results from this study will have important implications for the development of educational DI programs in Ontario and represent a resource for Canadian and international stakeholders implementing scope-of-practice changes.

METHODS

Study design, participants, and data collection

Our cross-sectional quantitative online survey was administered through FluidSurveys. The survey was sent to all registered members of the CPO with a valid email address at the time of email distribution, totalling 7,492. We used the modified Dillman technique²⁷ to distribute the survey; the CPO sent three emails to eligible participants between February 2013 and March 2013, describing the rationale for the study and providing a link to

the questionnaire if they wanted to participate. Our study was approved by the Research Ethics Board of the University of Toronto. All participants were required to provide informed consent by signing a check box before advancing to the questionnaire start page.

Questionnaire development

We developed the questionnaire on the basis of previous literature^{13,20,28} and in consultation with two advanced practice physiotherapists experienced in ordering DI under medical directives. A pilot questionnaire was completed by six physiotherapists in different practice areas and with varying levels of experience. On the basis of their feedback on relevance, structure, and completion time, we revised the questionnaire before distribution.

The five sections of the questionnaire addressed (1) demographics and practice characteristics of respondents; (2) interest in ordering and intent in rostering to order DI; (3) perceived benefits of physiotherapists being authorized to order DI; (4) barriers and facilitators to the uptake of ordering DI; and (5) educational needs related to DI (see Appendix 1). Response options for barriers and facilitators and benefits were based on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Other sections of the questionnaire used a combination of Likert scale, yes–no, or stand-alone questions.

Data analysis

All data analyses were performed using IBM SPSS Statistics, Version 20 (IBM Corporation, Armonk, NY).

For questions using a Likert scale, we combined “strongly disagree” and “disagree” into “disagree” and “strongly agree” and “agree” into “agree” for the descriptive analysis. To examine interest in ordering DI, we collapsed “very interested” and “somewhat interested” into “interested” and “not interested at all” and “not very interested” into “not interested” for analytical analysis.

We calculated response frequencies for practice characteristics, interest in ordering, intent in rostering, perceived benefits, educational preferences, and barriers and facilitators. We used Wilcoxon rank-sum tests to examine the association of interest in ordering with years of practice and χ^2 tests to examine the association of area of practice (orthopaedic and non-orthopaedic) and clinical setting (public and private) with interest in ordering.

RESULTS

We collected a total of 1,574 completed questionnaires from the 7,492 eligible participants for a 21% response rate. Of these respondents, 1,460 provided direct patient care and were included in our analysis.

Demographic and practice characteristics of respondents

Characteristics of respondents are outlined in Table 1. The respondents' mean age was 42 years; 77% of respondents were women and 23% were men. The primary place

Table 1 Demographic and Practice Characteristics of Respondents ($n = 1,574$)

Characteristic	No. (%) [*]
Sex	
Male	363 (23)
Female	1,211 (77)
Mean Age (SD), y	42 (11)
Education level	
Diploma	75 (5)
Bachelor	852 (54)
Master's—clinical	395 (25)
Master's—research or applied	197 (12.5)
Doctorate—clinical	22 (1.4)
Doctorate—research or applied	33 (2.1)
Mean (SD) years in practice	16.8 (6.5)
Primary place of employment	
Private practice or clinic	551 (35)
Hospital	425 (27)
Rehabilitation facility	217 (14)
Other	381 (24)
Provision of direct patient care	1,460 (93)
Mean (SD)	
Time spent in direct patient care, † %	82 (18)
Primary area of practice†	
Orthopaedics	616 (42)
General practice	296 (20)
Geriatric care	127 (9)
Neurology or neuroscience	134 (9)
Cardiorespiratory	73 (5)
Other (e.g., community, research)	214 (15)
>50% of caseload in orthopaedics†	967 (66)
Location of facility†	
Rural	270 (18.5)
Urban	1,190 (81.5)
Place of work—publicly funded†	775 (53)
Currently authorized to order the following under medical directives/direct orders	
MRI	8 (1)/10 (1)
Diagnostic US	17 (1)/11 (1)
Plain film X-rays	45 (33)/21 (1)
CT scans	9 (1)/10 (1)
Previously taken post-graduate course related to	
MRI	65 (4)
Diagnostic US	63 (4)
Plain film X-rays	86 (5)
CT Scans	61 (4)

^{*}Unless otherwise specified.

† $n = 1,460$.

US = ultrasound; CT = computed tomography.

of employment indicated was private practice clinics (35%). Among respondents who indicated they provided direct patient care (93%), the most common primary area of practice was orthopaedics (42%). The majority of respondents (66%) indicated that orthopaedics represented more than half their caseload. Approximately half reported working in publicly funded areas of practice (53%).

A small percentage of respondents reported being authorized to order DI under medical directives or direct orders; plain film X-rays were the most common (3%). Very few respondents had taken post-graduate courses

Table 2 Interest in Ordering Diagnostic Imaging by Practice Characteristics ($n = 1,574$)

Interest in ordering	Practice area, no. (%)		Employment sector, no. (%)	
	Orthopaedics	All other	Private	Public
X-rays/CT scans	559 (91)	613 (73)	610 (89)	562 (73)
MRI/US	541 (88)	544 (64)	591 (86)	494 (64)

CT = computed tomography; US = ultrasound.

related to ordering DI; again, courses related to plain film X-rays were the most commonly reported (5%).

The practice characteristics of respondents from our sample were found to be representative of the target population with respect to age, area of practice, and employment sector (data not shown).

Interest in ordering diagnostic imaging

The proportion of respondents who were interested in ordering DI (72% MRI/US, 78% X-rays/CT) was higher than the proportion who said they intended to apply to the CPO roster (55% MRI/US, 60% X-rays/CT). Respondents with a caseload consisting of more than 50% orthopaedics were significantly more interested in ordering MRI or US ($p < 0.001$) and X-rays ($p < 0.001$) than those with a caseload of less than 50% orthopaedics, but a high proportion of respondents in other areas of practice still expressed interest in ordering X-rays/CT (73%) and MRI/US (64%; see Table 2). Similarly, although physiotherapists practising in the private sector were significantly more interested in ordering both MRI/US ($p < 0.001$) and X-rays ($p < 0.001$) than those working in publicly funded facilities, a high proportion of respondents in the public sector still expressed interest in ordering X-rays/CT (73%) and MRI/US (64%; see Table 2).

Barriers to and facilitators of the uptake of ordering diagnostic imaging

As Table 3 shows, the highest levels of agreement on potential barriers to ordering were seen for financial cost (34%), apprehension about knowledge of indications (32%), and medical liability (30%). Most respondents agreed that having a mentor (69%) and support from other professionals (61%) would encourage them to order DI.

Perceived educational needs

Table 4 shows respondents' perceived DI educational needs. At entry-level practice, respondents were most comfortable ordering and interpreting X-rays (43%) compared with other types of DI. With respect to DI education, 57% of respondents preferred a combination of face-to-face and Web-based courses. Most respondents agreed that the course should be specific to a clinician's area of practice (88%).

Perceived benefits

Table 5 outlines respondents' perceptions of the impact of being authorized to order DI. In terms of benefits to health care service delivery, the highest levels of agreement among respondents were for improved patient satisfaction (87%), facilitation of earlier diagnosis (86%), improved patient outcomes (82%), and improved accessibility to health care services (79%). The benefits for professional development of PT practice on which respondents agreed most strongly were increased physiotherapist autonomy (92%) and advancement of the PT profession (89%).

DISCUSSION

Our study is the first to seek the opinions of Ontario physiotherapists on their ability to order DI. Our findings provide greater understanding of interest in ordering and intention to order DI among this cohort of physiotherapists, as well as on the barriers and facilitators to uptake,

Table 3 Perceived Barriers and Facilitators to the Uptake of Ordering Diagnostic Imaging

Barriers and Facilitators	% of responses* ($n = 1,574$)		
	Disagree	Neutral	Agree
Barriers ("will deter me from rostering")			
Financial costs associated with becoming rostered	40	26	34
Time requirements associated with the authorized activities	50	23	26
Process of rostering with the CPO	61	24	14
Apprehension of limited knowledge of the indications for ordering	48	20	32
Apprehension about possible future medical liability	46	25	30
Apprehension about possible health implications to patients after exposure	67	20	13
Uncertainty regarding PT compensation related to ordering diagnostic imaging	46	35	19
Facilitators ("will encourage me to roster")			
Support and acceptance from other professionals of the extended scope role	14	24	61
Having a mentor with experience ordering diagnostic imaging	12	19	69

* Percentages have been rounded to the nearest whole number and therefore may not total 100.

CPO = College of Physiotherapists of Ontario; PT = physiotherapy.

Table 4 Diagnostic Imaging Perceived Educational Needs

	% of responses* (<i>n</i> = 1,574)			
Preferred method of receiving updates on scope of practice	Workplace	OPA	CPO	Other
	8	20	70	2
Preferred delivery method for a diagnostic imaging course	Web based	Face to face	Combination	Other
	20	20	57	3
Comfort ordering and interpreting at entry-level practice	Uncomfortable	Neutral	Comfortable	
MRI	78	9	13	
Diagnostic US	74	10	17	
X-ray	43	14	43	
CT scans	75	12	13	
Factors influencing diagnostic imaging course selection	Not Important	Neutral	Important	
Recommendations from others/word of mouth	6	14	80	
Affiliation with a recognized group or organization	4	9	87	
Instructor education/work experience	0	4	95	
Cost	4	10	87	
Diagnostic imaging courses should be specific to the clinician's area of practice	Disagree	Neutral	Agree	
	6	6	88	

* Percentages have been rounded to the nearest whole number and therefore may not total 100.

OPA = Ontario Physiotherapy Association; CPO = College of Physiotherapists of Ontario; US = ultrasound; CT = computed tomography.

Table 5 Perceived Benefits of Being Authorized to Order Diagnostic Imaging

	% of responses* (<i>n</i> = 1,574)		
Benefit	Disagree	Neutral	Agree
Health care service delivery			
Facilitate earlier diagnosis	5	9	86
Increase a physiotherapist's workload	21	32	47
Eliminate the need for medical directives	8	23	69
Reduce wait times for medical specialists†	9	16	76
Reduce duplication of health services‡	10	17	74
Reduce avoidable admissions to hospitals‡	17	33	50
Facilitate earlier discharge	13	34	52
Improve the cost effectiveness of health care delivery	7	22	71
Facilitate collaboration between professionals	7	20	73
Improve accessibility to health care services	6	16	79
Increase direct access to PT services	11	19	71
Improve patient outcomes	4	14	82
Improve patient satisfaction	2	11	87
Professional development of PT practice			
Contribute to advancement of profession	3	7	89
Greater recognition for physiotherapists in Ontario's health care system	4	8	88
Enhance physiotherapists' clinical reasoning skills	7	12	81
Improve the marketability of physiotherapists	5	18	77
Increase physiotherapists' autonomy	3	6	92

* Percentages have been rounded to the nearest whole number and therefore may not total 100.

† E.g., by facilitating the triage of patients with orthopaedic conditions for consult or surgery.

‡ Authority of a physiotherapist to directly order an MRI to clarify the diagnosis may save the patient a visit to a physician to receive the same requisition.

PT = physiotherapy.

the potential benefits, and associated educational needs they perceive to be related to DI. This information may be important in achieving uptake of DI ordering by physiotherapists because innovations are more readily accepted if they are in line with intended adopters' views and perceived needs.¹⁹

Previous studies have predominantly examined advanced practitioner physiotherapists who are already

trained to order DI in orthopaedic practice and have not explicitly addressed respondents' level of interest in this authorized activity.^{9,13,14} Our study, however, examined the opinions of Ontario physiotherapists in the aggregate, and the results indicate that although physiotherapists working in orthopaedic practice are more interested in ordering DI than those in other areas of practice, respondents in other practice areas also showed significant

interest. We believe that although the nature and context of orthopaedic and non-orthopaedic practices may differ, physiotherapists practising in non-orthopaedic areas may similarly use DI to facilitate diagnosis and plan interventions.

Our findings also show that respondents working in the private sector are more interested in ordering DI than those working in the public sector. Because physiotherapists practising in private clinics are often a first point of contact for patients, this greater interest may be explained by their perception that they could improve efficiency of care by ordering DI without requiring physician referral. The private practice system does not allow physiotherapists direct access to images or technicians' reports, and physiotherapists must therefore wait for the patient or physician to provide these results; physiotherapists working in public facilities may already be operating under medical directives that allow them to order DI, which may explain why they expressed less interest in or perceived less urgency about rostering to order DI. These physiotherapists may also work closely with physicians as part of an interdisciplinary team and thus be better able to communicate and discuss DI needs. Nonetheless, the majority of physiotherapists working in the public sector still expressed an interest in ordering DI. Medical directives are not transferrable between institutions and require periodic renewal,²⁹ thus being able to order DI as a part of physiotherapists' scope of practice would enable physiotherapists in Ontario to do so regardless of respective workplace policies.

Although a high proportion of our respondents expressed interest in ordering DI, a lower proportion said they intended to roster. This discrepancy suggests potential barriers to uptake: Respondents may be hesitant to follow through on their interest and commit to this new activity by rostering with the CPO. Respondents identified limited knowledge of indications for ordering DI and medical liability as barriers to rostering, which indicates that they perceived a need for additional education. Because postgraduate training will be a prerequisite to rostering in Ontario and is likely to be a requirement of other PT regulatory bodies as well, there will be a demand for some form of training. At present, whether existing programs will be able to fulfil the theoretical and practical education criteria required by the CPO is not known.¹⁷ Educational preferences must also be considered for successful implementation of a new skill set such as ordering DI. Previous studies have suggested that successful adoption of health care behaviour change is more likely when the intended adopters can engage in educational and training activities centred on this change.¹⁹ Because our findings indicate that physiotherapists prefer to receive scope-of-practice updates from the CPO, curriculum developers may consider informing physiotherapists of courses through the CPO. As previous studies have found,³⁰ most respondents felt

that educational courses on DI should be customized to their area of practice. Interestingly, respondents also reported preferring a Web-based course with some face-to-face interaction. This course format likely increases the feasibility of continuing education for most working physiotherapists, because being able to access course content online reduces travel time and costs. When planning course content, educational developers may also be interested to note that most respondents were more confident in their ability to interpret X-rays than to interpret other forms of DI.

Expanding physiotherapists' scope of practice may also benefit health care systems.^{5-8,10-12} For example, a UK study⁸ showed that physiotherapists were more conservative than orthopaedic surgeons in ordering X-rays and generally favoured conservative management, resulting in reduced direct hospital costs. Clinical decision rules—an objective means of quantifying the individual contributions of assessment findings (e.g., subjective history, physical exam) that may support or negate a specific diagnosis, prognosis, or patient response to treatment³¹—have been implemented in Canada and elsewhere^{24,32} to streamline and increase the accuracy of practitioners' diagnostic and prognostic skills and thus help reduce costs associated with unnecessary DI referrals.³¹ Moreover, in Canada, advanced practice physiotherapists working in a triage role for preoperative assessments for total hip and total knee arthroplasties, including ordering and making use of DI results, helped to reduce surgical consultation wait times and surgeons' wait-lists and improved patient satisfaction.³³

Echoing findings from both the medical and the nursing professions,³⁴ the majority of respondents in our study identified mentorship and support from team members as strongly facilitating successful uptake of expansions in their scope of practice. The importance of peer support is reflected in previous studies' findings identifying turf protection on the part of other health professionals and professional demarcation as strong barriers to changes in practice.³⁵ This suggests that an important next step in gaining support for expanding physiotherapists' role to include ordering DI is to raise inter-professional awareness of physiotherapists' competencies and skill sets. Successful implementation of a health care innovation depends not only on the intended adopters but also on the context in which they work; a supportive work environment will facilitate uptake of this new practice.¹⁹

LIMITATIONS

Our study has several limitations. First, the literature on health care innovations has highlighted the pivotal role of context in determining whether a new concept will be successfully adopted; although we have speculated as to how our study findings may apply to the province of Ontario and act as a point of reference for

other jurisdictions, our inferences may not apply to some of these jurisdictions.

Second, it is possible that our survey may have missed some valuable information on physiotherapists' opinions of the uptake of ordering DI. Future studies could include a qualitative component to gain a deeper understanding of the rationale behind the opinions expressed by physiotherapists.

Finally, we found that most respondents did not agree with the suggested barriers to the uptake of ordering DI. However, individuals may be poor self-assessors of competence,³⁶ and respondents may thus have underestimated potential barriers. Possible barriers to uptake should therefore be examined more closely in future research.

CONCLUSION

Our findings provide evidence that Ontario physiotherapists are interested in ordering DI. This study may also represent a resource for Canadian and international stakeholders interested in exploring factors critical to successful implementation of health care changes. Successfully implementing a health care change such as authorizing physiotherapists to order DI requires addressing educational needs, barriers, and facilitators. Our findings will be critical to the development of sustainable and meaningful educational strategies for successful implementation of this authorized activity,^{22,37} they are also important in considering uptake because health care innovations are more readily accepted if they align with intended adopters' views and perceived needs.

Future studies should explore contexts in which health care innovations were successfully implemented, so as to better understand which factors may contribute to the success of adoptable innovations in health care. This may include examining different settings such as hospitals and private practice clinics across provinces and countries, as well as surveying other professions.

KEY MESSAGES

What is already known on this topic

Physiotherapists practising in extended roles who are able to order DI can have a positive influence on health care delivery and the patient experience. Key factors identified as affecting the uptake of extended-scope roles include mentorship, acceptance by other health care team members, and the availability of educational opportunities to prepare health care practitioners for their new role.

What this study adds

This study is the first to explore Ontario physiotherapists' opinions on their ability to order DI. Results demonstrate that Ontario physiotherapists are interested in ordering DI. This study may influence the develop-

ment of future educational DI programs in Ontario and act as an additional resource for Canadian and international stakeholders implementing scope-of-practice changes.

REFERENCES

1. Kersten P, McPherson K, Lattimer V, et al. Physiotherapy extended scope of practice—who is doing what and why? *Physiotherapy*. 2007;93(4):235–42. <http://dx.doi.org/10.1016/j.physio.2007.02.007>.
2. Desmeules F, Roy JS, MacDermid JC, et al. Advanced practice physiotherapy in patients with musculoskeletal disorders: a systematic review. *BMC Musculoskelet Disord*. 2012;13(1):107. <http://dx.doi.org/10.1186/1471-2474-13-107>. Medline:22716771
3. Ontario Physiotherapy Association, College of Physiotherapists of Ontario. Physiotherapy scope of practice review 2008 [Internet]. Toronto: The College; 2008 [cited 2013 Aug 2]. Available from: http://www.opa.on.ca/pdfs/position/HPAC_Scope062708.pdf.
4. Ontario Ministry of Health and Long-Term Care. Health Bulletins [Internet]. Toronto: The Ministry; 2012 [updated 2012 Jun 29; cited 2012 Oct 5]. Available from: http://www.health.gov.on.ca/en/news/bulletin/2009/regulation_accesstocare.aspx.
5. Stanhope J, Grimmer-Somers K, Milanese S, et al. Extended scope physiotherapy roles for orthopedic outpatients: an update systematic review of the literature. *J Multidiscip Healthc*. 2012;5:37–45. Medline:22359462
6. Moore JH, Goss DL, Baxter RE, et al. Clinical diagnostic accuracy and magnetic resonance imaging of patients referred by physical therapists, orthopaedic surgeons, and nonorthopaedic providers. *J Orthop Sports Phys Ther*. 2005;35(2):67–71. <http://dx.doi.org/10.2519/jospt.2005.35.2.67>. Medline:15773564
7. Aiken AB, Atkinson M, Harrison MM, et al. Reducing hip and knee replacement wait times: an expanded role for physiotherapists in orthopedic surgical clinics. *Healthc Q*. 2007;10(2):88–91. 6. <http://dx.doi.org/10.12927/hcq.18807>. Medline:17491573
8. Daker-White G, Carr AJ, Harvey I, et al. A randomised controlled trial: shifting boundaries of doctors and physiotherapists in orthopaedic outpatient departments. *J Epidemiol Community Health*. 1999;53(10):643–50. <http://dx.doi.org/10.1136/jech.53.10.643>. Medline:10616677
9. Li LC, Westby MD, Sutton E, et al. Canadian physiotherapists' views on certification, specialisation, extended role practice, and entry-level training in rheumatology. *BMC Health Serv Res*. 2009;9(1):88. <http://dx.doi.org/10.1186/1472-6963-9-88>. Medline:19490639
10. McGinn TG, Guyatt GH, Wyer PC, et al. Users' guides to the medical literature: XXII: how to use articles about clinical decision rules. *JAMA*. 2000;284(1):79–84. <http://dx.doi.org/10.1001/jama.284.1.79>. Medline:10872017
11. Maddison P, Jones J, Breslin A, et al. Improved access and targeting of musculoskeletal services in northwest Wales: Targeted Early Access to Musculoskeletal Services (TEAMS) programme. *BMJ*. 2004;329(7478):1325–7. <http://dx.doi.org/10.1136/bmj.329.7478.1325>. Medline:15576743
12. McPherson K, Kersten P, George S, et al. A systematic review of evidence about extended roles for allied health professionals. *J Health Serv Res Policy*. 2006;11(4):240–7. <http://dx.doi.org/10.1258/135581906778476544>. Medline:17018199
13. Yardley D, Gordon R, Freeburn R, et al. Clinical specialists and advanced practitioners in physical therapy: a survey of physical therapists and employers of physical therapists in Ontario, Canada. *Physiother Can*. 2008;60(3):224–38. <http://dx.doi.org/10.3138/physio.60.3.224>. Medline:20145755
14. Woodhouse L. Proposal for registered physiotherapist extended class—musculoskeletal example [Internet]. National Harbor: Ontario Physiotherapy Association—Advanced Practice Physiotherapy Task Force; 2006 [cited 2013 Jul 23]. Available from: <http://directaccess-summit.com/resources>

15. College of Physiotherapists of Ontario. Authorized activities: chapter 1: review of the activities and authority mechanisms [Internet]. Toronto: The College; 2014 [cited 2013 Jul 23]. Available from: http://www.collegept.org/Assets/elearning/E-LearningAuthorized-Activities/Authorized_Activities_PDF/Authorized_Activities_Chapter_01.pdf.
16. College of Physiotherapists of Ontario. Authorized activities: chapter 2: indirect authority mechanisms, delegations, exemptions and exceptions [Internet]. Toronto: The College; 2014 [cited 2014 May 25]. Available from: <http://www.collegept.org/Resources/Elearning-Modules/AuthorizedActivities>.
17. College of Physiotherapists of Ontario. Physiotherapy scope of practice changes: frequently asked questions [Internet]. Toronto: The College; 2014 [cited 2014 May 20]. Available from: http://www.collegept.org/Assets/Scope%20of%20Practice/FAQs_Scope_of_Practice120302.pdf.
18. College of Physiotherapists of Ontario. Rostering teleconference [Internet]. Toronto: The College; 2012 [cited 2013 Jul 23]. Available from: http://www.collegept.org/Assets/podcasts/Rostering_Teleconference_1pm_4128107.mp3.
19. Greenhalgh T, Robert G, Macfarlane F, et al. Diffusion of innovations in service organizations: systematic review and recommendations. *Milbank Q*. 2004;82(4):581–629. <http://dx.doi.org/10.1111/j.0887-378X.2004.00325.x>. Medline:15595944
20. van Soeren MH, Micevski V. Success indicators and barriers to acute nurse practitioner role implementation in four Ontario hospitals. *AACN Clin Issues*. 2001;12(3):424–37. <http://dx.doi.org/10.1097/00044067-200108000-00010>. Medline:11759360
21. Bryant-Lukosius D, Dicenso A, Browne G, et al. Advanced practice nursing roles: development, implementation and evaluation. *J Adv Nurs*. 2004;48(5):519–29. <http://dx.doi.org/10.1111/j.1365-2648.2004.03234.x>. Medline:15533090
22. Aherne M, Lamble W, Davis P. Continuing medical education, needs assessment, and program development: theoretical constructs. *J Contin Educ Health Prof*. 2001;21(1):6–14. <http://dx.doi.org/10.1002/chp.1340210103>. Medline:11291588
23. Chau J, Chadbourne P, Hamel R, et al. Continuing education for advanced manual and manipulative physiotherapists in Canada: a survey of perceived needs. *Physiother Can*. 2012;64(1):20–30. <http://dx.doi.org/10.3138/ptc.2010-50>. Medline:23277682
24. Littlejohn F, Nahna M, Newland C, et al. What are the protocols and procedures for imaging referral by physiotherapists? *NZ Journal of Physiotherapy*. 2004;34(2):81–7.
25. Aiken AB, Harrison MM, Hope J. Role of the advanced practice physiotherapist in decreasing surgical wait times. *Healthc Q*. 2009;12(3):80–3. <http://dx.doi.org/10.12927/hcq.2013.20881>. Medline:19553769
26. McKiernan S, Chiarelli P, Warren-Forward H. A survey of diagnostic ultrasound within the physiotherapy profession for the design of future training tools. *Radiography*. 2011;17(2):121–5. <http://dx.doi.org/10.1016/j.radi.2010.08.003>.
27. Dillman D. Survey implementation. New York: Wiley; 2000.
28. Dawson LJ, Ghazi F. The experience of physiotherapy extended scope practitioners in orthopaedic outpatient clinics. *Physiotherapy*. 2004;90(4):210–6. <http://dx.doi.org/10.1016/j.physio.2004.06.001>.
29. Federation of Health Regulatory Colleges of Ontario. What are the steps for developing and approving directives and delegation across a continuum of settings? In: An interprofessional guide on the use of orders, directives and delegation for regulated health professionals in Ontario [Internet]. Toronto: The Federation; c2007 [cited 2013 Oct 23]. Available from: <http://mdguide.regulatedhealthprofessions.on.ca/approve/default.asp>
30. Tassone MR, Speechley M. Geographical challenges for physical therapy continuing education: preferences and influences. *Phys Ther*. 1997;77(3):285–95. Medline:9062570
31. Littlejohn F, Nahna M, Newland C, et al. What are the protocols and procedures for imaging referral by physiotherapists? *J Phys Ther*. 2006;34(2):81–7.
32. Carragee EJ, Hannibal M. Diagnostic evaluation of low back pain. *Orthop Clin North Am*. 2004;35(1):7–16. [http://dx.doi.org/10.1016/S0030-5898\(03\)00099-3](http://dx.doi.org/10.1016/S0030-5898(03)00099-3). Medline:15062713
33. Aiken AB, Harrison MM, Hope J. Role of the advanced practice physiotherapist in decreasing surgical wait times. *Healthc Q*. 2009;12(3):80–3. <http://dx.doi.org/10.12927/hcq.2013.20881>. Medline:19553769
34. Health Professions Regulatory Advisory Council. Scope of practice review: physiotherapy: summary and selected highlights from the literature [Internet]. Toronto: The Council; 2008 [cited 2013 Jun 20]. Available from: <http://www.hprac.org/en/projects/resources/PHYSIOTHERAPY.literaturereview.pdf>
35. Holdsworth L, Webster V, McFadyen A. Physiotherapists' and general practitioners' views of self-referral and physiotherapy scope of practice: results from a national trial. *Physiotherapy*. 2008;94(3):236–43. <http://dx.doi.org/10.1016/j.physio.2008.01.006>.
36. Davis DA, Mazmanian PE, Fordis M, et al. Accuracy of physician self-assessment compared with observed measures of competence: a systematic review. *JAMA*. 2006;296(9):1094–102. <http://dx.doi.org/10.1001/jama.296.9.1094>. Medline:16954489
37. Austin TM, Graber KC. Variables influencing physical therapists' perceptions of continuing education. *Phys Ther*. 2007;87(8):1023–36. <http://dx.doi.org/10.2522/ptj.20060053>. Medline:17553921

APPENDIX 1: WEB-BASED QUESTIONNAIRE

SECTION A. DEMOGRAPHICS AND PRACTICE CHARACTERISTICS

- A1. What is your sex?
- Male
 - Female
- A2. What is your age (in years)?
- A3. What is the highest degree you have earned to date?
- Diploma
 - Bachelor's
 - Master's—Clinical
 - Master's—Research or Applied
 - Doctorate—Clinical
 - Doctorate—Research or Applied
- A4. How many years have you been practicing as a physical therapist (PT)?
- Drop-down menu (<1–50yrs)
- A5. Please indicate your primary place of employment from the list below (choose one)
- Hospital
 - Rehabilitation Facility
 - Mental Health and Addiction Facility
 - Residential/Long-term Care Facility
 - Assisted Living Residence/Supportive Housing
 - Community Health Centre (CHC)
 - Family Health Team (FHT)
 - Visiting Agency/Business (Client's environment)
 - Community Care Access Centre (CCAC)
 - Group Health Centre (Sault Ste. Marie only)
 - Nurse Practitioner Led Clinic
 - Other Group Professional Practice/Clinic
 - Solo Professional Practice Clinic
 - Post-Secondary Educational Institution
 - School or School Board
 - Children's Treatment Centre (CTC)
 - Other Pediatric Facility
 - Association/Government/Regulatory or similar
 - Health-related Business/Industry
 - Other Industry—Manufacturing and Commercial
 - Board of Health or Public Health
 - Cancer Centre
 - Telephone Health Advisory Services
 - Spa
 - Fitness Centre
 - Correctional Facility
 - Other
- A6. Do you provide direct patient care?
- A6-i. What percentage of time do you spend in direct patient care? (sliding bar)
- A7. Which patient populations are you primarily responsible for?
- Pediatric
 - Adult
 - Geriatric
- A8. Which of the following is your primary area of practice? Primary area of practice: the area of practice where you work the greatest number of hours in your last typical working week.
- General Practice
 - Sports Medicine
 - Burns and Wound Management
 - Plastics

- Amputations
- Orthopaedics
- Rheumatology
- Vestibular Rehabilitation
- Women's Health/Uro-genital
- Cancer Care
- Geriatric Care
- Chronic Disease Prevention and Management
- Cardiology/Cardiovascular
- Continuing Care/Long-Term Care
- Public Health
- Critical Care/ICU
- Mental Health and Addiction
- Neurology/Neuroscience
- Respiriology/Cardio-respiratory
- Health Promotion and Wellness
- Palliative Care
- Return to Work Rehabilitation
- Ergonomics
- Infectious Disease Prevention and Control
- Emergency
- Other

A8-i. For your choice of other, please specify

A8.ii. In the area of practice you have indicated above, what percentage of your caseload is represented by orthopaedics?

- <50%
- >50%

A9. Please indicate which of the following best describes the location of the facility of your primary area of practice

- Rural (defined as having a population of <30 000)
- Urban (defined as having a population of >30 000)

A10. Is the facility of your primary area of practice publicly funded?

- Yes
- No

A11-1a. Are you an advanced practitioner?

Advanced Practitioner: A PT who has pursued a formalized continuing education program to affirm and recognize his/her role as a practitioner with the knowledge and skills to practice beyond the scope of a general PT.

- Yes
- No

A11-1b. Please indicate your primary area of practice as an advanced practitioner.

- Clinical Specialist Yes ___ No ___

A11-1c. For your choice of other, please specify.

A11-2a. Are you a clinical specialist?

Clinical Specialist: A PT who has completed a formal specialty certification program approved by The Canadian Alliance of Physiotherapy Regulators (The Alliance) and has been granted permission by the CPO to use the title "specialist"

- Yes
- No

A11-2b. Please indicate your primary area of practice as a clinical specialist.

- Clinical Specialist Yes ___ No ___

A11-2c. For your choice of other, please specify.

A12.i. Have you practiced PT outside of Ontario in the past 5 years?

Yes/No

If "Yes":

Which of the following geographical areas have you practiced in as a PT in the past 5 years?

- AB—Canada For how many years? ____
- BC—Canada For how many years? ____
- MB—Canada For how many years? ____
- NB—Canada For how many years? ____
- NL—Canada For how many years? ____
- NS—Canada For how many years? ____
- NT—Canada For how many years? ____
- NU—Canada For how many years? ____
- PE—Canada For how many years? ____
- QC—Canada For how many years? ____
- SK—Canada For how many years? ____
- YT—Canada For how many years? ____
- Australia For how many years? ____
- New Zealand For how many years? ____
- UK For how many years? ____
- United States For how many years? ____
- Other For how many years? ____

A12-iv. While practicing in the geographical area(s) indicated above, were you authorized to order any of the following diagnostic investigations:

- Xray
- CT scan
- MRI
- Diagnostic Ultrasound

A13. Are you currently rostered for with the CPO for the following authorized acts:

Authorized Activities: The College of Physiotherapists of Ontario (CPO) refers to “Authorized activities” as the 14 controlled acts outlined in section 27 of the Regulated Health Professions Act (RHPA), as well as the legally restricted health care activities outlined in the statutes of the Healing Arts Radiation Protection Act (HARP) and Laboratory and Specimen Collection Centre Licensing Act (LSCCLA).

- Acupuncture
- Administering a substance by inhalation
- Assessing or Rehabilitating pelvic musculature
- Spinal Manipulation
- Tracheal Suctioning
- Treating Wounds below the dermis

A14-i. Are you currently able to order any of the following investigations under medical directives?

Medical Directives: transfers of authority that are written in advance, that can apply to an individual or group and outline the specific conditions under which they can be implemented.

- i) MRI
- ii) US
- iii) X-ray
- iv) CT scans: Yes/No

A14-ii. Are you currently able to order any of the following investigations under direct orders?

Direct Orders: transfers of authority to perform a restricted activity from one individual to another. Direct orders may be written or verbal but are always specific to an individual patient.

- i) MRI
- ii) US
- iii) X-ray
- iv) CT scans: Yes/No

A15. Have you taken any post-graduate courses related to ordering of the following investigations?

- i) MRI
- ii) US
- iii) X-ray
- iv) CT scans: Yes/No

SECTION B: INTEREST AND INTENTIONS RELATED TO ROSTERING TO ORDER A PRESCRIBED FORM OF ENERGY AND X-RAYS

Not interested at all, Not very interested, Somewhat interested, Very interested

- B1. Assuming the proposed legislative changes regarding diagnostic tests will be implemented in the near future, are you interested in ordering: i) Prescribed forms of energy (ie: MRI, diagnostic ultrasound) ii) X-rays, CT scans
- B2-i. Assuming the proposed legislative changes regarding diagnostic tests will be implemented in the near future, do you intend to roster to be authorized to order:
- Prescribed forms of energy (ie: MRI, diagnostic ultrasound)
 - X-rays, CT scans
- B2-ii. If "Yes," based on your current practice, how often do you anticipate ordering MRIs/diagnostic ultrasound (in total)?
- 1–5 times per month
 - 6–10 times per month
 - 11–15 times per month
 - >15 times per month
- B2-iii. If "Yes," based on your current practice, how often do you anticipate ordering X-rays/CT scans (in total)?
- 1–5 times per month
 - 6–10 times per month
 - 11–15 times per month
 - >15 times per month

SECTION C. OPINIONS ON ROSTERING PROCESS RELATED TO ORDERING A PRESCRIBED FORM OF ENERGY AND X-RAYS

- C1. Please indicate your level of agreement with the following statements regarding rostering to order prescribed forms of energy and X-rays:

Strongly disagree, Disagree, Neutral, Agree, Strongly agree

- Financial costs associated with becoming rostered (e.g. costs for additional education, administration) will limit my ability to roster
 - Additional time requirements associated with the authorized acts (e.g. educational components, the process of ordering tests, administrative duties) will deter me from rostering
 - The process of rostering with the CPO will deter me from rostering (this only refers to the process involved for applying to be rostered, and does not include the implications of being rostered)
 - Apprehension about having limited knowledge regarding appropriate indications for ordering prescribed forms of energy and X-rays will deter me from rostering. v) Apprehension about possible future medical liability concerns associated with prescribed vi) Apprehension about possible health implications to my patients following exposure to prescribed forms of energy and X-rays will deter me from rostering.
 - Support and acceptance of my extended scope role from other professionals (ie. team members, other healthcare professionals, managers, administration) will encourage me to roster
 - Having a mentor with experience ordering prescribed forms of energy and X-rays will encourage me to roster
 - Uncertainty regarding PT compensation related to the ordering of prescribed forms of energy and xrays will deter me from rostering. e.g. increased PT wage associated with PT skill set regarding diagnostic imaging. C2. As part of the CPO's quality assurance requirements, all registrants on rosters will be eligible for random onsite roster assessments every three years (in addition to the random general practice assessment every five years). Will this affect your decision to roster?
- Yes/No

SECTION D. OPINIONS ON THE PERCEIVED BENEFITS OF THE ABILITY TO ORDER A PRESCRIBED FORM OF ENERGY AND X-RAYS

Please identify the extent to which you agree or disagree with the following statements:

Strongly disagree, Disagree, Neutral, Agree, Strongly agree

- D1. Being able to order prescribed forms of energy and X-rays will:
- Contribute to the advancement of the physiotherapy profession
 - Provide greater recognition for the PT profession within the Ontario health care system
 - Enhance a PT's clinical reasoning skills
 - Increase a PT's autonomy

- v) Facilitate earlier diagnosis of pathology and implementation of appropriate physiotherapy care
- vi) Increase PT workload (e.g. caseload, administration)
- vii) Eliminate the need for medical directives to PTs regarding the new scope of practice
- viii) Improve marketability of PTs (e.g. by having a formal designation after having rostered with the CPO)
- ix) Reduce wait times for medical specialists, surgeons or physicians
- x) Reduce duplication of health services
- xi) Reduce avoidable admissions to hospitals
- xii) Facilitate earlier discharge of patients by physicians and/or PTs
- xiv) Improve the cost-effectiveness of health care delivery
- xiv) Facilitate collaboration between health care professionals
- xv) Improve accessibility to appropriate health care services
- xvi) Increase direct access to PTs
- xvii) Improve patient outcomes
- xviii) Improve patient satisfaction with their health management by healthcare professionals

SECTION E. OPINIONS ON EDUCATIONAL NEEDS OF ONTARIO PT FOR ORDERING AND ROSTERING TO ORDER PRESCRIBED FORMS OF ENERGY AND X-RAYS

- E1. Which of the following is your preferred method of receiving updates about changes to PTs' scope of practice? (choose one)
- Workplace (ie: memos, colleagues)
 - Ontario Physiotherapy Association (OPA) announcements
 - CPO Announcements (e.g. newsletters, emails, resources)
 - Other: _____
- E2. At entry-level practice, how comfortable did you feel to order and interpret each of the following types of diagnostic imaging?
Not comfortable at all, Not very comfortable, Neutral, Somewhat comfortable, Very comfortable
- i) MRI
 - ii) Diagnostic ultrasound
 - iii) X-ray
 - iv) CT scan
- E3. If given the choice, which type of diagnostic imaging learning/course would you partake in? (choose one)
- Web-based course (ie: online lectures, online group discussions)
 - Face-to-face course
 - Informal discussions (ie: in-services, interprofessional rounds)
 - Combination of face-to-face and web-based course
 - Other: _____
- E4. Assuming you have chosen to sign up for a course on prescribed forms of energy and X-rays, please indicate how important each of the following factors are in influencing your course selection:
Not important at all, Not very important, Neutral, Somewhat important, Very important
- i) Recommendations from others / word of mouth
 - ii) Affiliation (ie: if the course is offered through a University, Hospital, private company)
 - iii) The instructor's education and work experience
 - iv) Cost of the course
- E5. To what extent do you agree with the following statement:
Disagree, Somewhat disagree, Neutral, Somewhat agree, Agree
- i) Prior to rostering, a clinician should attend a diagnostic imaging course/training specific to their area of practice.
e.g., An orthopaedic PT should attend a course specific to orthopaedic diagnostic imaging, while a cardiorespiratory PT should attend a course specific to cardiorespiratory diagnostic imaging.