Barriers and Facilitators to Self-Directed Learning in Continuing Professional Development for Physicians in Canada: A Scoping Review
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Abstract

Purpose
This scoping review explored the barriers and facilitators that influence engagement in and implementation of self-directed learning (SDL) in continuing professional development (CPD) for physicians in Canada.

Method
This review followed the six-stage scoping review framework of Arksey and O'Malley and of Daudt et al. In 2015, the authors searched eight online databases for English-language Canadian articles published January 2005–December 2015. To chart and analyze data from the 17 included studies, they employed a two-step analysis process composed of conventional content analysis followed by directed coding applying the Theoretical Domains Framework (TDF).

Results
Conventional content analysis generated five categories of barriers and facilitators: individual, program, technological, environmental, and workplace/organizational. Directed coding guided by the TDF allowed analysis of barriers and facilitators to behavior change according to two key groups: physicians engaging in SDL, and SDL developers designing and implementing SDL programs. Of the 318 total barriers and facilitators coded, 290 (91.2%) were coded for physicians and 28 (8.8%) for SDL developers. The majority (209; 65.7%) were coded in four key TDF domains: environmental context and resources, social influences, beliefs about consequences, and behavioral regulation.

Conclusions
This scoping review identified five categories of barriers and facilitators in the literature and four key TDF domains where most factors related to behavior change of physicians and SDL developers regarding SDL programs in CPD were coded. There was a significant gap in the literature about factors that may contribute to SDL developers’ capacity to design and implement SDL programs in CPD.

In recent years, there has been a shift in physicians’ professional development from an approach focused on medical-centric, individualist teaching and learning toward a broader model of continuing professional development (CPD). CPD is composed of diverse educational and developmental activities that address multiple aspects of physician competencies. In Canada, this shift is reflected in the CanMEDS 2015 Physician Competency Framework, where learning needs relevant to advancing expertise and maintenance of competency are largely addressed through self-assessment and engagement in CPD. Given the demands for greater physician accountability, it is becoming ever more important to employ CPD strategies to enhance physician competence.

Self-directed learning (SDL) is a learning process considered to be one of the most appropriate strategies within CPD for physicians to remain current with new evidence and maintain their competency. It is defined by the Royal College of Physicians and Surgeons of Canada as “activities planned to address specific needs, enhance awareness of new evidence potentially relevant to practice or enhance the quality of multiple systems.” SDL is now one of the requirements set by Canadian and international professional and regulatory associations for medical board certification and maintenance of certification (MOC). Concomitantly, it is necessary for stakeholders and developers of accredited CPD programs to incorporate more SDL initiatives into their educational activities.

The effectiveness of SDL likely depends on many factors, including learners’ characteristics, external sources, and the learning environment (e.g., culture and context). Previous studies have identified strategies addressing each of these broad factors for successful outcomes in SDL, such as dedicated time, creation of accountability, goal generation through mentorship, and external assessments. However, to our knowledge, there is no dedicated review in the current literature that has systematically investigated and identified the barriers and facilitators to implementing and engaging in SDL in CPD for physicians in Canada, or in other settings. Such a review examining the barriers and facilitators that influence physicians’ engagement in SDL may help CPD program developers design and implement successful SDL programs that integrate the CanMEDS 2015 framework and that could result in measurable and sustained changes to clinical practice. Therefore, within an overarching
project assessing the scope and nature of CanMEDS-related SDL activities in CPD in Canada, we conducted this scoping review which focused on exploring the barriers and facilitators that influence physicians’ engagement in, and SDL developers’ design and implementation of, SDL programs in CPD in Canada.

Method

Approach

A scoping review is a type of literature review that examines the breadth, depth, and nature of a body of research.15 While a scoping review uses a rigorous and transparent methodology to systematically identify and analyze the literature in a given area,16 it does not synthesize quantitative findings nor does it assess the quality of the literature.17 Rather, a scoping review aims to provide a summative map of the existing literature in a given field. The purpose of conducting a scoping review is to identify knowledge gaps, to inform research agendas, and to identify implications for policy and decision making within a multidisciplinary field where different types of study designs can be found.18 Hence, scoping reviews are designed to investigate complex and multidisciplinary topics where evidence is still emerging.15,19,20

As many studies around SDL and CPD are multidisciplinary and the study designs are varied, we selected a scoping review as the most appropriate methodology for this study. To answer our research question (see below) in a methodologically rigorous way, we followed the six-stage scoping review framework proposed by Arksey and O’Malley21 and refined by Daudt et al21: (1) identify relevant studies; (2) study selection; (3) chart data; (4) collate, summarize, and report the results; and (6) consult with an expert panel.

Identifying the research question

Within the context of the larger project addressing the scope and nature of SDL activities in CPD in Canada related to the CanMEDS 2015 Physician Competency Framework,2 this scoping review focused on the following research question: “What are the barriers and facilitators to SDL in CPD in Canada?” Accordingly, the objective of this scoping review was to gather a comprehensive dataset detailing the current barriers and facilitators to physicians’ engaging in, and SDL developers’ designing and implementing, SDL programs within CPD.

Identifying relevant studies: Search strategy

From March to December 2015, we searched the electronic databases Ovid MEDLINE, PsycINFO, PubMed, EdSource, ERIC, Academic Search Complete, Engineering Village, and Web of Science Core Collection. The search query consisted of terms related to three core topic areas (SDL, physicians, CPD) and the Canadian setting. The specific search terms, which were identified through input from the research team and an experienced information scientist, are provided in Supplemental Digital Appendix 1 at http://links.lww.com/ACADMED/A547. The search was limited to English-language, scholarly articles published from January 2005 through December 2015.

Article screening and selection

We employed a two-stage screening process to identify the articles most relevant to the research question.

Stage 1. For the first stage of screening, three authors (D.N., K.S., C.M.) independently reviewed the titles and abstracts of the 1,364 articles identified in the database searches. The reviewers excluded all nonresearch and nonreview articles including editorials, commentaries, and letters to the editor. A total of 429 articles were excluded, and 935 articles underwent a full-text review. Articles were excluded from the dataset upon full-text review if they did not clearly draw on or comment on the processes of SDL as it pertains to CPD for physicians. Following full-text review, a total of 90 relevant articles were identified.

Stage 2. While the first stage of screening aimed to identify all the articles pertaining to SDL in CPD, the second stage further refined the dataset to reflect our specific research question. For stage 2, one reviewer (R.E.) independently reviewed the titles and abstracts of the 90 articles and an additional 9 articles identified through a manual reference list search. After this screening, 37 relevant articles underwent full-text review; of those articles, 20 were excluded (Figure 1). Reasons for exclusion at this stage included the following:

• article did not focus on SDL;
• article did not mention barriers to and/or facilitators of SDL;
• article was not based in the Canadian setting; or
• article did not focus on physicians and/or medical residents.

The final dataset included 17 articles.1,22–37

Data charting and analysis

Article characteristics such as publication year, publication type, research paradigm, and article source were charted for each of the 17 articles. An article was considered to be empirical research if it was original primary research (qualitative, quantitative, or mixed methods) that contained sections recognizable as the introduction, methods, results, and discussion.38 An article was considered to be a review if it examined a collection of published material in the literature.39 Data were charted using a Microsoft Excel spreadsheet (Microsoft Excel for Mac, version 15.30; Microsoft Corp., Redmond, Washington).

We employed a two-step analysis process to identify barriers and facilitators to SDL in CPD in Canada for physicians and SDL developers. The first step consisted of a conventional content analysis approach.40 The second step consisted of a directed coding approach,40 using a theoretical framework to guide the coding of the charted data from the first step.

In the first step of the analysis, we inductively generated five categories directly from the text data, reflecting the levels at which the barriers/facilitators were identified. The definitions that we employed for each of these categories are provided in Supplemental Digital Appendix 2 at http://links.lww.com/ACADMED/A547. Next, two coders (D.J., R.E.) independently read and charted four articles according to these five categories. Extracted data were compared, and disagreements (generally consisting of misunderstanding of context) were easily resolved. Then, these coders each read and charted half the remaining articles. After this step, there remained an open question
of how the barriers and facilitators at these identified levels might affect physician engagement in SDL in CPD.

In the second step of the analysis, we used the Theoretical Domains Framework (TDF) to identify the more specific behavioral factors that may act as barriers and facilitators in implementing and engaging in SDL programs in CPD. The TDF is a comprehensive framework composed of 12 domains that synthesize 128 explanatory constructs drawing on 33 psychological theories associated with clinical behavior change. It has been validated as a method for assessing and identifying barriers and facilitators to program implementation. To date, the TDF has been used to identify barriers and facilitators to behavior change in health care professionals, to ascertain implementation problems, and to inform the development of interventions focused on addressing identified barriers and facilitators. The potential of applying the TDF to synthesize evidence in systematic reviews and to guide the development and implementation of behavior change interventions has been previously highlighted. To our knowledge, this is the first use of the TDF to guide a directed coding process in a scoping review related to SDL in CPD for medical professionals.

To code the charted data, we developed a coding manual based on the 12 TDF domains: knowledge; skills; social/professional role and identity; beliefs about capabilities; beliefs about consequences; motivation and goals; memory, attention, and decision processes; environmental context and resources; social influences; emotion; behavioral regulation; and nature of the behavior. As barriers and facilitators can be perceived and experienced differently by SDL developers and physicians, we coded barriers and facilitators related to behavior change into the TDF domains according to two units of analysis: (1) SDL developer (barriers/facilitators to designing/implementing the SDL program) and (2) physician (barriers/facilitators to using/engaging in the SDL program). We coded barriers and facilitators not related to behavior change as “non-TDF.”

Figure 1 Flowchart of second stage of article screening.

For quality assurance purposes, we followed Reeves and colleagues’ protocol for two or more independent reviewers with quality checks from a third party. Two coders (D.J., R.E.) independently coded the charted data from four articles using the coding manual, then compared charted data to resolve any discrepancies. The remaining articles were divided equally between the two coders (D.J., R.E.). Throughout the coding process, the research team (D.J., R.E., S.K.) and the expert in using the TDF (J.P.) met frequently to review and discuss the results. We determined the key TDF domains based on the numbers of times barriers and facilitators were coded under each domain. Guided by qualitative research studies using the TDF as the basis for analysis, we also identified the most frequently cited barriers and facilitators in the articles to better illustrate the relevance of each domain.

Consulting with an expert panel
Members of the research team overseeing the overarching project—experts in CPD (K.S., F.L., S.K.), scoping review methodology (S.K.), and using the TDF (J.P.)—were involved in the ongoing consultation for this study.

Results
Characteristics of included studies
All 17 articles included in this review originated from Canada and focused on physicians. Less than 4 articles were published each year between 2005 and 2015. The majority of the articles were classified as empirical research (n = 9; 52.9%), with the remaining articles classified as reviews (n = 8; 47.1%). Among empirical research articles, more than half (n = 5) employed a mixed-methods analysis of some type of qualitative data (e.g., interviews) combined with quantitative results (e.g., quantitative measurement of intention to participate in a CPD program). Table 1 summarizes the characteristics and publication sources of the included articles.

Barriers and facilitators to SDL in CPD for physicians and SDL developers in Canada
Inductive categories. Five categories of barriers and facilitators were generated
Table 1
Characteristics of the 17 Articles Included in the Scoping Review on SDL in CPD for Physicians in Canada, 2005–2015

| Characteristic                              | Articles, no. (%) |
|---------------------------------------------|-------------------|
| **Publication year (n = 17)**               |                   |
| 2005                                        | 2 (11.9)          |
| 2007                                        | 3 (17.6)          |
| 2008                                        | 3 (17.6)          |
| 2009                                        | 1 (5.9)           |
| 2012                                        | 3 (17.6)          |
| 2013                                        | 3 (17.6)          |
| 2014                                        | 1 (5.9)           |
| 2015                                        | 1 (5.9)           |
| **Publication type (n = 17)**               |                   |
| Empirical research¹                          | 9 (52.9)          |
| Review²                                      | 8 (47.1)          |
| **Research paradigm (n = 9)⁴**              |                   |
| Qualitative                                 | 2 (22.2)          |
| Quantitative                                | 2 (22.2)          |
| Mixed methods                               | 5 (55.6)          |
| **Publication source (n = 17)**             |                   |
| Journal of Continuing Education in the Health Professions | 10 (58.8) |
| Medical Teacher                             | 2 (11.8)          |
| Advances in Health Sciences Education       | 1 (5.9)           |
| BMC Medical Education                       | 1 (5.9)           |
| Canadian Family Physician                   | 1 (5.9)           |
| Canadian Respiratory Journal                | 1 (5.9)           |
| Journal of Innovation in Health Informatics | 1 (5.9)           |

Abbreviations: SDL indicates self-directed learning; CPD, continuing professional development.
¹Defined as original primary research that contained sections recognizable as the introduction, methods, results, and discussion.
⁴Defined as an article that examined a collection of published material in the literature.
²In articles classified as empirical research.

Table 1 reports the number of times barriers and facilitators were coded in each domain for SDL developers and for physicians, as well as the number of articles in which each domain was coded.

Through a conventional content analysis, focusing on the levels at which the barriers/facilitators are perceived to occur: individual, program, technological, environmental, and workplace/organizational. Individual barriers (n = 14; 82.3%) and program facilitators (n = 12; 70.6%) were coded in most articles. Supplemental Digital Appendix 3 (available at http://links.lww.com/ACADMED/A547) shows the number of articles reporting barriers and facilitators in each inductively generated category (eTable1) as well as complete lists of barriers and facilitators reported in the dataset by category (eTables 2 and 3).

**TDF domains.** In the second step of analysis, the charted barriers and facilitators were coded according to the 12 TDF domains and identified as barriers/facilitators to the behavior of physicians or SDL developers. Table 2 reports the number of times barriers and facilitators were coded in each domain for SDL developers and for physicians, as well as the number of articles in which each domain was coded.

In total, the barriers and facilitators were coded 318 times in the 17 articles: Barriers were coded 133 times (41.8%), and facilitators were coded 185 times (58.2%). They were most frequently coded in the environmental context and resources domain (86 times, 27.0%), and facilitators were coded 290 times (91.2%). Supplemental Digital Appendix 4 (available at http://links.lww.com/ACADMED/A547) provides the complete list of barriers and facilitators identified in the articles were coded: environmental context and resources (27.0%), social influences (23.0%), beliefs about consequences (8.8%), and behavioral regulation (6.9%).

Table 3 presents the specific barriers and facilitators that potentially influence the behavior change of physicians taking part in SDL programs in CPD by the four key domains as well as the frequency of their mention in the articles. Barriers and facilitators that may affect physician behavior were most frequently coded in the environmental context and resources domain, followed by the social influences domain. On the basis of these findings, the highest number of barriers was reported in the environmental context and resources domain; these included time constraints, limited access to tools/programs, competing demands/interests, cost, technological problems, and lack of faculty with expertise and experience in team training. The highest number of facilitators was reported in the social influences domain; these included teamwork/collaborative work/interactivity/networking; helpful facilitators, experts, and presenters; managerial and peer enthusiasm/recommendation from college; peer-to-peer training; and administrative and organizational support for SDL.

Table 4 presents the specific barriers and facilitators that potentially influence the behavior change of SDL developers in implementing SDL programs in CPD in three of the four key domains as well as the frequency of their mention in the articles. No barriers or facilitators were coded in the beliefs about consequences domain. This may be due to the direct relationship of this domain to clinical practice effects that are outside of the SDL developers’ area of interest and influence the behavior of physicians were coded 290 times (91.2%).
The highest number of barriers and facilitators was reported in the environmental context and resources domain. Barriers included financial constraints, limited human resources/high staff turnover, lack of or insufficient infrastructure, and poor communication networks and inadequate coordination among providers/poor interdisciplinary collaboration. Facilitators included dedicated staff, support, and resources for the delivery of SDL programs.

**Discussion**

This scoping review describes the representation in the literature of barriers and facilitators to physicians’ engagement in, and SDL developers’ design and implementation of, SDL programs in CPD in Canada. By identifying barriers and facilitators to physician engagement in SDL, we aimed to inform the further integration of the CanMEDS 2015 framework into SDL programs within CPD to create measurable changes to clinical practice. The TDF-guided second step of our analysis allowed us to explore more specifically the behavioral factors that may act as barriers and facilitators. This enabled the identification of four key domains of barriers and facilitators associated with physician and SDL developer behavior change in the context of implementing and engaging in SDL programs in CPD: environmental context and resources, social influences, beliefs about consequences, and behavioral regulation. Below, we will explore the barriers and facilitators in these domains in further detail. In addition, we will explore those coded in the emotions domain, which was not distinguished as a key domain, to bring attention to this rarely explored aspect of barriers and facilitators to physician behavior change.

For physicians, environmental context and resources was the most frequently coded domain. Within this domain, the most frequently cited barrier for physicians was time constraints, which is a commonly reported barrier amongst physicians. This is particularly pertinent to implementers of SDL programs as physicians’ time constraints seemed to be the top factor hindering their engagement in SDL. Limited access to tools and programs was also frequently reported as a barrier. Conversely, in the same domain, the most frequently reported facilitator was tools and resources provided by SDL programs. Some examples described in the articles were structured tools that acted as a catalyst to encourage reflection on one’s current practice.

### Table 2

**Frequencies of Barriers and Facilitators Coded in Each TDF Domain, Scoping Review on SDL in CPD for Physicians in Canada, 2005–2015**

| TDF domain                        | No. of times coded (no. of articles) | Total, no. (%) |
|-----------------------------------|-------------------------------------|----------------|
|                                   | SDL developer | Physician | Times coded Articles |
| Knowledge                         | 5 (1.6) | 4 (23.5) |
| Barriers                          | 0 | 4 (3) |
| Facilitators                      | 1 (1) | 0 |
| Skills                            | 18 (5.7) | 6 (35.3) |
| Barriers                          | 0 | 3 (3) |
| Facilitators                      | 0 | 15 (6) |
| Social/professional role and identity | 4 (1.3) | 4 (23.5) |
| Barriers                          | 0 | 1 (1) |
| Facilitators                      | 0 | 3 (3) |
| Beliefs about capabilities         | 14 (4.4) | 7 (41.2) |
| Barriers                          | 0 | 7 (6) |
| Facilitators                      | 0 | 7 (5) |
| Beliefs about consequences         | 28 (8.8) | 6 (35.3) |
| Barriers                          | 0 | 3 (3) |
| Facilitators                      | 0 | 25 (4) |
| Motivation and goals              | 17 (5.3) | 9 (52.9) |
| Barriers                          | 0 | 8 (4) |
| Facilitators                      | 0 | 9 (6) |
| Memory, attention, and decision processes | 7 (2.2) | 2 (11.8) |
| Barriers                          | 0 | 3 (1) |
| Facilitators                      | 0 | 4 (1) |
| Environmental context and resources | 86 (27.0) | 16 (94.1) |
| Barriers                          | 13 (4) | 44 (14) |
| Facilitators                      | 4 (5) | 25 (8) |
| Social influences                 | 73 (23.0) | 12 (70.6) |
| Barriers                          | 2 (1) | 18 (7) |
| Facilitators                      | 4 (4) | 45 (12) |
| Emotion                           | 15 (4.7) | 3 (17.6) |
| Barriers                          | 0 | 11 (3) |
| Facilitators                      | 0 | 4 (3) |
| Behavioral regulation             | 22 (6.9) | 7 (41.2) |
| Barriers                          | 1 (1) | 4 (4) |
| Facilitators                      | 2 (2) | 15 (4) |
| Nature of the behavior            | 5 (1.6) | 3 (17.6) |
| Barriers                          | 0 | 2 (2) |
| Facilitators                      | 0 | 3 (3) |
| Other non-TDF                     | 24 (7.5) | 9 (52.9) |
| Barriers                          | 1 (1) | 8 (6) |
| Facilitators                      | 0 | 15 (8) |
| Total, domains combined           | 28 (8) | 290 (17) | 318 (100) | 17 (100) |

Abbreviations: TDF indicates Theoretical Domains Framework; SDL, self-directed learning; CPD, continuing professional development.
appraise the relevance of information to one’s practice, and handout materials and resources.

In social influences, the second most frequently coded domain, medicine’s on-the-job learning culture was the most cited barrier for physicians and was reported in articles studying feedback. For example, Watling argued that medicine’s on-the-job learning culture creates barriers that may foil the efforts of even the most well-intentioned and well-informed of educators to provide meaningful feedback. Sargeant et al, in a study looking at directed self-assessment and feedback, also suggested professional culture as a barrier to SDL. However, a deeper understanding of what this culture constitutes and how it acts as a barrier to the behavior of physicians in regard to engaging in SDL is still underdeveloped. The most frequently reported facilitator of SDL for physicians in the social influences domain was teamwork, collaborative work, interactivity, and networking in the SDL program. For example, Armson et al found that supportive colleagues enhance the reflective opportunities through gap identification, benchmarking of knowledge, skills and practice, and access to alternative perspectives. MacCarthy et al, in their study evaluating a peer-to-peer continuing education program for family physicians, observed that the physicians found networking and sharing of information useful.

Within beliefs about consequences, the third most frequently coded domain, the factor most often reported for physicians both as a facilitator and a barrier was perception of the content of the SDL program. Physicians were more favorable toward the SDL program if they perceived the content to be useful and relevant to their clinical practice, but they were less likely to engage in the SDL program if they judged the content to be irrelevant to them. It was also found that SDL activities resulting in a demonstrated improvement of medical practice encouraged physicians to engage in the program.

In behavioral regulation, the fourth most frequently coded domain, the most reported barriers and facilitators to SDL for physicians were, as in the social

### Table 3
Frequencies of Mention of Specific Barriers and Facilitators to Physician Behavior Change to Engagement in SDL in Four Key TDF Domains, Scoping Review on SDL in CPD for Physicians in Canada, 2005–2015 (n = 17 articles)

| Factors by TDF domain                   | No. of times coded (% of total) |
|----------------------------------------|---------------------------------|
| **Beliefs about consequences**         |                                 |
| Barriers                               |                                 |
| Perceived lack of relevance of content | 3                               |
| Facilitators                           |                                 |
| Perceived relevance of content         | 9                               |
| Perceived impact of SDL—resulting in improved medical practice | 8                               |
| Affective attitude (e.g., patient involvement, professional interest, pleasure of learning) | 4                               |
| CPD credits                            | 4                               |
| **Environmental context and resources**| 69 (23.8)                       |
| Barriers                               |                                 |
| Time constraints                       | 22                              |
| Limited access to tools/programs       | 11                              |
| Competing demands/interests            | 5                               |
| Cost                                   | 3                               |
| Lack of faculty with expertise and experience in team training | 2                               |
| Facilitators                           |                                 |
| Tools/resources provided (e.g., printable version of material, structured tool to encourage reflection, tools to appraise the relevance of information) | 10                              |
| Convenient location/time for SDL       | 6                               |
| Access to technologies                 | 5                               |
| More time allocated to SDL activities  | 5                               |
| Organization pays for staff to participate in SDL | 1                               |
| **Social influences**                  | 67 (23.1)                       |
| Barriers                               |                                 |
| Medicine’s on-the-job learning culture | 7                               |
| Dissatisfying/lack of facilitator input| 4                               |
| Low/poor peer participation            | 3                               |
| Nature of feedback (e.g., lacks credibility) | 2                               |
| Multilevel nature of teamwork          | 1                               |
| Dislike of expressing oneself in writing, unwillingness to speak in public | 1                               |
| Facilitators                           |                                 |
| Helpful facilitators, experts, presenters | 12                              |
| Managerial and peer enthusiasm/recommendation from college (e.g., RCPSC) | 8                               |
| Peer-to-peer training                  | 6                               |
| Administrative, organizational support for SDL | 5                               |
| Workplace context and culture (e.g., established environment of trust) | 5                               |
| Credibility of the person providing feedback | 4                               |
| Interaction with patients              | 2                               |
| Individualized follow-up              | 1                               |
| **Behavioral regulation**              | 19 (6.6)                        |
| Barriers                               |                                 |
| Nature of feedback (i.e., difficulty engaging with negative feedback) | 3                               |
| Reluctance to adopt new strategy       | 1                               |
| Facilitators                           |                                 |
| Feedback that is accurate, clear, constructive, credible, specific | 13                              |
| Determined action plan                 | 1                               |
| Coaching in identifying learning opportunities, developing goals and planning | 1                               |
| **Total in all 12 domains**           | 290                             |

Abbreviations: SDL indicates self-directed learning; TDF, Theoretical Domains Framework; CPD, continuing professional development; RCPSC, Royal College of Physicians and Surgeons of Canada.
Influences domain, related to feedback. In three studies, negative feedback was reported as a barrier for physicians to engage in the SDL program. Moreover, a number of studies identified the perceived accuracy and credibility of the feedback as facilitators for physicians to adopt the given feedback.

Barriers for physicians to engage in feedback were also coded in the emotions domain (see Supplemental Digital Appendix 4 at http://links.lww.com/ACADMED/A547). In particular, Eva et al. explored the factors influencing responsiveness to feedback. They found that the fear of appearing incompetent or not knowledgeable was a factor that acted both as a barrier and a facilitator to the behavior of the learner: The “ramifications of appearing incompetent” hindered physicians’ ability to ask for feedback, but some physicians indicated that “fear of appearing not to know is a motivational factor” in engaging in the SDL program. Additionally, Sargeant et al. identified emotion as a theme that is “inherent within the processes of reconciling, assimilating, accepting, and using external feedback”; for example, they argued that “feedback inconsistent with self-perceptions could evoke strong negative feelings that interfere with its assimilation and acceptance.”

For SDL developers, barriers and facilitators affecting behavior toward implementing an SDL program were most frequently coded in the environmental context and resources domain. Barriers such as financial constraints, limited human resources/high staff turnover, and lack of or insufficient infrastructure seemed to be potential hindrances to implementing an SDL program. In contrast, dedicated staff, support, and resources seemed to be a potential facilitator to successful implementation.

It is critical to note that the TDF domains that we did not discuss in detail in this review may well be relevant. The factors in those domains may be underidentified within the current literature as important behavior change factors amongst physicians and SDL developers. In this review, we determined the key TDF domains according to the frequencies of coded barriers and facilitators in the 17 included articles, based on previous studies applying the TDF framework in data analyses. However, as the frequencies are simply counts of the number of times the identified barriers and facilitators were reported in the included articles, they are a function of the methods used to collect the data from the source articles; therefore, frequency itself does not imply importance. More qualitative research is needed to probe the factors in the domains not discussed in this study.

On the basis of this scoping review’s results, barriers and facilitators that potentially affect the behavior of physicians in engaging in SDL were reported more than 10 times more frequently than those that may affect the behavior of SDL developers in implementing SDL programs. Most of the literature was focused on the physician (the target of the SDL programs) to the detriment of a concerted analysis of external factors such as design, process, and faculty development around SDL in CPD. Furthermore, there appears to be a paucity of studies exploring the factors that might contribute to the behavior change of SDL developers in successfully implementing SDL programs. As successful implementation of SDL programs not only depends on the factors affecting the intervention target (i.e., the physician) but also on the factors affecting the developers and deliverers of SDL activities, future studies should be mindful of the different elements that can potentially hinder or facilitate the entire spectrum of SDL programs, from development and delivery through to receipt and enactment.

### Table 4

| Factors by TDF domain                      | No. of times coded (% of total) |
|-------------------------------------------|---------------------------------|
| **Environmental context and resources**   |                                 |
| Barriers                                  | 17 (60.7)                       |
| Financial constraints                     | 3                               |
| Limited human resources/high staff turnover| 3                               |
| Lack of or insufficient infrastructure    | 3                               |
| Poor communication networks and inadequate coordination among providers/poor interdisciplinary collaboration | 2                     |
| Turmoil from industrial reform            | 1                               |
| Logistics                                 | 1                               |
| **Facilitators**                          |                                 |
| Dedicated staff, support, and resources for SDL | 3                         |
| End of module survey/supplement survey post-SDL intervention/baseline survey | 1                     |
| **Social influences**                     | 6 (21.4)                        |
| Barriers                                  |                                 |
| Teaching culture/environment in medicine  | 2                               |
| **Facilitators**                          | 2                               |
| Multidisciplinary collaboration           |                                 |
| Democratic management styles              | 1                               |
| Partnership between the government and the medical association | 1                     |
| **Behavioral regulation**                 | 3 (10.7)                        |
| Barriers                                  | 1                               |
| Lack of strategies to assist implementation|                                 |
| **Facilitators**                          | 2                               |
| Allowing teachers to provide meaningful feedback | 2                     |
| **Total in all 12 domains**               | 28                              |

Abbreviations: SDL indicates self-directed learning; TDF, Theoretical Domains Framework; CPD, continuing professional development.
We suggest that for the best results in physician engagement in SDL in CPD and, ultimately, for measurable changes to clinical practice, the different activities, programs, and systems within CPD need to be aligned with each other and function in collaboration. Thus, it is essential to address the gaps in the knowledge of factors related to physicians' engagement in and SDL developers' implementation of SDL activities, not only to improve the implementation of SDL programs in CPD and to encourage physicians to engage in them but also to improve the alignment of CPD programs with relevant practice needs and contexts. We believe that addressing these gaps in knowledge could also contribute to improvement of other aspects of CPD, such as MOC programs.

Finally, to our knowledge, the present study is a first effort in scoping the barriers and facilitators to physicians' engagement in SDL in CPD and barriers and facilitators to SDL developers' implementation of SDL programs in CPD, as they are represented in the Canadian literature. Furthermore, we developed an innovative two-step analysis process of conventional content analysis followed by TDF-guided directed coding, which is the first of its kind in a scoping review related to SDL in CPD for medical professionals. This process allowed us to gain a deep and granular insight into the barriers and facilitators to physicians' behavior change related to SDL contained in our dataset. The application of the TDF in the analysis enabled the identification of the key TDF domains, in which the barriers and facilitators in the literature were most frequently coded. As the TDF has been validated as a method to assess and identify factors implicated in implementation science, the findings of this scoping review can inform future intervention development. Domains in the TDF can be explicitly linked to specific strategies and behavior change techniques that are designed and evidenced to affect behavior change, thus providing guidance on specifically what to target, and how, in a future medical education intervention. The barriers identified can be addressed by designing interventions that are better fit for purpose, employing the most feasibly delivered, appropriate, and evidenced behavior change techniques. A further strength of using the TDF is its provision of a shared terminology for categorizing barriers and facilitators, which provides the capacity to develop a cumulative evidence base in this literature rather than relying on the ad hoc development of overlapping concepts in individual studies.

Limitations
There are several limitations in this scoping review that may limit the interpretation of the results. Our search strategy was limited to articles published in English and to scholarly articles. (The gray literature was excluded because of time and funding constraints.) The relatively small number of included articles may have been due to the scarcity of studies that explicitly looked at barriers and facilitators to physicians' engagement in SDL in CPD and/or to SDL developers' implementation of SDL programs in CPD. Although the search was limited to literature in the Canadian setting, we believe that the methodological rigor in our scoping review process enables the conceptual generalizability and transferability of our findings, meaning that our findings may be pertinent and can inform SDL developer activity in CPD for physicians in other contexts. In regard to some of the main limitations with using the TDF, as previously identified in the literature, the time-consuming nature and the resource intensiveness of the process were the most challenging aspects. Additionally, it was also challenging to develop a clear interrater understanding of the domains and the associated constructs (i.e., barriers and facilitators) for each domain. Several consultations with a content expert were necessary to ensure sound operationalization of the TDF, adding to the time-intensive nature of our methodology.

Conclusion
In conclusion, this scoping review identified barriers and facilitators to physicians' engagement in SDL activities in CPD and SDL developers' design and implementation of SDL programs in CPD in Canada. In particular, we found that the barriers and facilitators were most frequently coded in four TDF domains: environmental context and resources, social influences, beliefs about consequences, and behavioral regulation. The facilitators and barriers in these domains—such as physicians' time constraints, access to tools, teamwork and collaborative work, and perception of the content of the SDL program—demonstrate the variety of factors that can influence physician engagement in SDL in CPD. Our findings also illustrate the importance of taking note of barriers and facilitators perceived to occur at different levels (i.e., individual, program, technological, environmental, and workplace/organizational) and, further, how these factors may influence physicians' engagement in SDL activities and SDL developers' design and implementation of SDL programs in CPD. We suggest that the aforementioned factors that affect physicians and SDL developers at individual and external levels should be considered and addressed in order to enable the achievement of the best possible outcomes. Furthermore, given the knowledge gap in the literature around barriers and facilitators experienced by SDL developers, future studies should consider looking into the external factors that may influence SDL developers' capacity to design and implement effective SDL programs in CPD.

Acknowledgments: The authors would like to acknowledge their broader team members, including Dr. Joan Sargeant, Dr. Ivan Silver, Dr. Natalia Danilovich, Heather Stenerson, Robert Parson, Elaine Chow Baker, and Bettina Habib.

Funding/Support: This work is part of the broader project, “Self-Directed Learning in Continuing Professional Development: A Scoping Review to Explore the Representation of CanMEDS Competencies in the Canadian Context,” which received funding from the Royal College of Physicians and Surgeons of Canada (CanMEDS Research and Development Grant 2015).

Other disclosures: None reported.

Ethical approval: This project was reviewed and approved by the Queen's University Health Sciences & Affiliated Teaching Hospitals Research Ethics Board.

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References

1. Sargeant J, Bruce D, Campbell CM. Practicing physicians’ needs for assessment and feedback as part of professional development. J Contin Educ Health Prof. 2013;33(suppl 1):S54–S62.

2. Frank JR, Snell L, Sherbino J, eds. CanMEDS 2015 Physician Competency Framework. Ottawa, Ontario, Canada: Royal College of Physicians and Surgeons of Canada; 2015. http://canmeds.royalcollege.ca/uploads/en/framework/CanMEDS2015Framework_EN_Reduced.pdf. Accessed February 8, 2018.

3. Campbell C, Silver I, Sherbino J, Cate OT, Holmboe ES. Community-based continuing professional development. Med Teach. 2010;32:657–662.

4. Murad MH, Coto-Yglesias F, Varkey P, Prokop LJ, Murad AL. The effectiveness of self-directed learning in health professions education: A systematic review. Med Educ. 2010;44:1057–1068.

5. Royal College of Physicians and Surgeons of Canada. A concise guide to maintenance of certification. http://www.royalcollege.ca/rcsite/cpd/dmc-program/concise-guide-maintenance-certification-e. Published 2017. Accessed February 8, 2018.

6. Royal College of Physicians and Surgeons of Canada. Accreditation of continuing professional development (CPD) activities. http://www.royalcollege.ca/rcsite/cpd/accreditation-continuing-professional-development-cpd-activities-e. Accessed February 8, 2018.

7. American Board of Medical Specialties. Board certification and maintenance of certification. http://www.abms.org/board-certification/. Accessed February 8, 2018.

8. Merkur S, Mladovsky P, Mossialos E, McKee M. Do lifelong learning and revalidation ensure that physicians are fit to practise? Copenhagen, Denmark: World Health Organization Regional Office for Europe; 2008. http://apps.who.intiris/bitstream/10665/107971/1/E93412.pdf. Accessed February 8, 2018.

9. Knowles MS. Self-Directed Learning: A Guide for Learners and Teachers. New York, NY: Association Press; 1975. https://eric.ed.gov/?id=ED114653. Accessed February 8, 2018.

10. Schumacher DJ, Englander R, Carraccio C. Developing the master learner: Applying learning theory to the learner, the teacher, and the learning environment. Acad Med. 2013;88:1635–1645.

11. Bennett EE, Blanchard RD, Hinshey KT. AM last page. Applying Knowles’ andragogy to resident teaching. Acad Med. 2012;87:129.

12. Li ST, Paterniti DA, Co JP, West DC. Successful self-directed lifelong learning in medicine: A conceptual model derived from qualitative analysis of a national survey of pediatric residents. Acad Med. 2010;85:1229–1236.

13. Stuart E, Sectish TC, Huffman LC. Are residents ready for self-directed learning? A pilot program of individualized learning plans in continuity clinic. Ambul Pediatr. 2005;5:298–301.

14. Davis DA, Matwalian PE, Fordin M, Yan Harrison R, Thorpe KE, Perrier L. Accuracy of physician self-assessment compared with observed measures of competence: A systematic review. JAMA. 2006;296:1094–1102.

15. Levac D, Colquhoun H, O’Brien KK. Scoping studies: Advancing the methodology. Implement Sci. 2010;5:69.

16. Pham MT, Rajić A, Greig JD, Sargeant JM, Papadopoulos A, McEwen SA. A scoping review of scoping reviews: Advancing the approach and enhancing the consistency. Res Synth Methods. 2014;5:371–385.

17. Arkes H, O’Malley L. Scoping studies: Towards a methodological framework. Int J Soc Res Methodol. 2005;8(1):19–32.

18. Tricco AC, Lillie E, Zarin W, et al. A scoping review on the conduct and reporting of scoping reviews. BMC Med Res Methodol. 2016;16:15.

19. Gough D, Thomas J, Olier S. Clarifying differences between review designs and methods. Syst Rev. 2012;1:28.

20. Kastner M, Tricco AC, Soobiah C, et al. What is the most appropriate knowledge synthesis method to conduct a review? Protocol for a scoping review. BMC Med Res Methodol. 2012;12:114.

21. Daudt HM, van Mossel C, Scott SJ. Enhancing the scoping study methodology: A large, inter-professional team’s experience with Arksey and O’Malley’s framework. BMC Med Res Methodol. 2013;13:48.

22. MacCarthy D, Kallstrom L, Kadlec H, Hollander M. Improving primary care in British Columbia, Canada: Evaluation of a peer-to-peer continuing education program for family physicians. BMC Med Educ. 2012;12:110.

23. Gagnon MP, Légare F, Labrecque M, Frémont J. Exploring organizational characteristics for implementing evidence based practice: A consensus approach. Qual Saf Health Care. 2009;18:153–160.

24. Guan J, Tregoning S, Keenan L. Social interaction and participation: Formative evaluation of online CME modules. J Contin Educ Health Prof. 2008;28:172–179.

25. Campbell JM, Mann K, van der Vleuten C, Metsemakers J. “Directed” self-assessment: Practice and feedback within a social context. J Contin Educ Health Prof. 2008;28:47–54.

26. Waitley CJ. Unfulfilled promise, untapped potential: Feedback at the crossroads. Med Teach. 2014;36:692–697.

27. Sargeant J, Mann K, van der Vleuten C, Metsemakers J. “Directed” self-assessment: Practice and feedback within a social context. J Contin Educ Health Prof. 2008;28:47–54.

28. Sargeant J, Mann K, van der Vleuten C, Metsemakers J. “Directed” self-assessment: Practice and feedback within a social context. J Contin Educ Health Prof. 2008;28:47–54.

29. Campbell CM, Parboosingh J, The Royal College experience and plans for the maintenance of certification program. J Contin Educ Health Prof. 2013;33(suppl 1):S36–S47.

30. Eva KW, Aronson H, Holmboe E, et al. Factors influencing responsiveness to feedback: On the interplay between fear, confidence, and reasoning processes. Adv Health Sci Educ Theory Pract. 2012;17:15–26.

31. Lougheed MD, Moosa D, Finlayson S, et al. Impacts of a provincial asthma guidelines continuing medical education project: The Ontario Asthma Plan of Action’s Provider Education in Asthma Care Project. Can Respir J. 2007;14:111–117.

32. Allaire AS, Labrecque M, Giguere A, Gagnon MP, Légare F. What motivates family physicians to participate in training programs in shared decision making? J Contin Educ Health Prof. 2012;32:98–107.

33. Rappolt S, Pearce K, McEwen S, Polatjako HJ, Exploring organizational characteristics associated with practice changes following a mentored online educational module. J Contin Educ Health Prof. 2005;25:116–124.

34. Lockyer J, Fidler H, Hogan DB, et al. Assessing outcomes through congruence of course objectives and reflective work. J Contin Educ Health Prof. 2005;25:76–86.

35. Motola I, Devine LA, Chung HS, Sullivan JE, Issenberg SB. Simulation in healthcare education: A best evidence practical guide. AMEE Guide No. 82. Med Teach. 2013;35:e1511–e1530.

36. Aronson H, Elmslie T, Roder S, Wakefield J. Encouraging reflection and change in clinical practice: Evolution of a tool. J Contin Educ Health Prof. 2015;35:220–231.

37. Aronson H, Kinzie S, Hawes D, Roder S, Wakefield J. Exploring learning into practice: Lessons from the practice-based small group learning program. Can Fam Physician. 2007;53:1477–1485.

38. Toberge DR, Curtis S. Publication Manual of the American Psychological Association. 6th ed. Washington, DC: American Psychological Association; 2013.

39. U.S. National Library of Medicine. Publication characteristics (publication types) with scope notes: 2018 MeSH edition. https://www.nlm.nih.gov/mesh/pubtypes.html. Published 2018. Accessed March 1, 2018.

40. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15:1277–1288.

41. Michie S, Johnston M, Abraham C, Lawton R, Parker D, Walker A; “Psychological Theory” Group. Making psychological theory useful for implementing evidence-based practice: A consensus approach. Qual Saf Health Care. 2005;14:26–33.
42 Cane J, O’Connor D, Michie S. Validation of the theoretical domains framework for use in behaviour change and implementation research. Implement Sci. 2012;7:37.

43 Curran JA, Brehaut J, Patey AM, Osmond M, Stiell I, Grimshaw JM. Understanding the Canadian adult CT head rule trial: Use of the theoretical domains framework for process evaluation. Implement Sci. 2013;8:25.

44 McKenzie JE, French SD, O’Connor DA, et al. IMPLEMENTing a clinical practice guideline for acute low back pain evidence-based management in general practice (IMPLEMENT): A cluster randomised controlled trial study protocol. Implement Sci. 2008;3:11.

45 McKenzie JE, O’Connor DA, Page MJ, et al. Improving the care for people with acute low-back pain by allied health professionals (the ALIGN trial): A cluster randomised trial protocol. Implement Sci. 2010;5:86.

46 Dyson J, Lawton R, Jackson C, Cheater F. Does the use of a theoretical approach tell us more about hand hygiene behaviour? The barriers and levers to hand hygiene. J Infect Prev. 2011;12(1):17–24.

47 Michie S, Pilling S, Garety P, et al. Difficulties implementing a mental health guideline: An exploratory investigation using psychological theory. Implement Sci. 2007;2:8.

48 Amemori M, Korhonen T, Kinnunen T, Michie S, Murtomaa H. Enhancing implementation of tobacco use prevention and cessation counselling guideline among dental providers: A cluster randomised controlled trial. Implement Sci. 2011;6:13.

49 Pesseau J, Mutsaers B, Al-Jaishi AA, et al. Major outcomes with personalized dialysate TEMPerature (MyTEMP) investigators. Barriers and facilitators to healthcare professional behaviour change in clinical trials using the theoretical domains framework: A case study of a trial of individualized temperature-reduced haemodialysis. Trials. 2017;18:227.

50 Atkins L, Francis J, Islam R, et al. A guide to using the theoretical domains framework of behaviour change to investigate implementation problems. Implement Sci. 2017;12:77.

51 Little EA, Pesseau J, Eccles MP. Understanding effects in reviews of implementation interventions using the theoretical domains framework. Implement Sci. 2015;10:90.

52 Reeves S, Barr H, Birch I, et al. A BEME systematic review of the impact of interprofessional education on health and social care practitioners, professional practice, patient/client health and social outcomes (update). BEME Review Protocol, July 2014. https://www.researchgate.net/publication/27867351. Accessed March 9, 2018.

53 Tavender EJ, Bosch M, Grusen RL, et al. Understanding practice: The factors that influence management of mild traumatic brain injury in the emergency department—A qualitative study using the theoretical domains framework. Implement Sci. 2014;9:8.

54 Francis JJ, Stockton C, Eccles MP, et al. Evidence-based selection of theories for designing behaviour change interventions: Using methods based on theoretical construct domains to understand clinicians’ blood transfusion behaviour. Br J Health Psychol. 2009;14(pt 4):625–646.

55 Pesseau J, Sniehotta FF, Francis JJ, Campbell NC. Multiple goals and time constraints: Perceived impact on physicians’ performance of evidence-based behaviours. Implement Sci. 2009;4:77.

56 Horowitz SD, Hawkins RE. Chapter 27: The maintenance of certification program from the American Board of Medical Specialties and its member boards. In: Wentz DK, ed. Continuing Medical Education: Looking Back, Planning Ahead. Hanover, NH: University Press of New England; 2011:317–327.

57 Kitto SC, Chesters J, Grbich C. Quality in qualitative research. Med J Aust. 2008;188:243–246.

58 Phillips CJ, Marshall AP, Chaves NJ, et al. Experiences of using the theoretical domains framework across diverse clinical environments: A qualitative study. J Multidiscip Healthc. 2013;8:139–146.