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OVERVIEW REPORT

**Connecting Theory & Practice:
Exploring the Risks & Supports to the
Competence of Physiotherapists**

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About this Overview Report

This **Overview** reports on a multi-stage project commissioned by the College of Physiotherapists of Ontario (CPO), the regulatory authority responsible to set the standards for physiotherapists in Ontario. This project first looked at the available evidence about the risks to competence and to health practitioners such as physiotherapists. The full report on this literature review of the evidence is found in the scoping review report, called *Risks and Supports to the Competence of Health Professions with a Focus on Physical Therapists*.¹

Next this project looked at seven different CPO data sets, using the structure of the risks and supports to competence identified in the scoping review, to investigate the relationships among these various data sets. The data sets included demographic data, data provided about the national entry to practice examination, called the Physiotherapy Competency Examination (PCE), and a variety of data sets related to practice (e.g. Quality Assurance Practice Assessments; practice concerns that lead to investigations; or non-compliance, such as non-completion of the mandatory online jurisprudence assessment). The comprehensive technical report, called *What Ontario² Physiotherapist Data Says about Risks to Competence*,³ reports on many noted associations and connections between the risks to PT competence.

This **Overview Report** connects the key lessons arising from patterns that emerged in the scoping review (*Understanding the Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists*) with the observations that were found in the data provided about CPO registrants in several sets of data about physiotherapists in Ontario (*What Ontario Physiotherapist Data Says about Risks to Competence*).

Key definitions that guided each of these papers and this summary are found in Appendix 1: Key Terms. Additionally, brief information about the **methodology** is found in Appendix 2: Summary of Methodology, with more details found in each paper.

¹ Glover Takahashi, Nayer, Hynes, St. Amant. August 2016. *Understanding the Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists*. Toronto, ON

² In all the analysis and discussion, the Canadian graduates are those who were educated in Canada and either now, or in the past, worked in Ontario. Only data from physiotherapists who have been registered with the College of Physiotherapists of Ontario are included in this analysis.

³ Nayer, M., Glover Takahashi, S. (2016). *What Ontario Physiotherapist Data Says about Risks to Competence*. Toronto, ON

About the use of **epidemiology** as a model

- *Understanding the Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists* uses epidemiology as a model to identify patterns among the features of, and factors impacting, competence (i.e. risks to competence, supports to competence, competence life-cycle, and CanMEDS Roles⁴).
- Risks to competence should *not* be interpreted as indicators, or predictors, for any one individual; rather, a risk to competence is a potential vulnerability that individuals and organizations need to be aware of, and that needs to be reasonably managed, mitigated, and moderated.
- It is equally important to not view supports to competence as guarantees to ensure competence, but as factors that develop, maintain, or reinforce an individual's knowledge, skills, or abilities which an individual and/or organization can monitor and act on.

About the Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists

- The epidemiology-based analytical model offers a helpful organizing framework for exploring and explaining the competence of health professions. Almost 1000 articles from a 40-year period (i.e. 1975–2014) were reviewed as part of the largest known scoping review of competence of physicians, pharmacists, physiotherapists, and occupational therapists.
- Articles about physicians were dominant in the 943 articles (Figure 1).
- The majority of articles were written in the last decade.
- The proportion of articles on the Medical Expert Role far surpassed that of all other intrinsic CanMEDS Roles, regardless of whether the articles reported on risks and/or supports to competence. This proportion has remained relatively steady over the past 35 years. While Scholar is a more frequent topic in PT literature than in other professions, the distribution of PT articles by CanMEDS Role does not appear to vary in a way that would materially impact interpretation.
- Results indicated that risks to competence are less studied than supports to competence. Physicians are more likely to study risks to competence, while the other three professions are more likely to study supports. The PT articles include a higher

⁴ Note: The CanMEDS framework was used for the *Understanding the Risks and Supports to the Competence of Health Professions with a Focus on Physical Therapists*, while the *Essential Competency Profile for Physiotherapists in Canada*, 2009, which is modeled on the CanMEDS framework, was used for the document *What Physiotherapist Data Says about Risks to Competence*.

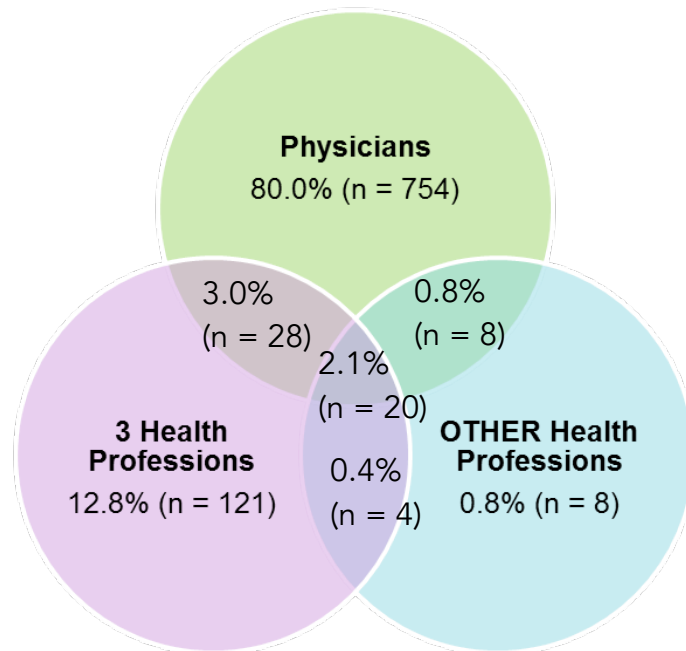
proportion of supports to competence (81.4%) than in the full complement of articles (60.7%).

- Additionally, the PT articles include a lower proportion of risks to competence (18.6%) than in the full complement of articles (39.3%).

The distribution of articles by risk and support for ALL articles and the 35 PT articles are found in Table 1. (The full list of the 35 PT articles is presented in

- Appendix 3: **Physiotherapy** References.)

Figure 1: Distribution of articles by profession



- While the proportion of risks and supports to competence between the full complement of articles and PT articles are not the same, it was assumed that from a theoretical perspective it was reasonable to consider that the variations may be more reasonably attributed to differences in interests among researchers and publishers than on real differences in the risks to competence or supports to competence.

Interesting Findings about **Risks** to Competence

- The most frequently discussed risks to competence in ALL articles were:
 1. Experiencing transitions (including change in status, change in focus of practice, and new graduate).
 2. Being an international graduate.
 3. Lack of experience or competence.
 4. Age.
- Articles about resident physicians focussed most often on transitions, international medical graduates, wellness, and lack of clinical exposure/experience as risks to competence.
- Some risks varied over the health professional's life-cycle, with transitions and personal health and wellness being more common early on (i.e. during field training and even more so during residency); and age, gender, no certification, practice features,

previous discipline, area of specialty, lack of clinical exposure/experience, and resources being more common risks later on in practice.

- Being an international medical graduate was consistently found as a risk across the entire professional life-cycle, regardless of the geographic origin of the article.

Table 1 Frequency of risks and of supports to competence

	Risk/Support Category	All 4 Health Prof'ls N = 943 (%)		PT only N = 35 (%)	
RISKS TO COMPETENCE	1. Transitions (Includes: change in status, change in focus of practice, new graduate, and transitions)	67	(7.1%)	2	(5.7%)
	2. International graduate	48	(5.1%)	2	(5.7%)
	3. Lack of clinical exposure/experience	30	(3.2%)	1	(2.9%)
	4. Age	66	(7.0%)	1	(2.9%)
	5. Gender	58	(6.2%)	1	(2.9%)
	6. Practice features (Includes: location of practice, professional isolation, and size of practice)	9	(1.0%)	1	(2.9%)
	7. No certification	55	(5.8%)	1	(2.9%)
	8. Personal wellness	74	(7.8%)	1	(2.9%)
	9. Resources, including people, money, and time	53	(5.6%)	1	(2.9%)
	10. Adequacy of practice or education	72	(7.6%)	0	
	11. Area of specialty	22	(2.3%)	0	
	12. Other risks to competence	53	(5.6%)	0	
	13. Previous disciplinary action	2	(0.2%)	0	
SUPPORTS	1. Continuing education participation	307	(32.6%)	17	(48.6%)
	2. Educational information/program features	282	(30.0%)	12	(34.3%)
	3. Personal support and feedback (Includes: mentorship and peer performance)	127	(13.5%)	7	(20.0%)
	4. Clinical exposure/experience	96	(10.2%)	3	(8.6%)
	5. Quality assurance participation	43	(4.6%)	3	(8.6%)
	6. Support through structure or organization	33	(3.5%)	2	(5.7%)
	7. Professional organization participation/systems	22	(2.3%)	1	(2.9%)
	8. Technology	77	(8.2%)	1	(2.9%)
	9. Other supports to competence	44	(4.7%)	1	(2.9%)
	10. Reflection and self-assessment	41	(4.3%)	1	(2.9%)
	11. Assessment and feedback through tools	24	(2.5%)	0	
	12. Performance review	36	(3.8%)	0	

Interesting Findings about Supports to Competence

- The most frequently discussed supports to competence in ALL articles were:
 1. Participation in continuing education.
 2. Educational information/program features.

3. Personal support and feedback (including mentorship and peer performance).

- The PT articles most frequently included the support categories of “continuing education participation” and “educational information/program feature.”
- Supports to competence in ALL articles varied by location of article (i.e. countries). This is a notable finding and may point to either cultural or sociological differences, or to differing interests of authors and publishers.
- Some supports varied over the health professional’s life-cycle, with educational information/program features, clinical exposure/experience, reflection and self-assessment, and technology being relatively more common early on (i.e. during field training and residency), whereas continuing education participation, personal support and feedback, professional organization, and quality assurance participation were more common supports in practice.
- Assessment and feedback, performance review, and support through structure or organization were consistently found as supports across the entire professional life-cycle.
- The finding that the Communicator Role was most often discussed in relation to supports and not risks to competence is interesting.
- The qualitative analysis of the 35 PT papers illustrated some key themes, all of which are related to supports to competence. They are found in Table 2.

Table 2 Nine messages from thematic analysis in the 35 PT papers

#	Summary
1.	<p>Longitudinal educational opportunities have enhanced effects for PT learners and their patients ¹</p> <ul style="list-style-type: none"> • Positive treatment effects e.g. improved use of evidence in low back pain treatments • Positive patient effects e.g. fewer disabilities in patients with neck pain, fewer treatment/patient visits ¹⁻⁹ • Improved clinical reasoning over time ¹⁰ • Development of research skills and research outcomes ^{9,11} • Personal and professional growth, including goal setting, skills training, behaviour change professionalism, leadership ¹² • Topical areas developed: research skills, management of older/elderly patients ⁷, palliative care ¹³, interprofessional practice skills,¹³manipulation, variety of clinical skills • Typical short course (i.e. 2 day, CE) did not improve outcomes of neck pain patients treated by PTs ² • Longitudinal included longer educational programs ¹³ (e.g. Master’s degree, series of educational offerings, mentorship/coaching/follow-up support, service learning ¹⁴ and experiential learning in clinical setting. ^{5,15}
2.	<p>Important effects and outcomes of clinical professional development (CPD) for PT learners and their patients</p> <ul style="list-style-type: none"> • Enhanced confidence in new content and/or new skills ^{6,12,15,16} • Adoption of new/recommended practice behaviours Reeves ^{6,12,15,16} • Improved patient centredness and patient management ^{6,12,15,16}

#	Summary
	<ul style="list-style-type: none"> Enhanced professional/leadership skills: readiness for leadership ^{5,17,18} clinical ingenuity ⁵, critical thinking ⁵, and reflection, development of expertise Improved knowledge/skills/competencies related to the educational area(s): evidence-based skills Fruth, 2010, cultural competence, interprofessional practice in palliative care Dando, 2012, use of assistive devices, stroke assessment ¹¹, knowledge/attitudes towards validated instruments, evaluation of older driver fitness
3.	<p>A wide variety of CPD formats “work” to support PTs’ learning and patient outcomes^{6,7,8,19-21}</p> <ul style="list-style-type: none"> Seems to not matter what format is used, effects on learning and performance have been demonstrated ^{6,7,21} Effectiveness has been shown to improve with: written material, short courses, service learning, coaching/mentoring, longer educational experiences, service work/learning ¹⁴ Learning improved via discussion, role-playing, feedback, reminders (mail out) PTs prefer formal courses despite higher prices and even though the evidence doesn't suggest it is a more effective way to learn or improve practice
4.	<p>“Successful” instructors deliver educational content in a manner that supports learning, positive learning climate, and learner/teacher relationship^{22,23}</p> <ul style="list-style-type: none"> Essential features of successful instructors/teachers: 22,23 <ol style="list-style-type: none"> professional development skills, learning and teaching skills including effective feedback skills, reflection building relationship building skills including respectful and professional towards learner Best teachers had 2 or 3 of above features ^{22,23} Best teachers used evidence-based approach to clinical teaching ^{22,23} Understanding of practice context(s) was important to learners and to teachers’ impact High tutor/teacher skill/expertise had a positive impact on learning and learner behavioural change
5.	<p>What impacted learners and learning ^{11,20,24-27}</p> <ul style="list-style-type: none"> Local convenience appreciated by learners and supported participation in continuing education ²⁴ Caseload/workload can be a barrier to participation in continuing education Implementation of musculoskeletal guidelines difficult in busy, active clinical settings ²⁰ Local colleague support valued and had positive impact on learning and sustained improvement (e.g. mentorship, journal clubs) ²⁷ Support for continuing education appreciated by learners (e.g. financial aid or time off from employers) Feedback on assessment resulted in significant and sustained improvements ¹¹ Guidance in situ led to better improvements in skill than written reports on performance ^{25,26}
6.	<p>Content gaps and skills needs were identified ^{7,26-28}</p> <ul style="list-style-type: none"> Continuing professional development needs of community physiotherapists not being met Physiotherapists overestimate their use of outcome measures ²² Topic areas identified for more development: physical therapy of older patients, burn rehabilitation, manipulation skills

#	Summary
7.	<p>Practice not always aligned with values or guidelines ^{15,20,22,29,30}</p> <ul style="list-style-type: none"> Evidence-based practice viewed as important and, despite most PTs having confidence in search skills (e.g. 2/3), the PTs initiated a search 2 or fewer times in 12-month period. Physiotherapists overestimate their use of outcome measures ²² Inconsistency between understanding of and application of clinical practice guidelines ³⁰ Tensions between profession-specific development of skills and teamwork development of skills ¹⁵
8.	<p>Experience matters ^{20,31}</p> <ul style="list-style-type: none"> Diagnostic ability increases with experience ³¹ Clinical memory skills were best with intermediate level PTs, next best were the experts, followed by novices. Memory skills were lowest with those who had no experience ³¹ Better LBP outcomes if treated by a PT with a large percentage of LBP patients in their caseload ²⁰
9.	<p>Predictors of better patient outcomes Cleland, 2009, ^{10,13,20}</p> <ul style="list-style-type: none"> Longitudinal educational interventions ¹³ Typical short course (i.e. 2 day, CE) did not improve outcomes of neck pain patients treated by PTs ² Being treated by female physiotherapist in low back pain (LBP) study ²⁰ Being treated by a PT with a large percentage of LBP patients in their caseload ²⁰ Improved clinical reasoning over time ¹⁰

Considerations in interpreting risks and supports to competence

- Risks to competence found in the literature are associations and should not be viewed as causal or predictors of dyscompetence.⁵
- Supports to competence found in the literature are associations and should not be viewed as guarantees of continued competence.

Limitations to Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists

- Variations in interest (i.e. supports or risks to competence) is likely associated with what is of interest to authors and publishers, rather than being attributable to fundamental differences in competence among professions. For example, the relatively low frequency of articles about the risk of communication abilities does not reflect the incidence of communication problems in patient complaints about health professions.
- Due to the low number of articles for occupational therapists, pharmacists, and physiotherapists, they were collapsed into a single group for analysis. While this made

⁵ Dyscompetent means *less than fully competent* and may reflect a temporary situation (e.g. dyscompetence due to severe fatigue or anxiety) or a new status due to decline of knowledge, skills or abilities. This term is more accurate than incompetent.”

it possible to compare them to physicians through cross-tabular and regression analyzes it may hide profession-specific differences.

- More work would need to be done to understand more fully the risks and supports for occupational therapists, pharmacists, and physiotherapists.

Interesting findings in *What Physiotherapist Data Says about Risks to Competence*

In the seven data sets about registered physiotherapists, practice information about 11,340 Ontario physiotherapists was looked at. The data sets were explored independently, and in combination, with a subsequent focus on those risks to competence from the scoping review. Below are some particularly interesting observations about the physiotherapists' practice, sequenced by the number of physiotherapists in the group.

- **Practice profile of physiotherapists:** Over 90% of current 8,553 registrants provide patient care, with 61% of them working full time. The average age of current registrants is 43.73 years with a standard deviation of 11 years. Three-quarters of current registrants were educated in Canada. Registration patterns have changed such that 10 years ago 82% of the registrants were Canadian trained, while over the past 10 years this has dropped to only 66%, the balance being made up of Internationally Educated Physiotherapists from around the world. India, the USA, and the Philippines are the top three source countries over the past 10 years.
- **Performing a Controlled Act:** Over 60% of physiotherapists report performing at least one controlled act. Those who report performing a controlled act are more likely to have received higher scores on the Physiotherapy Competency Examination (PCE) and are more likely to be the subject of an investigation where action was taken than those who are not rostered.
- **Internationally Educated Physiotherapists (IEPTs)** have, on average, lower Physiotherapy Competency Examination (PCE) exam scores, on both exams, than Canadian graduates, and take the exams more times, on average, before passing. As candidates who are older when they take the PCE tend to have lower exam scores than candidates who are younger when they take the PCE, and IEPTs tend to be older than Canadian exam takers, it is possible that age and location of graduation may be confounded in these results. Additionally, there were country differences in IEPT rates of passing the exams that may be attributable to the education system within the home country; some countries may not have as a goal of education that practitioners work autonomously and/or in primary care, as is the practice in the Canadian health context. IEPTs tend to have poorer results on the CPO Quality Assurance Practice Assessment and are more likely to require further action following the assessment.
- **Number of sites worked at over PT's career** was related to other factors. IEPTs work at more worksites over their career than Canadian graduates and men work at more

worksites than women. Those who work at a higher number of worksites over their career are more likely to have had lower PCE written and clinical component scores, more likely to be the subject of an investigation where action was taken, and more likely to have received more than one Notice of Intent to Suspend. Those who have a lower number of worksites tend to have better ratings on the Quality Assurance Practice Assessment.

- **Jurisprudence Requirements and Notice of Intent to Suspend:** Those individuals who had at least one incident of non-compliance with jurisprudence were significantly more likely to also have received at least one Notice of Intent to Suspend, and vice versa. Men are significantly more likely to have at least one incidence of non-compliance with jurisprudence than women.
- **Quality Assurance Practice Assessment:** Those who received lower PCE scores, or who failed the first time they took the exams, were more likely to receive lower ratings on the Quality Assurance Practice Assessment and more likely to require further action. Those in higher age brackets at the time they underwent the Practice Assessment were more likely to receive ratings of Needs Minor or Major Improvements on their Practice Assessment.
- **Practice Concerns / Complaints/ Investigations:** Overall, men were significantly more likely to be the subject of an investigation where action was taken than women; however, male IEPTs were more likely to be the subject of an investigation than female IEPTs, while the reverse was true for Canadian graduates. As a group, IEPTs were more likely to be the subject of an investigation where action was taken than Canadian graduates. The highest volume of investigations occurred during the period from 30 to 49 years of age. Those who have had an investigation have worked at a higher number of worksites over their career. A high proportion of the investigations involved individuals who were educated in countries without practice that allows the physiotherapists to work autonomously and/or in primary care, as is the practice in the Canadian health context, as compared to their proportion in the registrant database. Individuals who have been involved in an investigation are significantly more likely to have lower first-time PCE exam scores on both exams and to have a history of a past failure of one of the exams on the first attempt..

Connecting Theory & Practice: Exploring the Risks & Supports to the Competence of Physiotherapists

Below we connect the theory of the risks to competence found in the scoping review with real-time physiotherapy practice data. The connections below are sequenced by which risk to competence from the scoping review we frequently found in the physiotherapists' practice.

- ☒ Being **Internationally Educated** was the risk to competence factor in the scoping review that was the most frequent risk to PT competence, as the **Internationally Educated Physiotherapists (IEPT)** were noted:
 - To have average PCE written and clinical component scores that are lower
 - To, on average, take each PCE component more times to pass
 - To be more likely to be the subject of an investigation where action was taken
 - To have more concerns noted on their Practice Assessment
 - To be more likely to require further action after their Practice Assessment
- There were also some positive trends for **IEPTs**, where
 - IEPTs were *less* likely to receive a Notice of Intent to Suspend
 - IEPTs were equally non-compliant with Jurisprudence
- ☒ **Gender** was a risk in the scoping review that was very often noted as a risk to PT competence. Specifically *being a male PT was a very frequent risk* to competence as noted:
 - Overall, men are more likely to be the subject of an investigation; it is notable that the male IEPTs are significantly more likely to be the subject of an investigation than female IEPTs.
 - There is a trend that men are less likely to achieve a top rating on their Practice Assessment and more likely to require further action; however, this did not reach statistical significance.
 - Men achieve lower scores on both the PCE written and clinical components and take the exams more times prior to passing.
 - Men are more likely to be non-compliant with jurisprudence requirements.
 - There was also *one associated risk to competence of female PT* noted in the practice data, where
 - Female graduates of Canadian programs were more likely to have an investigation than male graduates of Canadian programs.

☒ **Age** was a repeated risk to competence in the scoping review, which was also found to be a risk to the competence of physiotherapists, given

- a noted increase in investigations, where action was taken, with increasing age
- poorer outcomes in the Practice Assessment with increasing age
- lower performance in the Physiotherapy Competency Examination (PCE), on both written and clinical components with increasing age.

☒ **Performing a controlled act** is a regulatory process where a PT is recognized for specialized practice skills, such as manipulation, acupuncture/needling, suctioning, and administering a substance by inhalation. Performing a controlled act was considered a proxy for **area of specialty**, which was identified as a risk to practice in the scoping review. In PT practice, those who report performing a controlled act are more likely to be the subject of an investigation. It was also noted that physiotherapists who pass the written and clinical components the first time are significantly more likely to report performing a controlled act.

☒ **Transitions** were a common risk to competence in the scoping review. This also showed up in the PT practice, as those who work at a higher number of work sites over their career (i.e. have multiple transitions) are more likely to be the subject of an investigation, to have worse ratings on the Practice Assessment, and more likely to have taken the PCE more than once. In the case of these PTs, given that they were more likely to fail the PCE and also had lower results on the Practice Assessment, it is not clear if there are causal links between or associations between exam performance, Practice Assessment performance, and numbers of transitions due to number of worksites.

Interconnectedness of Risk Factors

The clustering of various risk factors examined in this study and many of these relationships were noted to be **statistically significant factors for PT competence**.

- Of particular note is that being an IEPT, being male, and having an increased number of worksites over one's career are correlated to most other risks to competence (e.g. number of PCE written and clinical components taken, investigations where action was taken, and QA Overall Rating).
- The number of written and clinical components taken before passing the PCE are also correlated with most of the other variables (i.e. Jurisprudence total, investigations where action was taken, QA Overall Rating, IEPT, gender, number of worksites).
- Those who are the subject of an investigation where action was taken are also more likely to have taken the written component more times, to have been non-

compliant with jurisprudence, and also received at least one Notice Intent to Suspend.

What's missing? Differences between theory and practice

- For a few topics from the scoping review, there were different results for PTs, while some topics didn't show up when connecting the scoping review and the analysis of the CPO data sets.
 - **Transitions:** There was no evidence that being a new graduate was a risk to PT competence. There was no available demographic or other data to indicate if change in focus of practice was a risk to PT competence.
 - **Lack of clinical exposure/experience:** There was no available demographic or other data to indicate if lack of clinical exposure/experiences was a risk to PT competence.
 - **Practice features** (Includes: location of practice, professional isolation, and size of practice): The demographic data about practice features such as location of practice was not looked at to see if it was a risk to practice. There was no available demographic or other data to indicate if lack professional isolation or size of practice were a risk to PT competence.
 - **No certification:** There was no available demographic or other data to indicate if lack of certification (e.g. specific courses related controlled acts) was a risk to PT competence.
 - **Personal Health and Wellness:** Wellness information was not available. This is quite different from physicians, especially resident physicians, where this has been systematically explored and documented as an associating factor
 - **Resources:** Resources, including people, money, and time, were not available in the demographic data or otherwise to indicate if lack of resources was a risk to PT competence.
 - **Adequacy of practice or education:** This type of information was not available in the demographic or other data, so that it is not possible to understand if lack of resources was a risk to PT competence.
 - **Area of specialty:** Area of specialty was not examined during this analysis.
 - **Previous disciplinary action:** While the number were quite small, there was a trend that an individual who had been subject of an investigation where action was taken once was more likely to be the subject of an investigation where action was taken a second time. This is consistent with the literature that those named in complaints or regulatory actions have an increased risk of future similar issues.
-
- None of the support topics from the scoping review were able to be explored using the CPO data sets.

Discussion

The key point to note is that findings from this study are consistent with what is reported in the literature, much of which is based on physician studies.

Age is a significant factor in relation to competence.

There is a strong negative correlation of age with PCE exam scores, indicating that older candidates achieve lower scores, as well as lower pass rates, on the PCE. This type of pattern of older practitioners achieving lower scores on various types of tests is well demonstrated in the literature^{32-48,49,50,51}. And others have demonstrated that age and clinical performance are negatively correlated^{50,52}.

There was also a relationship between the PT Practice Assessment results and age, with older physiotherapists more likely to receive a lower rating on the assessment. Other studies have also shown that physician practice assessments have identified competence concerns with older practitioners^{49,53-58}.

Being male is a risk to competence in a number of areas.

Men have lower scores and pass rates on the PCE. Similar findings regarding exam results have been shown in the literature in both written component, where men achieved lower scores than women^{59-61,62} as quoted in,⁶³ and in clinical exams⁶³⁻⁶⁵.

While some studies have shown that men provide a lower quality of clinical care^{30,45,66-68}, the PT data showed that the results for men and women in the Practice Assessment were similar.

Another area of difference was related to complaints, where male IEPTs had a higher rate of investigations where action was taken than female IEPTs, while the reverse is true for the graduates of Canadian programs, where the women have a higher rate of complaints than the men. This is also supported in the literature, where many different studies have demonstrated higher rates of referrals to regulators regarding care concerns or other issues⁶⁹⁻⁷⁷.

Risks to competence increase as the PT's age increases.

The current analysis indicates that a higher percentage of complaints/reports occur during the 30s and 40s. Other studies, primarily related to medicine, indicate that complaints, disciplinary actions, and malpractice claims increase with age, though in these cases the age is generally older than the 40s^{54,69,70,75-82}.

Lower PCE examination scores is a risk to competence in the future.

The PT data shows that physiotherapists who are the subject of investigations are more likely to have lower first-time exam scores and more likely to fail the exams on the first attempt; this is true for both examinations. This is consistent with another study, which demonstrated that physicians with complaints against them achieved lower communication and clinical decision making skills scores on the Medical Council of Canada clinical exam ⁸³.

For those who completed the Practice Assessment, there is a correlation between their ratings and their scores on the PCE, with those who had lower scores achieving lower ratings on the Practice Assessment. This relationship between exam scores and future clinical performance has been demonstrated elsewhere ^{84,85}.

Since IEPTs are older than graduates of Canadian programs, this raises the question of interaction of age with country of education. If the analysis is repeated while controlling for age, would the same findings be evident? This would help tease out whether it is the age or the country of education that is most relevant to the relative risk for competence.

Being the subject of an investigation is a risk for further investigations.

The analysis included five years' of PT complaints/reports. The trends noted here are in line with the literature in that where an individual has one complaint or regulatory action that individual is more likely than others to receive a second complaint or be involved in another regulatory action. Investigating the concerns noted in each complaint as well as the roles, as per the Essential Competencies for Physiotherapists in Practice document, might shed additional light on high risk areas of practice.

Non-compliant in one area is linked to non-compliant in another area.

There was a relationship between receiving a Notice of Intent to Suspend (NIS) and non-compliance with PT jurisprudence requirements. These two infractions are both professionalism issues. Professionalism issues, even in medical school, are predictive of complaints later in the career ⁸⁶. This is consistent with investigation results here, in that Professional Misconduct is one of the top five decision letter concerns, as well as the top concern for those who have more than one investigation. The decrease in NIS in more recent years could relate to the change in registration categories, such that to remain registered requires paying full fee, so instead of changing to an "inactive" or "retired" status those individuals are resigning. It appears that, for many, receiving a NIS is one indication that they are leaving the practice of physiotherapy and do not realize that a formal notice to CPO to indicate they are resigning is required. CPO has increased its

communication strategy to help registrants to understand their responsibilities in this regard.

Being an IEPT is a risk to competence.

This appears in multiple areas, including exam scores, Practice Assessment results, and investigations. IEPTs are more likely to work at more worksites, which in itself is likely a risk factor.

Similar findings have been demonstrated in the literature, with international medical graduates (IMGs) demonstrating lower exam scores or competence assessment scores^{54,64,76,87,88}. IMGs have been shown to have lower pass rates on high stakes exams⁸⁹⁻⁹⁶, weaker performance in residency⁹⁷, and demonstrate weaker clinical skills^{98,99}.

Additionally, internationally educated physicians are more likely to have a complaint against them^{71,75,80,100,101} and to participate in fewer continuing professional development activities³⁵.

Frequent changes in worksite might be a risk to competence.

Working at a higher number of worksites over a career is correlated with receiving more than one NIS, the total number of investigations, lower ratings on the Practice Assessment, and an increasing number of times each exam was taken. The literature identifies transitions as a risk to competence. While in most cases this term refers to new graduates beginning work¹⁰²⁻¹⁰⁷ some studies also refer to short-term educational rotations¹⁰⁸, or to practitioners returning to work^{41,109}. It is not clear whether the individuals are working at a higher number of sites because they are dyscompetent or whether they are showing indicators of dyscompetence because they move around more often and therefore work at a higher number of worksites.

Personal health and wellness could impact on competence/performance.

Certain factors, such as personal health and wellness or participation in Continuing Professional Development, are additional contextual factors that can influence risk¹¹⁰.

Examination of risks to competence and supports to competence.

The approach taken here to examine factors associated with risk to competence/performance and the concept of developing a framework for assessing risk and developing methods of mitigating the risks to competence is also being examined in other professions¹¹⁰. The findings here are similar to findings published in the literature, which supports the approach. Combining this information with the information on

supports to competence, as presented in the accompanying paper to this report, provides information to guide potential future activities of CPO.

What this all means to CPO

- **Epidemiology can be used as a working model to study risks to competence and supports to competence and to focus the efforts of individuals, programs, and organizations.**
- **Regulatory authorities, such as CPO, would benefit from further work on risks to competence and supports to competence, such as:**
 - Becoming more familiar with the risks and supports to competence in the scoping review paper on risks and supports (e.g. use definitions and descriptions, read key articles)
 - Continuing to explore risks to competence of PTs by further analysis of PT data (e.g. risks to competence by locale), continuing to gather data in a systematic way, regular comparison of data to monitor trends beyond this study, and enhancing data collected to understand all risks to PT competence
 - Exploring what might mitigate or moderate risks to PT competence
 - Establishing an approach to understanding the relative importance of different supports to PTs' competence (e.g. survey of registrants, focus groups of various groups of registrants)
 - Working with other health professional groups who are looking at risks and supports to competence, given the noted high degree of overlap in risks and supports found between the theory that is dominated by physicians and the CPO PT practice data
 - Establishing an approach to understanding the relative importance of different risks to competence (e.g. analysis of regulatory data, focus groups of registrants).
- **Regulatory authorities, such as CPO, would benefit from employing a risks and supports to competence approach to focus the efforts of individuals, programs, and organizations.**
 - Empower registrants about self-management of their own risks and supports (i.e. putting "self" back into regulation)
 - Communicate internally and externally about risks, supports, and mitigating, moderating, and monitoring risks to competence
 - Organize regulatory programs based on the relative risks to competence of different factors for PT groups with variable levels of risk

- Encourage health systems and physical therapy organizations to monitor and mitigate risks to competence and develop and integrate supports to competence
- Conduct focussed analysis of one or more of the topics included in this study (e.g. transitions, quality assurance participation, or reflection/self-assessment); and compare the results with the relative risks and supports of health practitioners in other data sources (e.g. medico-legal, regulatory, certification).

Summary

Risks to competence identified in this study of PT data are congruent with the literature on risks to competence, which is predominantly written about physicians.

The risks to competence for PTs that stand out the most strongly are: being an IEPT, increasing age, being male, and working at a higher number of worksites over one's career. There are correlations among the variables studied, which provides support for the conclusions presented.

It would be helpful to consider further analysis (e.g. coding) of the decision letters issued by the Inquiries, Complaints and Reports Committee files to better understand risk patterns. It may be beneficial to determine the reasons for some of the results (e.g. what are the reasons for not registering on time or not completing the jurisprudence modules?). This information could inform future communications from CPO to registrants.

The current analysis does not offer solutions, though it does present the current situation. There may be some implications to registration practices (e.g. assisting registrants to identify their own risks to competence; identifying high-risk individuals in advance of concerns) or to continuing competence programs (e.g. providing information on beneficial activities to support competence).

This study presents the results of current CPO data. This study is similar to a census, which provides a snapshot in time. It may be beneficial to review evolution of risks over time. There are other regulators participating in this type of work; collaboration and synergy across partners/organizations with a mutual or shared interest could be helpful.

While this study focuses on risks to competence, the other perspective is to look at the supports to competence – what are the factors that can moderate or mitigate the risks to competence?

References

1. Wickford J, Edwards I, Rosberg S. A transformative perspective on learning and professional development of Afghan physiotherapists. *Physiotherapy Theory & Practice*. 2012;28(4):269-282.
2. Cleland J, Fritz J, Brennan GP, Magel JS. Does continuing education improve physical therapists' effectiveness in treating neck pain: a randomized clinical trial. *Journal of Orthopaedic & Sports Physical Therapy*. 2009;39(1):A95-A95.
3. Hendrick P, Bond C, Duncan E, Hale L. Clinical reasoning in musculoskeletal practice: students' conceptualizations. *Physical Therapy*. 2009;89(5):430-442.
4. Andersson EP. Continuing Education in Sweden--To What Purpose? *Journal of Continuing Education in Nursing*. 2001;32(2):86-93.
5. Constantine M, Carpenter C. Bringing Masters' level skills to the clinical setting: what is the experience like for graduates of the Master of Science in manual therapy programme? *Physiotherapy Theory & Practice*. 2012;28(8):595-603.
6. Meuser TM, Carr DB, Irmiter C, Schwartzberg JG, Ulfarsson GF. The American Medical Association Older Driver Curriculum for Health Professionals: Changes in Trainee Confidence, Attitudes, and Practice Behavior. *Gerontology & Geriatrics Education*. 2010;31(4):290-309.
7. Beling J. Effect of service-learning on knowledge about older people and faculty teaching evaluations in a physical therapy class. *Gerontology & Geriatrics Education*. 2003;24(1):31-46.
8. Chipchase LS, Johnston V, Long PD. Continuing professional development: the missing link. *Manual Therapy*. 2012;17(1):89-91.
9. Sellars J, Clouder L. Impact of the Accreditation of Clinical Educators scheme: reflections from one higher education institution. *Physiotherapy*. 2011;97(4):339-344.
10. Banks K, Meaburn A, Phelan E. Do the clinical competencies of musculoskeletal outpatient physiotherapists improve after they have participated in a bespoke in-service education programme designed around individual and service continuing professional development needs? *Journal of Allied Health*. 2013;42(1):33-39.
11. Bernhardt J, Bate PJ, Matyas TA. Training novice clinicians improves observation accuracy of the upper extremity after stroke. *Archives of Physical Medicine & Rehabilitation*. 2001;82(11):1611-1618.

12. Demmelmaier I, Denison E, Lindberg P, Asenlof P. Tailored skills training for practitioners to enhance assessment of prognostic factors for persistent and disabling back pain: four quasi-experimental single-subject studies. *Physiotherapy Theory & Practice*. 2012;28(5):359-372.
13. Dando N, d'Avray L, Colman J, Hoy A, Todd J. Evaluation of an interprofessional practice placement in a UK in-patient palliative care unit. *Palliative Medicine*. 2012;26(2):178-184.
14. Crandell CE, Wiegand MR, Brosky JA, Jr. Examining the role of service-learning on development of professionalism in doctor of physical therapy students: a case report. *Journal of Allied Health*. 2013;42(1):e25-32.
15. Reeves S, Freeth D, McCrorie P, Perry D. 'It teaches you what to expect in future . . . ': interprofessional learning on a training ward for medical, nursing, occupational therapy and physiotherapy students. *Medical Education*. 2002;36(4):337-344.
16. Dures E, Hewlett S, Ambler N, Jenkins R, Clarke J, Gooberman-Hill R. Rheumatology clinicians' experiences of brief training and implementation of skills to support patient self-management. *BMC Musculoskelet Disord*. 2014;15:108.
17. Aldridge RL, Jr., Keith B, Sloas S, Mott-Murphree A. Relationship of the Nelson Denny Reading Test to scores on the National Physical Therapy Licensure Examination. *Journal of Allied Health*. 2010;39(2):72-75.
18. Lazaro RT, Umphred DA. Improving cultural diversity awareness of physical therapy educators. *Journal of Cultural Diversity*. 2007;14(3):121-125.
19. Ahuja D. Continuing professional Development within Physiotherapy Special Perspective. *Journal of Physical Therapy*. 2011;3(1):4-8.
20. Bekkering GE, Engers AJ, Wensing M, et al. Development of an implementation strategy for physiotherapy guidelines on low back pain. *Australian Journal of Physiotherapy*. 2003;49(3):208-214.
21. Evans DW, Breen AC, Pincus T, et al. The effectiveness of a posted information package on the beliefs and behavior of musculoskeletal practitioners: the UK Chiropractors, Osteopaths, and Musculoskeletal Physiotherapists Low Back Pain Management (COMPLeMENT) randomized trial. *Spine*. 2010;35(8):858-866.
22. Bucciarei KM, Pivko SE, Olzenak DL. How does a physical therapist acquire the skills of an expert clinical instructor? *Journal of Physical Therapy Education*. 2011;25(2):17-25.
23. Cole B, Wessel J. How clinical instructors can enhance the learning experience of physical therapy students in an introductory clinical placement. *Advances in Health Sciences Education*. 2008;13(2):163-179.

24. Fruth SJ, Van Veld RD, Despos CA, Martin RD, Hecker A, Sincroft EE. The influence of a topic-specific, research-based presentation on physical therapists' beliefs and practices regarding evidence-based practice. *Physiotherapy Theory & Practice*. 2010;26(8):537-557.
25. Norman G, Monteiro S, Sherbino J. Reflecting upon reflection in diagnostic reasoning. *Academic Medicine*. 2014;89(9):1195.
26. Van Peppen RP, Schuurmans MJ, Stutterheim EC, Lindeman E, Van Meeteren NL. Promoting the use of outcome measures by an educational programme for physiotherapists in stroke rehabilitation: a pilot randomized controlled trial. *Clinical Rehabilitation*. 2009;23(11):1005-1017.
27. Bourne JA, Dziedzic K, Morris SJ, Jones PW, Sim J. Survey of the perceived professional, educational and personal needs of physiotherapists in primary care and community settings. *Health & Social Care in the Community*. 2007;15(3):231-237.
28. Bergkamp D, Lenk J, Reynolds M, et al. Effectiveness of a burn rehabilitation workshop addressing confidence in therapy providers. *Journal of Burn Care & Research*. 2013;34(1):e10-14.
29. Caldwell K, Coleman K, Copp G, Bell L, Ghazi F. Preparing for professional practice: how well does professional training equip health and social care practitioners to engage in evidence-based practice? *Nurse Education Today*. 2007;27(6):518-528.
30. Learman KE, Ellis AR, Goode AP, Showalter C, Cook CE. Physical therapists' clinical knowledge of multidisciplinary low back pain treatment guidelines. *Physical Therapy*. 2014;94(7):934-946.
31. Gobet F, Borg JL. The intermediate effect in clinical case recall is present in musculoskeletal physiotherapy. *Manual Therapy*. 2011;16(4):327-331.
32. Charap MH, Levin RI, Weinglass J. Physician choices in the treatment of angina pectoris. *American Journal of Medicine*. 1985;79(4):461-466.
33. Lewis CE, Freeman HE, Kaplan SH, Corey CR. The impact of a program to enhance the competencies of primary care physicians in caring for patients with AIDS. *Journal of General Internal Medicine*. 1986;1(5):287-294.
34. Hofman KJ, Tambor ES, Chase GA, Geller G, Faden RR, Holtzman NA. Physicians' knowledge of genetics and genetic tests. *Academic Medicine*. 1993;68(8):625-632.
35. Xierali IM, Rinaldo JC, Green LA, et al. Family physician participation in maintenance of certification. *Annals of Family Medicine*. 2011;9(3):203-210.

36. Zakroyeva A, Goldberg D, Gask L, Leese M. Training Russian family physicians in mental health skills. *European Journal of General Practice*. 2008;14(1):19-22.
37. Mujtaba SH, Ashraf T, Anjum Q. Improving general practitioners' knowledge regarding blood pressure measurement in selected cities of Pakistan through workshop. *Asia-Pacific Journal of Public Health*. 2013;25(1):84-91.
38. Frost-Pineda K, VanSusteren T, Gold MS. Are physicians and medical students prepared to educate patients about alcohol consumption? *Journal of Addictive Diseases*. 2004;23(2):1-13.
39. Acton RT, Barton JC, Casebeer L, Talley L. Survey of physician knowledge about hemochromatosis. *Genetics in Medicine*. 2002;4(3):136-141.
40. Al-Maniri AA, Al-Rawas OA, Al-Ajmi F, De Costa A, Eriksson B, Diwan VK. Tuberculosis suspicion and knowledge among private and public general practitioners: Questionnaire Based Study in Oman. *BMC Public Health*. 2008;8:177.
41. Grace ES, Korinek EJ, Weitzel LB, Wentz DK. Physicians Reentering Clinical Practice: Characteristics and Clinical Abilities. *Journal of Continuing Education in the Health Professions*. 2011;31(1):49-55.
42. Haque AS, Zubairi AB, Shiraz A, et al. Asthma knowledge and approach among Pakistani family physicians and the impact of an educational programme. *International Journal of Tuberculosis and Lung Disease*. 2007;11(11):1260-1265.
43. Pentzek M, Abholz HH, Ostapczuk M, Altiner A, Wollny A, Fuchs A. Dementia knowledge among general practitioners: first results and psychometric properties of a new instrument. *International Psychogeriatrics*. 2009;21(6):1105-1115.
44. Schroen A. Beliefs among pulmonologists and thoracic surgeons in the therapeutic approach to non-small cell lung cancer. *Chest*. 2000;118:129-137.
45. Epstein S, Gonzales J. Are psychiatrists' characteristics related to how they care for depression in the medically ill? Results from a national case-vignette survey. *Psychosomatics*. 2001;42:482-489.
46. Norcini JJ, Fletcher SW, Quimby BB, Shea JA. Performance of women candidates on the American Board of Internal Medicine Certifying Examination, 1973-1982. *Annals of Internal Medicine*. 1985;102(1):115-118.
47. Sample L, Laduca T, Leung C, et al. Comparing patient-management skills of referred physicians and non-referred physicians on a computer-based case-simulation examination. *Academic Medicine*. 2001;76(10 Suppl):S24.

48. Meskauskas JA, Webster GD. The American Board of Internal Medicine Recertification Examination: Process and Results. *Annals of Internal Medicine*. 1975;82(4):577.
49. Grace ES, Wenghofer EF, Korniek EJ. Predictors of Physician Performance on Competence Assessment: Findings From CPEP, the Center for Personalized Education for Physicians. *Academic Medicine*. 2014;89(6):912-919.
50. Chauvel N, Le Vaillant M, Pelletier-Fleury N. Variation in HbA1c prescription for patients with diabetes in French general practice: an observational study prior to the implementation of a P4P programme. *Eur J Public Health*. 2013;23(1):61-66.
51. Lipner R, Song H, Biester T, Rhodes R. Factors That Influence General Internists' and Surgeons' Performance on Maintenance of Certification Exams. *Academic Medicine*. 2011;86(1):53-58.
52. Beam CA, Conant EF, Sickles EA. Association of volume and volume-independent factors with accuracy in screening mammogram interpretation. *Journal of the National Cancer Institute*. 2003;95(4):282-290.
53. Caulford PG, Lamb SB, Kaigas TB, Hanna E, Norman GR, Davis DA. Physician incompetence: specific problems and predictors. *Academic Medicine*. 1994;69(10 Suppl):S16-18.
54. Norman GR, Davis DA, Caulford P, Kaigas T, Hanna E, Lamb S. Competency Assessment of Primary Care Physicians as Part of a Peer Review Program. *JAMA*. 1993;270(9):1046-1051.
55. Norman GR, Wenghofer E, Klass D. Predicting doctor performance outcomes of curriculum interventions: problem-based learning and continuing competence. *Medical Education*. 2008;42:794-799.
56. Wenghofer E, Klass D, Abrahamowicz M, et al. Doctor scores on national qualifying examinations predict quality of care in future practice. *Medical Education*. 2009;43(12):1166-1173.
57. Norton PG, Dunn EV, Soberman L. What Factors Affect Quality of Care? *Canadian Family Physician*. 1997;43:1739-1744.
58. McAuley RG, Paul WM, Morrison GH, Beckett RF, Goldsmith CH. Five-year results of the peer assessment program of the College of Physicians and Surgeons of Ontario. *Canadian Medical Association Journal*. 1990;143(11):1193-1199.
59. Weinberg E, Rooney JF. The Academic Performance of Women Students in Medical School. *Journal of Medical Education*. 1973;48:240-247.

60. Case SM, Becker DF, Swanson DB. Performance of Men and Women on NBME Part I and Part II: The More Things Change . . . Academic Medicine. 1993;68(10, October Supplement):S25-S27.
61. Shen L. Gender effects on student performance on the NBOME Part I, Part II, and Part III. Academic Medicine. 1994;69(10, October supplement):S75-S77.
62. Dawson-Saunders B, Iwamoto C, Postell LE, Nunguster RJ, Swanson DB. Initial investigation of differential performance by men and women on a national certification examination in medicine. Paper presented at: American Educational Research Association Annual Meeting 1990; Boston, MA.
63. Stillman PL, Regan MB, Swanson DB, Haley HL. Does gender affect clinical skills as measured by a multiple station examination using standardized patients? Paper presented at: Fourth Ottawa Conference on Assessing Clinical Competence; Current Developments in Assessing Clinical Competence 1990; Ottawa, Canada.
64. McClintock JC, Gravlee GP. Predicting success on the certification examinations of the American Board of Anesthesiology. Anesthesiology. 2010;112(1):212-219.
65. Rothman AI, Cohen R, Ross J, Poldre P, Dawson B. Station gender bias in a multiple-station test of clinical skills. Academic Medicine. 1995;70(1):42-46.
66. Cook RL, Wiesenfeld HC, Ashton M, Krone M, Zamborsky T, Scholle SH. Barriers to screening sexually active adolescent women for chlamydia: a survey of primary care physicians. J Adolesc Health. 2001;28:204-210.
67. Cyrus A, Moghimi M, Jokar A, et al. Model determination of delayed causes of analgesics prescription in the emergency ward in Arak, Iran. Korean Journal of Pain. 2014;27(2):152-161.
68. Jonassen JA, Mazor KM. Identification of physician and patient attributes that influence the likelihood of screening for intimate partner violence. Academic Medicine. 2003;78(10 Suppl):S20-23.
69. Taragin MI, Wilczek AP, Karns ME, Trout R, Carson JL. Physician demographics and the risk of medical malpractice. American Journal of Medicine. 1992;93(5):537-542.
70. Wickersham P, Morrison J. Physicians Disciplined by a State Medical Board. JAMA. 1998;279(23):1889-1893.
71. Alam A, Kurdyak P, Klemensberg J, Griesman J, Bell CM. The characteristics of psychiatrists disciplined by professional colleges in Canada. PLoS One. 2012;7(11):e173-e174.

72. Bismark MM, Spittal MJ, Gurrin LC, Ward M, Studdert DM. Identification of doctors at risk of recurrent complaints: a national study of healthcare complaints in Australia. *BMJ Qual Saf.* 2013;22(7):532-540.
73. Clay SW, Conatser RR. Characteristics of physicians disciplined by the State Medical Board of Ohio. *The Journal of the American Osteopathic Association.* 2003;103(2):81.
74. Morrison J, Morrison T. Psychiatrists disciplined by a state medical board. *The American Journal of Psychiatry.* 2001;158(3):474-478.
75. Ross LK, Fox PJ, Gould D, Kohatsu ND. Characteristics Associated With Physician Discipline: A Case-Control Study. *Archives of Internal Medicine.* 2004;164(6):653-658.
76. Donaldson LJ, Panesar SS, McAvoy PA, Scarrott DM. Identification of poor performance in a national medical workforce over 11 years: an observational study. *BMJ Qual Saf.* 2014;23(2):147-152.
77. Bismark MM, Spittal MJ, Studdert DM. Prevalence and characteristics of complaint-prone doctors in private practice in Victoria. *Med J Aust.* 2011;195(1):25-28.
78. Harms BA, Heise CP, Gould JC, Starling JR. A 25-year single institution analysis of health, practice, and fate of general surgeons. *Annals of Surgery.* 2005;242(4):520-526.
79. Baxter AD, Boet S, Reid D, Skidmore G. The aging anesthesiologist: a narrative review and suggested strategies. *Canadian Journal of Anesthesia.* 2014;61:865-875.
80. Khaliq AA, Dimassi H, Huang C-Y, Narine L, Smego RA. Disciplinary action against physicians: Who is likely to get disciplined? *The American Journal of Medicine.* 2005;118(7):773-777.
81. Wenghofer EF, Campbell C, Marlow B, Kam SM, Carter L, McCauley W. The effect of continuing professional development on public complaints: a case-control study. *Medical Education.* 2015;49:264-275.
82. Katlic MR, Coleman J. The Aging Surgeon. *Annals of Surgery.* 2014;260(2):199-201.
83. Tamblyn R, Abrahamowicz M, Dauphinee D, et al. Physician Scores on a National Clinical Skills Examination as Predictors of Complaints to Medical Regulatory Authorities. *JAMA.* 2007;299(9):993-1001.
84. Tamblyn R, Abrahamowicz M, Brailovsky C, et al. Association between licensing examination scores and resource use and quality of care in primary care practice. *JAMA.* 1998;280(11):989-996.
85. Tamblyn R, Abrahamowicz M, Dauphinee DW, et al. Association between licensure exam scores and practice in primary care. *JAMA.* 2002;288(23):3019-3026.

86. Papadakis MA, Hodgson CS, Teherani A, Kohatsu ND. Unprofessional behavior in medical school is associated with subsequent disciplinary action by a state medical board. *Academic Medicine*. 2004;79(3):244-249.
87. Shiroma PR, Alarcon RD. Selection factors among international medical graduates and psychiatric residency performance. *Academic Psychiatry*. 2010;34(2):128-131.
88. Nayer M, Rothman A. IMG candidates' demographic characteristics as predictors of CEHPEA CE1 results. *Canadian Family Physician*. 2013;59(2):170-176.
89. Andrew RF. How do IMGs compare with Canadian medical school graduates in a family practice residency program? *Canadian Family Physician*. 2010;56(9):e318-322.
90. Benson JA, Jr., Meskauskas JA, Grosso LJ. Performance of U.S. citizen-foreign medical graduates on certifying examinations in internal medicine. *American Journal of Medicine*. 1981;71(2):270-273.
91. Esmail A, Roberts C. Academic performance of ethnic minority candidates and discrimination in the MRCGP examinations between 2010 and 2012: analysis of data. *BMJ*. 2013;347(Online, 10 pages).
92. Falcone JL, Middleton DB. Performance on the American Board of Family Medicine Certification examination by country of medical training. *Journal of the American Board of Family Medicine: JABFM*. 2013;26(1):78-81.
93. Go PH, Klaassen Z, Chamberlain RS. An ERAS-based survey evaluating demographics, United States Medical Licensing Examination Performance, and research experience between American medical graduates and United States citizen international medical graduates: is the bar higher on the continent? *Journal of Surgical Education*. 2012;69(2):143-148.
94. Peitzman SJ, McKinley D, Curtis M, Burdick W, Whelan G. Performance of international medical graduates in techniques of physical examination, with a comparison of U.S. Citizens and non-U.S. citizens. *Academic Medicine*. 2000;75(10 Suppl):S115-117.
95. Glover Takahashi S, Rothman A, Nayer M, Urowitz MB, Crescenzi AM. Validation of a large-scale clinical examination for international medical graduates. *Canadian Family Physician*. 2012;58(7):e408-417.
96. van Zanten M, Boulet JR. Medical education in the Caribbean: a longitudinal study of United States Medical Licensing Examination performance, 2000-2009. *Academic Medicine*. 2011;86(2):231-238.
97. Blonski J, Rahm S. The relationship of residency performance to match status and US versus international graduate status. *Family Medicine*. 2003;35(2):100-104.

98. Kales HC, DiNardo AR, Blow FC, McCarthy JF, Ignacio RV, Riba MB. International medical graduates and the diagnosis and treatment of late-life depression. *Academic Medicine*. 2006;81(2):171-175.
99. Montgomery K, Lewis CE. AIDS-related educational preparation and needs of United States and foreign medical school graduates providing primary care in Los Angeles. *Medical Care*. 1991;29(9):926-931.
100. Grant WD. An individualized educational model for the remediation of physicians. *Archives of Family Medicine*. 1995;4(9):767-772.
101. Elkin K, Spittal MJ, Studdert DM. Risks of complaints and adverse disciplinary findings against international medical graduates in Victoria and Western Australia. *Med J Aust*. 2012;197(8):448-452.
102. Kilminster S, Zukas M, Quinton N, Roberts T. Preparedness is not enough: understanding transitions as critically intensive learning periods. *Medical Education*. 2011;45(10):1006-1015.
103. Kilminster S, Zukas M, Quinton N, Roberts T. Learning practice? Exploring the links between transitions and medical performance. *Journal of Health Organization and Management*. 2010;24(6):556-570.
104. Cave J, Woolf K, Jones A, Dacre J. Easing the transition from student to doctor: how can medical schools help prepare their graduates for starting work? *Med Teach*. 2009;31(5):403-408.
105. Hesketh EA, Allan MS, Harden RM, Macpherson SG. New doctors' perceptions of their educational development during their first year of postgraduate training. *Medical Teacher*. 2003;25(1):67-76.
106. Prince K, Van de Wiel M, Van der Vleuten C, Boshuizen H, Scherpbier A. Junior doctors' opinions about the transition from medical school to clinical practice: a change of environment. *Education for Health*. 2004;17(3):323-331.
107. Ryan C, Ross S, Davey P, et al. Junior doctors' perceptions of their self-efficacy in prescribing, their prescribing errors and the possible causes of errors. *Br J Clin Pharmacol*. 2013;76(6):980-987.
108. Bernabeo EC, Holtman MC, Ginsburg S, Rosenbaum JR, Holmboe ES. Lost in transition: the experience and impact of frequent changes in the inpatient learning environment. *Acad Med*. 2011;86(5):591-598.
109. Edwards J, MacDonald J, Merriman H. Returners as learners: a different species? A qualitative study. *Education for Primary Care*. 2007;18(3):354-363.

110. Phipps DL, Noyce PR, Walshe K, Parker D, Aschcroft DM. Risk Assessment in Pharmacy Practice. Manchester, UK: Royal Pharmaceutical Society of Great Britain;2010.
111. Frank JR, Mungroo R, Ahmad Y, Wang M, de Rossi S, Horsley T. Toward a definition of competency-based education in medicine: a systematic review of published definitions. *Medical Teacher*. 2010;32(8):631-637.
112. Frank JR, Snell LS, Ten Cate O, et al. Competency-based medical education: theory to practice. *Medical Teacher*. 2010;32:638-645.
113. Epstein RM, Hundert EM. Defining and assessing professional competence. *JAMA*. 2002;287(2):226-235.
114. Wenghofer EF, Williams AP, Klass DJ. Factors Affecting Physician Performance: Implications for Performance Improvement and Governance. *Healthcare Policy*. 2009;5(2).
115. Royal College of Physicians and Surgeons of Canada. CanMEDS 2005 Framework. Ottawa: Royal College of Physicians and Surgeons of Canada;2005.
116. Glover Takahashi S, Richardson DL, Martin D. The CanMEDS Collaborator Toolkit. Ottawa, ON: RCPSC; 2012.
117. Glover Takahashi S, Herold J, Nayer M, Bance S. The epidemiology of competence: protocol for a scoping review. *BMJ Open*. 2014;4:e006129.
118. Frank JR, Snell LS, Sherbino J, eds. Draft CanMEDS 2015 Milestones Guide – September 2014. Ottawa: The Royal College of Physicians and Surgeons of Canada; 2014.
119. Dreyfus H, Dreyfus S. *Mind over machine: the power of human intuition and expertise in the era of the computer*. New York: Free Press; 2000.
120. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *Int J Soc Res Methodol*. 2005;8:19-32.

Appendices

Appendix 1: Key Terms

The Cs of Competence

Competence is viewed as multi-dimensional and dynamic ¹¹¹; changing with time, experience, and context ¹¹²; and relating to the standards required to perform one's role(s) at the minimum level expected for a given profession ¹¹³. The multi-dimensional elements of competence include capability, competencies, context of practice, and continuum of practice ¹¹⁴.

Capability refers to the personal "raw materials," such as intellectual/cognitive functioning, physical ability, and psychological health ¹¹⁴. This dimension can vary with time and circumstances. For example, a physician might have a new progressive neurological condition, an acute depressive episode, a fractured hand, a substance abuse disorder that affects current performance or functionality, or be fatigued due to prolonged service with resulting impairment of decision making or motor skills.

Competencies are the observable abilities of healthcare professionals ¹¹³. For example, the key competencies and enabling competencies in the CanMEDS Framework identify the knowledge, skills, and attitudes that physicians require to perform competently ¹¹⁵.

Context of practice includes the types of patients and their problems; the location of work or practice (i.e. clinic, operating room, community); and the infrastructure that does or doesn't support competence (e.g. pharmacy formulary, legal systems, information systems, electronic medical records, quality monitoring systems, peer/mentor access or systems) ¹¹⁴. The elements of an individual's context of practice are interrelated and have an impact on competence ¹¹⁴.

Continuum of practice refers to both the evolution of expertise (i.e. student, novice, competent, proficient, expert) and the life cycle of the professional (i.e. student, field-based novice, independent professional, retirement) ^{113,114}.

Competence life cycle stages are the distinct phases of development that healthcare providers transition through in their respective professional lives ¹¹⁶⁻¹¹⁹. The life cycle stages studied here are field-based education, physician residency or graduate medical education, and practice

Additional Key Terms

Dyscompetence means less than fully competent and may reflect a temporary situation (e.g. dyscompetence due to severe fatigue or anxiety) or a new status due to decline of knowledge, skills or abilities. This term is more accurate than “incompetent.” (For a more fulsome description of the coding please refer to *What Ontario Physiotherapist Data Says about Risks to Competence*, which is a companion document to this Overview Report)

Definitions and Descriptions for Epidemiology of Competence Terms

Area	Risk/Support Category	Description
A. Type of health profession	Physician	One of 4 health professions in study. Other words for this profession include "doctor" and "medical doctor." Refers to individuals at any stage of the physician competence life cycle (e.g. medical student, resident, practising physician).
	Other health professions (e.g. dentists and nurses)	Other health professions were only included when the study also discussed one or more of the 4 professions of primary interest.
	Pharmacist	One of 4 health professions in study.
	Occupational Therapist	One of 4 health professions in study.
	Physiotherapist	One of 4 health professions in study. Another word for this profession is "physical therapist."
B. Competence life cycle	Practice	Working in the health field as an autonomous practitioner.
	Resident	Post-professional education of physicians, called residency education or graduate medical education, leading towards a certification or specialty designation. If education of another profession was not post-professional, it was considered field-based education.
	Field-based education	The practical education of one or more of the health professions of interest. Includes clinical-based training for physiotherapists and clerkship or internship education for physicians.
	Other	Articles where the competence life cycle was not specifically mentioned.
C. CanMEDS Role(s)	Medical Expert	Demonstrating clinical knowledge, skills, and abilities required for effective patient care.
	Communicator	Communicating with patients and providing appropriate written documentation.
	Professional	Demonstrating ethical practice, high personal standards of behaviour, accountability to the profession and society, profession-led regulation, and maintenance of personal health.
	Scholar	Demonstrating commitment to life-long learning, utilizing evidence-informed decision making, teaching, and research.
	Collaborator	Working effectively with other health professions, including teamwork, managing differences, and resolving conflict.
	Manager	Managing time, resources, and priorities, including supervision of learners.
	Health Advocate	Advocating for care or services for individual patients, the community or the patient population.
D. Risks to competence	Transitions	Dyscompetence or differences in performance associated with change(s) in work or professional status, in focus of practice, and/or changes experienced by new graduates.
	International graduate	Dyscompetence or differences in performance associated with health professionals that were educated in a different country than where the study took place.
	Lack of clinical exposure/experience	Dyscompetence or differences in performance associated with knowledge/competence gaps in certain clinical areas arising from insufficient volume of procedures and insufficient volume of patients

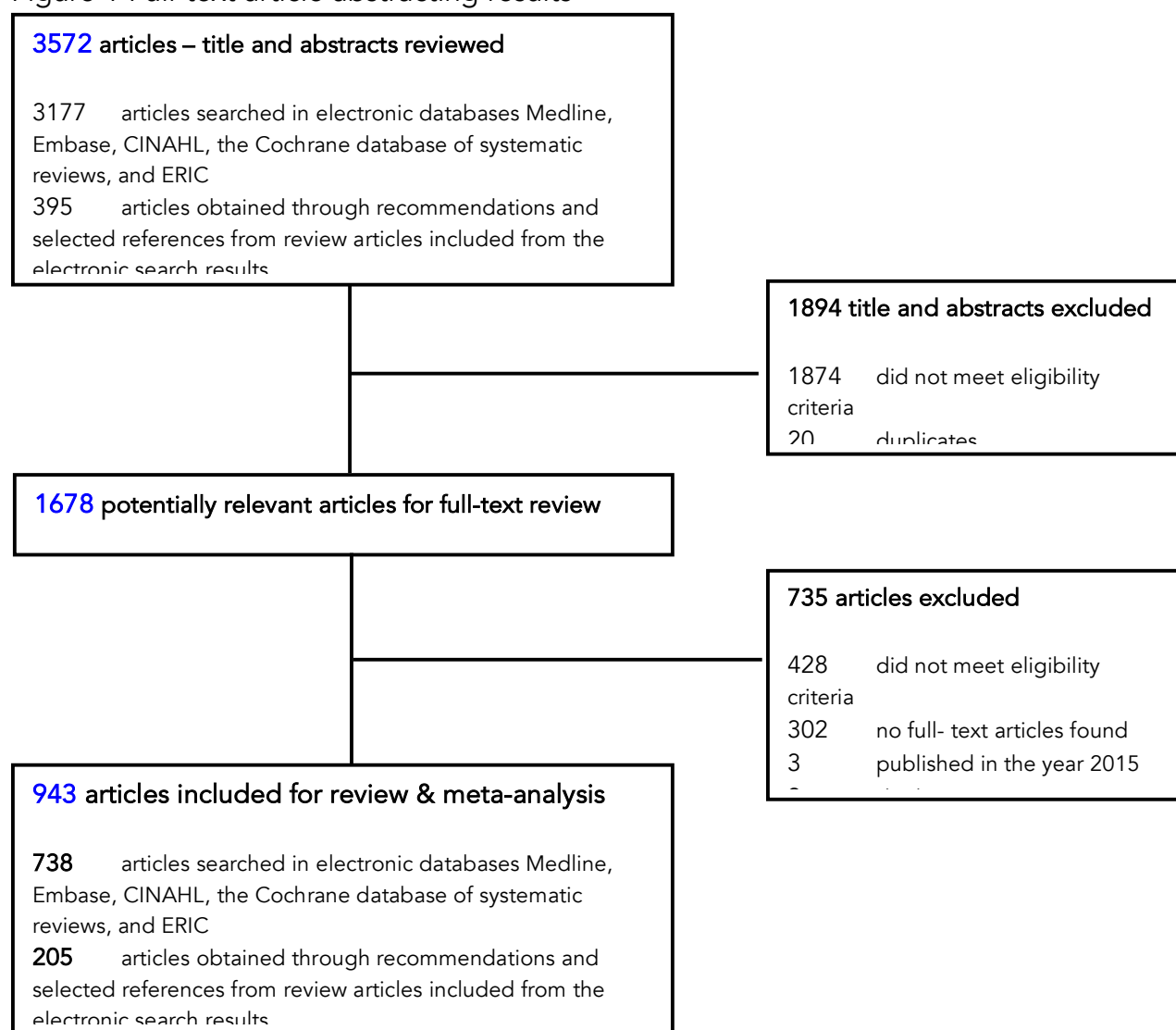
Area	Risk/Support Category	Description
		with a particular condition to attain or maintain competence.
	Age	Dyscompetence or differences in performance associated with the person's age, including youth and older age.
	Gender	Dyscompetence or differences in performance between males and females.
	Practice features	Dyscompetence or differences in performance associated with geographic or office features of the practice.
	No certification	Dyscompetence or differences in performance associated with presence/absence of specific specialty certification.
	Personal Wellness	Dyscompetence or differences in performance associated with physical or mental health-related issues.
	Resources	Dyscompetence or differences in performance associated with resources, including people, money, and time.
	Adequacy of practice or education	Dyscompetence or differences in performance associated with a previous educational program that did not adequately prepare learners with particular skills or with specific knowledge due to brevity or low quality.
	Area of specialty/certification	Specialty or certification-based variations in dyscompetence. Certification and specialty are often used interchangeably.
	Previous disciplinary activity	Impact of previous complaint or discipline matter by a regulatory authority, specialty organization, or health facility on dyscompetence.
	Other	Differences related to risks to competence not included in the higher-volume defined topics.
E. Supports to competence	Continuing education participation	Involvement in an educational activity such as a course, workshop, or conference during the practice competence life cycle (i.e. post-specialty/ program-specific training).
	Educational information/ program features	Actions or interventions included in a pre-existing educational program that are designed to improve the learning, knowledge translation, and application of the material.
	Personal support and feedback	Mentorship and feedback provided or available to individuals to inform or improve clinical skills and/or knowledge.
	Clinical exposure/experience	Time spent in specific rotations or at specific clinical sites, with a particular patient/client population.
	Quality assurance participation	Formal activities within a structured organizational quality assurance program, in the workplace.
	Support through structure or organization	Employer- or site-specific structures or processes that develop or maintain individual or professional competence.
	Professional organization participation/systems	Mandatory participation in formal personal activities to develop or maintain competence as established through regulatory, association, or specialization requirements.
	Technology	Mechanical or electronic means to develop or maintain competence via simulation, eLearning opportunities, and electronic decision-support rules.
	Reflection and self-assessment	Approaches to developing or maintaining competence that include introspection, personal analysis, and consideration of adequacy of competence or demonstration of competence.

Area	Risk/Support Category	Description
	Assessment and feedback through tools	Approaches that employed a specific tool to measure professional competencies, to determine the adequacy of performance and/or to provide information and motivation for improvement.
	Performance review	A formal or structured work-based process whereby a practitioner is provided with information on the adequacy of performance and/or provided with information and motivation for improvement. This information is generally formative and designed to assist in performance improvement.
	Other	Approaches to developing or maintaining competence not included in other high-volume defined topics.

Appendix 2: Summary of Methodology

For the study, *Understanding the Risks and Supports to the Competence of Health Professions with a Focus on Physiotherapists*, we conducted a scoping review that started with over 3500 articles reviewed and over 943 articles fully analyzed following the criteria outlined by Arksey and O'Malley¹²⁰ and our published protocol¹¹⁷. Following the scoping review, we did a more detailed qualitative analysis of the 35 PT papers. We employed multiple quality assurance processes, including the calibration of reviewers involved in abstracting, coding, or analysis. Written protocols were used and abstracting information was collected through an online form. There were quality checks at each step, consultation on discrepancies, cross-checking between qualitative and quantitative data, and consensus decisions on methodology, thematic analysis, and summaries.

Figure 1 Full-text article abstracting results



For the study *What Physiotherapist Data Says about Risks to Competence*, the research questions were:

- To what extent do those who have incidents/concerns illustrate risks to competence found in the literature, and to what extent are each of the modifiable risks to competence and non-modifiable risks to competence factors in a physiotherapist's competence?
- Are registrants with an incident or concern about competence in one area more or less likely to have repeats in the same area or another area?
- Does this physiotherapist (PT) data tell us anything about supports to competence?

The CPO provided the following data sets:

1. Full electronic registration database about 11,340 physiotherapists; this included approximately 8500 of those who are currently registered and others who are no longer registered, but for whom a record exists in the electronic database.
2. Exam data set from the Canadian Alliance of Physiotherapy Regulators, with the exam results for all Ontario registrants who had taken the Physiotherapy Competency Examination from 1994 to 2015.
3. Quality Assurance (QA) database for years 2004–2015
4. Practice Enhancement Required letters from the QA assessments
5. QA completed with recommendation letters from the QA assessments
6. Notice of Intent to Suspend data for years 2004–2015
7. Non-compliance with Jurisprudence data for years 2005–2015
8. Inquiries, Complaints, Reports Committee Decisions for years 2009–2014 where the outcome was anything other than no further action.

Following coding, all datasets were combined into a single database and analyzed in SPSS v. 23. Simple statistics (e.g. frequencies, means, and standard deviations) were calculated when appropriate. Cross-tabulations and Chi-Squared statistics were generated to compare the percentages of different categories of registrants with respect to the different assessment tools. This involved considering the categories (e.g. men and women, Internationally Education Physiotherapists [IEPTs] and Canadian graduates, country of graduation, and age categories) and the number and percent in each category who met certain criteria (e.g. received one or more NIS, had one or more incomplete Jurisprudence activities, pass/fail status on the PCE, investigations, or results in the Practice Assessment). Pearson correlation coefficients were calculated to determine relationships between continuous risk factor variables (e.g., exam score and age).

As with the other study, we included quality checks at each step, consultation on discrepancies, cross-checking between qualitative and quantitative data, and consensus decisions on methodology, thematic analysis, and summaries.

Appendix 3: **Physiotherapy** References

Abraham-Justice, K., M. Wolff-Burke and A. Fergus (2008). "The utilization of manipulation by first professional physical therapy students and clinicians: an analysis of influential factors. 2008 Combined Sections Meeting. Nashville, Tennessee, February 6-9, 2008." Journal of Orthopaedic & Sports Physical Therapy **38**(1): A48-49.

Ahuja, D. (2011). "Continuing professional Development within Physiotherapy Special Perspective." Journal of Physical Therapy **3**(1): 4-8.

Aldridge, R. L., Jr., B. Keith, S. Sloas and A. Mott-Murphree (2010). "Relationship of the Nelson Denny Reading Test to scores on the National Physical Therapy Licensure Examination." Journal of Allied Health **39**(2): 72-75.

Andersson, E. P. (2001). "Continuing Education in Sweden — To What Purpose?" Journal of Continuing Education in Nursing **32**(2): 86-93.

Banks, K., A. Meaburn and E. Phelan (2013). "Do the clinical competencies of musculoskeletal outpatient physiotherapists improve after they have participated in a bespoke in-service education programme designed around individual and service continuing professional development needs?" Journal of Allied Health **42**(1): 33-39.

Bekkering, G. E., A. J. Engers, M. Wensing, H. J. Hendriks, M. W. van Tulder, R. A. Oostendorp and L. M. Bouter (2003). "Development of an implementation strategy for physiotherapy guidelines on low back pain." Australian Journal of Physiotherapy **49**(3): 208-214.

Beling, J. (2003). "Effect of service-learning on knowledge about older people and faculty teaching evaluations in a physical therapy class." Gerontology & Geriatrics Education **24**(1): 31-46.

Bergkamp, D., J. Lenk, M. Reynolds, K. Hallacy, J. G. Ward, S. D. Helmer and J. M. Haan (2013). "Effectiveness of a burn rehabilitation workshop addressing confidence in therapy providers." Journal of Burn Care & Research **34**(1): e10-14.

Bernhardt, J., P. J. Bate and T. A. Matyas (2001). "Training novice clinicians improves observation accuracy of the upper extremity after stroke." Archives of Physical Medicine & Rehabilitation **82**(11): 1611-1618.

Bourne, J. A., K. Dziedzic, S. J. Morris, P. W. Jones and J. Sim (2007). "Survey of the perceived professional, educational and personal needs of physiotherapists in primary care and community settings." Health & Social Care in the Community **15**(3): 231-237.

Bucciarei, K. M., S. E. Pivko and D. L. Olzenak (2011). "How does a physical therapist acquire the skills of an expert clinical instructor?" Journal of Physical Therapy Education **25**(2): 17-25.

Caldwell, K., K. Coleman, G. Copp, L. Bell and F. Ghazi (2007). "Preparing for professional practice: how well does professional training equip health and social care practitioners to engage in evidence-based practice?" Nurse Education Today **27**(6): 518-528.

Chipchase, L. S., V. Johnston and P. D. Long (2012). "Continuing professional development: the missing link." Manual Therapy **17**(1): 89-91.

Cleland, J., J. Fritz, G. P. Brennan and J. S. Magel (2009). "Does continuing education improve physical therapists' effectiveness in treating neck pain: a randomized clinical trial." Journal of Orthopaedic & Sports Physical Therapy **39**(1): A95-A95.

Cole, B. and J. Wessel (2008). "How clinical instructors can enhance the learning experience of physical therapy students in an introductory clinical placement." Advances in Health Sciences Education **13**(2): 163-179.

Constantine, M. and C. Carpenter (2012). "Bringing Masters' level skills to the clinical setting: what is the experience like for graduates of the Master of Science in manual therapy programme?" Physiotherapy Theory & Practice **28**(8): 595-603.

Crandell, C. E., M. R. Wiegand and J. A. Brosky, Jr. (2013). "Examining the role of service-learning on development of professionalism in doctor of physical therapy students: a case report." Journal of Allied Health **42**(1): e25-32.

Dando, N., L. d'Avray, J. Colman, A. Hoy and J. Todd (2012). "Evaluation of an interprofessional practice placement in a UK in-patient palliative care unit." Palliative Medicine **26**(2): 178-184.

Demmelmaier, I., E. Denison, P. Lindberg and P. Asenlof (2012). "Tailored skills training for practitioners to enhance assessment of prognostic factors for persistent and disabling back pain: four quasi-experimental single-subject studies." Physiotherapy Theory & Practice **28**(5): 359-372.

Dures, E., S. Hewlett, N. Ambler, R. Jenkins, J. Clarke and R. Gooberman-Hill (2014). "Rheumatology clinicians' experiences of brief training and implementation of skills to support patient self-management." BMC Musculoskeletal Disorders **15**: 108.

Evans, D. W., A. C. Breen, T. Pincus, J. Sim, M. Underwood, S. Vogel and N. E. Foster (2010). "The effectiveness of a posted information package on the beliefs and behavior of musculoskeletal practitioners: the UK Chiropractors, Osteopaths, and Musculoskeletal Physiotherapists Low Back Pain Management (COMPLeMENT) randomized trial." Spine **35**(8): 858-866.

Fruth, S. J., R. D. Van Veld, C. A. Despos, R. D. Martin, A. Hecker and E. E. Sincroft (2010). "The influence of a topic-specific, research-based presentation on physical therapists' beliefs and practices regarding evidence-based practice." Physiotherapy Theory & Practice **26**(8): 537-557.

Gobet, F. and J. L. Borg (2011). "The intermediate effect in clinical case recall is present in musculoskeletal physiotherapy." Manual Therapy **16**(4): 327-331.

Hendrick, P., C. Bond, E. Duncan and L. Hale (2009). "Clinical reasoning in musculoskeletal practice: students' conceptualizations." Physical Therapy **89**(5): 430-442.

Lazaro, R. T. and D. A. Umphred (2007). "Improving cultural diversity awareness of physical therapy educators." Journal of Cultural Diversity **14**(3): 121-125.

- Learman, K. E., A. R. Ellis, A. P. Goode, C. Showalter and C. E. Cook (2014). "Physical therapists' clinical knowledge of multidisciplinary low back pain treatment guidelines." Physical Therapy **94**(7): 934-946.
- Long, T. M. and D. F. Perry (2008). "Pediatric physical therapists' perceptions of their training in assistive technology." Physical Therapy **88**(5): 629-639.
- Meuser, T. M., D. B. Carr, C. Irmiter, J. G. Schwartzberg and G. F. Ulfarsson (2010). "The American Medical Association Older Driver Curriculum for Health Professionals: Changes in Trainee Confidence, Attitudes, and Practice Behavior." Gerontology & Geriatrics Education **31**(4): 290-309.
- Naylor, S., M. Norris and A. Williams (2014). "Does ethnicity, gender or age of physiotherapy students affect performance in the final clinical placements? An exploratory study." Physiotherapy **100**(1): 9-13.
- Normann, B., K. W. Sorgaard, R. Salvesen and S. Moe (2014). "Clinical guidance of community physiotherapists regarding people with MS: professional development and continuity of care." Physiotherapy Research International **19**(1): 25-33.
- Reeves, S., D. Freeth, P. McCrorie and D. Perry (2002). "'It teaches you what to expect in future . . . ': interprofessional learning on a training ward for medical, nursing, occupational therapy and physiotherapy students." Medical Education **36**(4): 337-344.
- Sellars, J. and L. Clouder (2011). "Impact of the Accreditation of Clinical Educators scheme: reflections from one higher education institution." Physiotherapy **97**(4): 339-344.
- Thomson, D., B. Steward and B. Richardson (2008). "How a team of physiotherapists negotiated the impact of current healthcare policies on their practice: The CHAI visit." Advances in Physiotherapy **10**(1): 21-30.
- Van Peppen, R. P., M. J. Schuurmans, E. C. Stutterheim, E. Lindeman and N. L. Van Meeteren (2009). "Promoting the use of outcome measures by an educational programme for physiotherapists in stroke rehabilitation: a pilot randomized controlled trial." Clinical Rehabilitation **23**(11): 1005-1017.
- Wickford, J., I. Edwards and S. Rosberg (2012). "A transformative perspective on learning and professional development of Afghan physiotherapists." Physiotherapy Theory & Practice **28**(4): 269-282.