Factors Associated With Specialists’ Intention to Adopt New Behaviors After Taking Web-Based Continuing Professional Development Courses: Cross-sectional Study

Lysa Bergeron1,2, BSc, MSc; Simon Décary3, BSc, MSc, PhD; Codjo Djignefa Djade1, BSc, MSc; Sam J Daniel4,5, MSc, MD; Martin Tremblay4, BSc, MSc, PhD; Louis-Paul Rivest6, BSc, MSc, PhD; France Légare1,7, BSc, MD, MSc, PhD, CCMF

1VITAM - Centre de recherche en santé durable, Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale, Quebec, QC, Canada
2Department of Social and Preventive Medicine, Faculty of Medicine, Université Laval, Quebec, QC, Canada
3School of Rehabilitation, Faculty of Medicine and Health Sciences, Université de Sherbrooke, Sherbrooke, QC, Canada
4Direction du Développement Professionnel Continu, Fédération des Médecins Spécialistes du Québec, Montreal, QC, Canada
5Department of Pediatric Surgery, McGill University, Montreal, QC, Canada
6Department of Mathematics and Statistics, Faculty of Science and Engineering, Université Laval, Quebec, QC, Canada
7Department of Family Medicine and Emergency Medicine, Faculty of Medicine, Université Laval, Quebec, QC, Canada

Corresponding Author:
France Légare, BSc, MD, MSc, PhD, CCMF
VITAM - Centre de recherche en santé durable
Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale
2480, chemin de la Canadière
Quebec, QC, G1G2G1
Canada
Phone: 1 4186635313
Email: france.legare@fmed.ulaval.ca

Abstract

Background: Web-based continuing professional development (CPD) is a convenient and low-cost way for physicians to update their knowledge. However, little is known about the factors that influence their intention to put this new knowledge into practice.

Objective: We aimed to identify sociocognitive factors associated with physicians’ intention to adopt new behaviors as well as indications of Bloom’s learning levels following their participation in 5 web-based CPD courses.

Methods: We performed a cross-sectional study of specialist physicians who had completed 1 of 5 web-based CPD courses offered by the Federation of Medical Specialists of Quebec. The participants then completed CPD-Reaction, a questionnaire based on Godin’s integrated model for health professional behavior change and with evidence of validity that measures behavioral intention (dependent variable) and psychosocial factors influencing intention (n=4). We also assessed variables related to sociodemographics (n=5), course content (n=9), and course format (eg, graphic features and duration) (n=8). Content variables were derived from CanMEDS competencies, Bloom’s learning levels, and Godin’s integrated model. We conducted ANOVA single-factor analysis, calculated the intraclass correlation coefficient (ICC), and performed bivariate and multivariate analyses.

Results: A total of 400 physicians participated in the courses (range: 38-135 physicians per course). Average age was 50 (SD 12) years; 56% (n=223) were female, and 44% (n=177) were male. Among the 259 who completed CPD-Reaction, behavioral intention scores ranged from 5.37 (SD 1.17) to 6.60 (SD 0.88) out of 7 and differed significantly from one course to another (P<.001). The ICC indicated that 17% of the total variation in the outcome of interest, the behavioral intention of physicians, could be explained at the level of the CPD course (ICC=0.17). In bivariate analyses, social influences (P<.001), beliefs about capabilities (P<.001), moral norm (P<.001), beliefs about consequences (P<.001), and psychomotor learning (P=.04) were significantly correlated with physicians’ intention to adopt new behaviors. Multivariate analysis showed the same factors, except for social influences and psychomotor learning, as significantly correlated with intention.

Conclusions: We observed average to high behavioral intention scores after all 5 web-based courses, with some variations by course taken. Factors affecting physicians’ intention were beliefs about their capabilities and about the consequences of adopting.
new clinical behaviors, as well as doubts about whether the new behavior aligned with their moral values. Our results will inform design of future web-based CPD courses to ensure they contribute to clinical behavior change.

(JMIR Med Educ 2022;8(2):e34299) doi: 10.2196/34299

KEYWORDS

continuing professional development; CPD-Reaction; behavioral intention; medical specialists; continuing professional development; web-based training; medical education; education; physician; psychosocial; online course

Introduction

Improving patient outcomes requires that health professionals constantly adjust their practices in light of new evidence. Continuing professional development (CPD) is one of the most common strategies for achieving this, and indeed is a requirement for continued practice in many countries, including Canada [1]. The use of web-based CPD increased 10-fold from 2002 to 2008 in the United States and continues to grow rapidly [2], paralleling the increasing use of other web-based tools by health professionals [3]. A combination of the high costs of in-person CPD and the sanitary measures imposed during the COVID-19 pandemic have accelerated this increase in web-based CPD [4,5]. It is not clear whether web-based CPD has a real impact on clinical practice [6-9] or if physicians want CPD delivered this way [10]. However, in times of pandemic there is little choice, and some of the advantages of distance learning have been highlighted in this context [11]. High-quality CPD courses should translate the evidence presented not only into new awareness, but also into new practices; yet most studies only evaluate their impact on clinical practice using measures of satisfaction and changes in knowledge [6,12,13]. Several meta-analyses on the impact of CPD on physician performance have recommended that new research should focus less on whether CPD is effective and more on why it is effective [14]. This requires a better understanding of the theory-based mechanisms underlying the impact of web-based CPD courses on clinical practice [15]. Future courses could then be based on these evidence-based and theory-informed mechanisms.

Sociocognitive theories describe these mechanisms by identifying key variables and the interrelationship of determinants in predicting health behaviors [16]. Studies based on such theories provide the empirical evidence to guide many behavior-change interventions. Learning is based not only on absorbing information, but on other factors that produce social behaviors, such as social modeling and a personal sense of control [16-19]. To ensure that CPD courses lead to physicians adopting the desired behavior in clinical practice, it is essential that they be informed by sound, theory-based factors known to influence the adoption of a given behavior [20-22]. According to Godin’s integrated model for health professional behavior change [17], behavioral intention is the central factor influencing the adoption of a given behavior. In turn, this intention is influenced by a number of other sociocognitive factors. Incorporating these modifiable sociocognitive factors in the design of CPD has proven acceptable and feasible [23] and holds great promise for improved clinical practices [15,24].

Godin’s comprehensive list of these factors, gathered from evidence produced by multiple studies in numerous domains, informed our CPD-Reaction tool, designed to assess behavioral intention after CPD activities [19,25]. The questionnaire consists of 12 items related to intention and 4 of the following influences on intention: (1) social influence (perception of approval or disapproval by persons significant to the individual regarding the adoption of the behavior); (2) beliefs about capabilities (belief that one is capable of performing the behavior); (3) moral norm (feeling of personal obligation regarding the adoption of the behavior); and (4) beliefs about consequences (perception that the behavior will have harmful or beneficial effects). For CPD to result in adopting a new clinical or organizational practice, “deep” learning also needs to occur [26]. Many CPD developers use Bloom’s taxonomy to design the learning objectives of CPD activities, which also provides measures for their effects [27]. Bloom’s taxonomy is related to Kirkpatrick’s model, one of the best-known models for analyzing and evaluating the results of training programs [28]. Bloom’s taxonomy provides additional detail by defining 3 domains of learning, which are affective, psychomotor, and cognitive. Affective learning relates to attitudes, psychomotor to physical skills, and cognitive to six learning levels, each of increasing “depth” or complexity [29].

Therefore, to address the lack of theory-informed assessment of CPD activities, we aimed to identify sociocognitive factors associated with physicians’ intention as well as indications of Bloom’s learning levels following their participation in 5 web-based CPD courses.

Methods

Study Design

We performed a cross-sectional study of a convenience sample of specialist physicians who had completed 1 of 5 different web-based CPD courses [30]. We report data according to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) reporting guidelines for cross-sectional studies [31]. Data were collected between November 2015 and April 2019 following completion of the CPD courses by participants using a web-based interactive platform (MEDUSE) designed by the Federation of Medical Specialists of Québec (FMSQ) [32]. The FMSQ consists of 35 medical associations and represents 59 medical specialties in the province of Quebec. Its members include more than 10,000 medical specialists [33].

Ethics Approval

Approval for this study was obtained from the research ethics boards of the Centre intégré universitaire de santé et de services sociaux (CIUSSS) de la Capitale-Nationale (Project 2020-1889_SPPL).
Study Participants
To be eligible, the physicians had to have completed (1) one of the 5 available FMSQ CPD web-based courses and (2) the CPD-Reaction questionnaire.

CPD Courses
The 5 web-based courses were all accredited by the Royal College of Physicians and Surgeons of Canada [34] and targeted the following five behaviors: (1) to adapt the frequency of cytological exams for gynecological patients 25-45 years old to new human papillomavirus recommendations; (2) to use recommended lung cancer treatment and monitoring algorithms; (3) to use a systematic leadership approach in community health endeavors (eg, preventing instances of suicide from a bridge in Montreal); (4) to respect best practices in record keeping; and (5) to identify patients who meet the criteria for identifying a potential organ donor. Courses were free of commercial support (paid by FMSQ members’ annual contributions). They were secured and accessible 24/7 by Quebec specialist physicians. The courses lasted from 90 to 120 minutes, and participants could stop or reinitiate courses at any time. Course objectives were based on Godin’s integrated model for health professionals’ behavior and aimed to encourage physicians to adopt new behaviors (or cease old ones). Each targeted behavior was designed according to 3 of the TACT principles: “target,” “action,” and “context” (“time” was excluded, as the targeted behaviors were not dependent on a specific time frame) [35]. The courses were also designed to develop core competencies as described in the CanMEDS Competency Framework [36]. CanMEDS is a framework created by the Royal College to ensure that CPD courses, regardless of their specialist content, allow physicians to develop one or more of the following core roles: medical expert, communicator, collaborator, leader, health advocate, scholar, or professional. We inserted the relevant learning objectives into each of the 5 CPD-Reaction questionnaires and attached them to the end of each respective course (Figure S1 in Multimedia Appendix 1).

Data Collection Procedure
Data were collected in 2 separate databases by the FMSQ, one for the sociodemographic variables of those attending each course (henceforth referred to as “participants”) and another for those who had completed CPD-Reaction (henceforth referred to as “respondents”). Individual participant sociodemographic data could not be linked to individual respondent CPD-Reaction questionnaire scores and were analyzed at the level of the CPD course. For sociodemographic variables and variables collected at the course level (content and format of the CPD courses), the same values were then attributed to all respondents in the same course.

At the Level of Participants
Psychosocial Determinant Variables (1 Dependent Variable and 4 Independent Variables)
The CPD-Reaction is a self-administered questionnaire based on sociocognitive theories of behavioral change. The questionnaire had been developed and validated earlier with participants in 18 different CPD activities and had a Cronbach α ranging from .77 to .85 [22,25]. The CPD-Reaction questionnaire consists of 12 items grouped into the five following constructs: (1) behavioral intention (dependent variable; 2 items); (2) beliefs about capabilities (3 items); (3) social influences (3 items); (4) beliefs about consequences (2 items); and (5) moral norm (2 items). The specific clinical behavior targeted by the CPD course is inserted into each item of the questionnaire. There is no overall score for CPD-Reaction. The score for each construct is computed as the average of each item (Likert scale of 1, which is low, to 7, which is high), except for social influence, which is rated on a Likert scale of 1 to 5 [37]. Thus, a moral norm score of 7, for example, indicates that the respondent feels a strong obligation to adopt this behavior, while a score of 1 for beliefs about capabilities indicates that the respondent does not feel confident in their ability to adopt the behavior [37]. All physicians who completed CPD courses were invited to fill out the CPD-Reaction questionnaire afterward.

At the Level of the CPD Courses
Participant Profile (Sociodemographic) Variables (5 Independent Variables)
All participants (n=400) provided information about their age, number of years in practice, sex (female or male), their medical association (clinical area), and administrative region.

Characteristics of Course Content (9 Independent Variables)
Two coders independently noted the presence of slides in each CPD course in which they could identify the following elements: (a) targeting of a CanMEDS role—medical expert, communicator, collaborator, leader, health advocate, scholar, or professional (when more than one role was targeted, the reference category was “not applicable”); (b) Bloom’s learning levels; and (c) constructs of Godin’s theoretical framework for the study of health care professionals’ behavior and intention [17,27,36].

Characteristics of Course Format (8 Independent Variables)
Informed by literature on presentation of material for optimal learning [38,39], 2 coders independently assessed the presence of the following factors: use of virtual characters, use of a reflective approach, duration of the course, presence of nonfunctional links to references, presence of slides with a video of a health professional (opinion leader), presence of slides with a figure or a diagram, presence of slides with a quiz, and presence of women on the scientific committee for the course development.

Data Analysis
The data set had a hierarchical structure consisting of 2 levels, which were respondents and CPD courses. Individual participant sociodemographic data were in a distinct database and could not be linked to individual respondent CPD-Reaction questionnaire scores. Therefore, analysis focused primarily on variables at the level of CPD courses. These variables were only retained if they could be collected for all 5 courses. All variables retained at the course level had fewer than 1% missing values. At the respondent level (n=259), only the dependent variable, intention, and the 4 independent psychosocial variables (social influences, beliefs about capabilities, moral norm, and beliefs...
about consequences) were accessible and analyzed. At the CPD course level (n=5 CPD courses), data analyzed included the 5 sociodemographic variables of participants, 8 course format variables, and 9 course content variables.

We used descriptive statistics and frequency counts to describe all variables. We performed an ANOVA single-factor analysis to assess whether the topic of the courses had an impact on intention. We also computed the intraclass coefficient (ICC) to assess the percentage of variance in behavioral intention and its psychosocial determinants attributable to the CPD course [40]. We performed exploratory bivariate analysis using Spearman correlations for each one of our independent variables at the level of the CPD courses to assess their association with physicians’ intention scores. Lastly, we performed bivariate and multivariate analysis on the 4 psychosocial determinants of intention at the respondent level (n=259) to explore their impact on intention scores. We used a linear model and introduced a random effect for the CPD courses. A threshold of .05 was set for statistical significance. We verified all assumptions for the linear regression model [41]. All analyses were performed with SAS, version 9.4 (SAS Institute Inc).

**Results**

### Characteristics of the Participants

**Table 1** shows the characteristics of participants from across Quebec attending each course.

| Variables | Coursesa | 1 | 2 | 3 | 4 | 5 | All courses |
|-----------|----------|---|---|---|---|---|-------------|
|Participants, n (%) |  | 96 (24) | 60 (15) | 71 (18) | 135 (34) | 38 (9) | 400 (100) |
| Age (years), mean (SD) | 48 (11) | 49 (11) | 51 (13) | 52 (12) | 46 (12) | 50 (12) |
| Gender, n (%) |  |  |  |  |  |  |  |
| Female | 70 (73) | 20 (33) | 43 (61) | 74 (55) | 16 (42) | 223 (56) |
| Male | 26 (27) | 40 (67) | 28 (39) | 61 (45) | 22 (58) | 177 (44) |
| Main clinical area for each course, n (%) |  | 67 (70)b | 24 (40)c | 11 (15)d | 23 (17)e | 7 (18)f | 87 (22)b |
| Most frequent administrative area of main practice site, n (%) |  | 18 (19)g | 18 (30)h | 14 (20)h | 35 (26)h | 6 (16)h | 77 (19)g |
| Years of practice, mean (SD) | 19 (13) | 19 (13) | 20 (14) | 22 (14) | 14 (13) | 19 (14) |

aCourse details: behaviors used in the questionnaire for each course; course 1—to adapt the frequency of cytological examinations according to new recommendations; course 2—to use lung cancer treatment and monitoring algorithms; course 3—to use a systematic leadership approach; course 4—to respect good practices in record keeping; and course 5—to identify patients who meet the criteria for identifying a potential organ donor.

bObstetrics and gynecology.

cPneumology.

dPreventive medicine.

ePsychiatry.

fAnesthesiology.

gMontérégie.

hMontreal.

### CPD Course Characteristics

**Table 2** shows details of course characteristics, including course formatting, content, presence of Godin’s constructs, and Bloom’s learning levels. Three courses lasted 90 minutes and 2 lasted 120 minutes. Two out of 5 courses focused on the CanMEDS role of medical expert, 1 on the role of leader, 1 on the role of professional, and 1 on several of the roles at once (classified as “not applicable”). Moreover, 3 course characteristics showed no variability—all contained slides with a quiz (format variable), slides on beliefs about capabilities, and slides on role and identity (content variables; Table 2).
Table 2. CPD<sup>a</sup> course characteristics.

| Variables                                      | Course<sup>b</sup> | 1 | 2 | 3 | 4 | 5 |
|-----------------------------------------------|--------------------|---|---|---|---|---|
| Characteristics of course format              |                    |   |   |   |   |   |
| Virtual character use in course               | Yes                | No | Yes | Yes | Yes | No |
| Use of a reflective approach                  | Yes                | No | No  | Yes | Yes | Yes |
| Duration, min                                 | 90                 | 120 | 120 | 90  | 90  | |
| Presence of nonfunctional references          | Yes                | No | No  | No  | No  | Yes |
| Presence of slides with a video of health profes-  | No                | No | No  | No  | No  | Yes |
|     sional—leader opinion                     |                    |   |     |     |     |     |
| Presence of slides with a figure or a diagram  | No                 | Yes | Yes | Yes | Yes | Yes |
| Presence of slides with a quiz                | Yes                | Yes | Yes | Yes | Yes | Yes |
| Presence of women on the scientific committee  | No                 | __ |     |     |     | Yes |
| Characteristics of course content             |                    |   |   |   |   |   |
| Main CanMED role                              | Medical expert     | Medical expert | Leader | Professional | N/A<sup>d</sup> |
| Presence of slides per constructs of Godin’s integrated model for health  |                    |   |   |   |   |   |
|   professional behavior change                | Intention          | Yes | Yes | Yes | No  | Yes |
| Social influences                             | No                 | No  | Yes | No  | Yes | Yes |
| Beliefs about capabilities                    | Yes                | Yes | Yes | Yes | Yes | Yes |
| Role and identity                             | Yes                | Yes | Yes | Yes | Yes | Yes |
| Beliefs about consequences                    | Yes                | Yes | Yes | Yes | Yes | Yes |
| Presence of which level of Bloom’s taxonomy   |                    |   |   |   |   |   |
| Cognitive                                     | Yes                | Yes | Yes | Yes | Yes | No |
| Affective                                     | No                 | No  | No  | No  | No  | Yes |
| Psychomotor                                   | No                 | No  | No  | No  | Yes | Yes |

<sup>a</sup>CPD: continuing professional development.

<sup>b</sup>Course details: course 1—to adapt the frequency of cytological exams for gynecological patients 25-45 years old to new Human Papillomavirus recommendations; course 2—to use recommended lung cancer treatment and monitoring algorithms; course 3—to use a systematic leadership approach in community health endeavors (eg, preventing suicides from a bridge in Montreal); course 4—to respect best practices in record keeping; and course 5—to identify patients who meet the criteria for identifying a potential organ donor.

<sup>c</sup>Not available.

<sup>d</sup>N/A: not applicable.

**CPD-Reaction Questionnaires Scores and ICC**

Of the 400 participants, 259 (65%) respondents fully completed the CPD-Reaction questionnaire. Table 3 shows details of respondents’ mean intention and psychosocial determinants and SD scores for each course. The behavioral intention score was medium to high and varied depending on the course undertaken (intention score between 5.37, SD 1.17 and 6.60, SD 0.88). ANOVA analysis of the variable intention showed significant differences between courses ($F$ value=12.50, $P<.001$). The ICC (0.17) indicated that 17% of the total variation in the behavioral intention of physicians to adopt new behaviors could be explained at the level of the course in which they had registered. Some courses showed significantly different means of intention, that is, respondents shared more intracourse similarities than extracourse similarities (ie, within CPD courses vs between courses).
Table 3. CPD-Reaction questionnaire mean scores and ICC\(^a\).

| Variables                      | Courses\(^b\) | Mean (SD) | ICC  |
|-------------------------------|---------------|-----------|------|
|                               | 1             | 2         | 3    | 4    | 5    | N/A\(^c\) | N/A |
| Number of respondents, n (%)  | 53 (20)       | 44 (17)   | 63 (24) | 61 (24) | 38 (15) |           |     |
| Psychosocial determinants\(^d\), mean (SD) |   |           |       |       |       |       |     |
| Intention                     | 6.22 (1.15)   | 6.22 (0.87) | 5.37 (1.17) | 6.57 (1.11) | 6.60 (0.88) | 6.15 (1.16) | 16.8 |
| Social influences             | 5.44 (0.97)   | 5.41 (1.12) | 4.39 (0.98) | 5.17 (0.95) | 5.16 (1.33) | 5.07 (1.12) | 13.0 |
| Beliefs about capabilities     | 6.28 (0.80)   | 6.22 (0.75) | 5.07 (0.81) | 6.16 (0.89) | 6.25 (1.11) | 5.94 (0.99) | 25.9 |
| Moral norm                    | 6.58 (0.66)   | 6.35 (0.82) | 5.94 (0.93) | 6.61 (1.11) | 6.68 (0.80) | 6.41 (0.93) | 8.98 |
| Beliefs about consequences    | 6.28 (0.94)   | 6.30 (0.94) | 5.99 (0.91) | 6.72 (0.47) | 6.68 (0.77) | 6.38 (0.86) | 10.9 |

\(^a\)ICC: intraclass correlation coefficient.
\(^b\)Course details: course 1—to adapt the frequency of cytological exams for gynecological patients 25-45 years old to new Human Papillomavirus recommendations; course 2—to use recommended lung cancer treatment and monitoring algorithms; course 3—to use a systematic leadership approach in community health endeavors (eg, preventing suicides from a bridge in Montreal); course 4—to respect best practices in record keeping; and course 5—to identify patients who meet the criteria for identifying a potential organ donor.
\(^c\)N/A: not applicable.
\(^d\)Score range 1-7.

Factors Associated With Physicians’ Intention to Adopt a New Behavior

Only one of the course variables, psychomotor learning level (Bloom’s taxonomy), was significantly associated with the physicians’ intention to change their behavior, and this was the case in all 5 courses (\(R^2=0.89, P=.04\)) (data not shown). Bivariate regression analysis of psychosocial determinants showed that all 4 variables were significantly associated with intention (\(P<.001\)) (Table 4). Multivariate regression analysis of the same variables showed 3 out of the 4 were significantly correlated with intention, namely beliefs about capabilities (0.49, \(P<.001\)), moral norm (0.37, \(P<.001\)), and beliefs about consequences (0.40, \(P<.001\)) (Table 4). When we analyzed the courses separately, we found similar results (Multimedia Appendix 2).

Table 4. Bivariate regression analysis and multivariate regression analysis of psychosocial determinants associated with intention to adopt a clinical behavior (n=259 respondents).

| Variables                      | \(\beta\)   | 95% CI     | \(P\) value |
|-------------------------------|-------------|------------|-------------|
| Bivariate regression analysis |             |            |             |
| Social influences             | .42         | 0.31 to 0.53 | <.001       |
| Beliefs about capabilities     | .95         | 0.86 to 1.04 | <.001       |
| Moral norm                    | .82         | 0.71 to 0.93 | <.001       |
| Beliefs about consequences    | .80         | 0.67 to 0.92 | <.001       |
| Multivariate regression analysis |          |            |             |
| Social influences             | -.04        | -0.12 to 0.04 | .30         |
| Beliefs about capabilities     | .49         | 0.37 to 0.62 | <.001       |
| Moral norm                    | .37         | 0.27 to 0.48 | <.001       |
| Beliefs about consequences    | .40         | 0.30 to 0.50 | <.001       |

Discussion

Principal Findings

We identified factors associated with physicians’ intention to adopt new behaviors following the completion of 5 different web-based CPD courses. Behavioral intention scores were average to high but differed significantly from one course to another. The differences between CPD courses (higher level in our hierarchical database) explained a significant proportion of this variance in intention (ICC=0.17). We saw no influence of course characteristics (content-wise or format-wise) on intention except the targeting of Bloom’s psychomotor learning level. Finally, we observed that together, beliefs about capabilities, moral norm, and belief about consequences (3 of the psychosocial variables included in Godin’s integrated model for health professional behavior change) partially explained physicians’ behavioral intentions.

Significance and Comparison With Prior Work

First, we found that behavioral intention scores were average to high but varied by course. Some courses seemed to be
associated with higher physician intention to adapt their practice compared with others. Course 3, on using a systematic leadership approach in community health endeavors, had the lowest intention score of all—although this course also targets more complex and ambiguous outcomes than the others, and leadership skills are difficult to develop in 120 minutes. We also found that the variance in intention explained by the difference in CPD courses had significant magnitude. We obtained an ICC of 0.17; thus, the intergroup variance represented 17% of the total variance. Interestingly, higher ICCs are more often seen in studies in specialty settings than in primary care studies [42]. It is possible that specialist physicians have more in common with each other, even diverse specialist physicians attending the same course, than do general practitioners. Some studies have observed that medical professional culture ensures there is more similarity than diversity within specific medical specialties [43-45].

Second, in bivariate analyses at the CPD course level, the only variable significantly correlated with the intention to adopt new behaviors was targeting Bloom’s psychomotor learning level. This level of learning, unlike the cognitive or affective levels, is more closely related to physical changes in behavior. However, this variable was not retained in our final model, suggesting that as an influence on adoption of new behaviors, it does not supersede the psychosocial variables included in the integrated model [17]. Regarding the other nonsignificant variables, previous studies have also found little significant association between sociodemographic characteristics and intention to adopt new behaviors [46,47]. Our results validate the assumption of the integrated model for health professional behavior change: modifiable psychosocial factors are the variables most likely to explain behavior change, and CPD courses should therefore focus on these factors to be more effective.

Third, we found that the 3 variables most significantly associated with intention to adopt a behavior among respondents were all psychosocial factors included in our integrated theoretical framework—beliefs about capabilities, moral norm, and beliefs about consequences (ie, their confidence about adopting the behavior, its ethical acceptability, and their perception that the behavior would be useful and beneficial). Based on our results, CPD courses should use behavior change techniques that focus on these 3 variables [48,49]. To improve beliefs about capabilities, courses could provide more experience to give participants confidence in their abilities, such as identifying barriers and management strategies, providing feedback, and encouraging monitoring of future actions (eg, noting and recording when the new behaviors have been adopted) [17,50]. To improve beliefs about consequences, courses could provide information about the proven benefits of the behavior and personalized information about its consequences. Regarding moral norm, courses could emphasize the felt obligation to adopt behaviors or help participants focus on moral considerations such as being aware of others’ needs [51]. In addition, according to Godin’s theory, when people hold two ideas that are not psychologically consistent, to reduce cognitive dissonance, they do all in their power to change them until they become consistent [17]. One way to reduce cognitive dissonance is to solicit arguments from the subject in favor of the behavior to be adopted even if they are against it [52]. While producing such arguments may cause discomfort, the subject will ultimately adjust their initial attitude to be more consistent with the arguments they fabricated in favor of the behavior. Surprising as it may seem, when we are led to act contrary to our convictions, we tend to justify our actions, and we adapt our opinions to our behavior. Other work on “provisional selves” suggests that playing a role with which one is unfamiliar, or even against which one resists, opens new moral possibilities and can help one envisage adapting one’s current role or adopting new ones [53,54]. Including this technique in a CPD course would be an interesting challenge.

Limitations and Strengths
This was a cross-sectional study, which limited our interpretation to assuming that attending the CPD courses improved intention scores. Indeed, we are unaware if respondents already had moderate-to-high intention to adopt these behaviors before completing the CPD courses—using the CPD-Reaction questionnaire both before and after the course would have better indicated a change in intention due to the course topic. A future study with a more robust study design (eg, pre-post controlled trial) could further verify the impact of courses [55]. Moreover, to increase power, we brought data from all 5 CPD courses (each targeting a different clinical behavior) into one hierarchical data set. Although aggregating data on distinct behaviors is not always advisable [56,57], this limitation was mitigated by respect for the theory archetypes that structure the study. In addition, our sensitivity analysis (Multimedia Appendix 2) showed similar results to those obtained with the aggregated database. The literature suggests that at least 30 units at each level of analysis are needed to reach sufficient power [58]. New ways to assess CPD courses are needed as few individual CPD courses recruit hundreds of participants. Moreover, sociodemographic data collected at the group level could not be applied to the respondent level (ie, to the individual level). Inferring results of analysis at the upper level (where determinants and outcomes are related at the group [course] level) to the individual level (ecological fallacy) or the reverse (atomistic fallacy) can result in bias [59]. Finally, intention is recognized as a limited proxy for behavior. Meta-analytic syntheses have found that intention accounts, on average, for only about 25% of the variance in behavior [35,60], although finding other reliable measures of behavior is challenging [19,56]. While a 2006 review by Eccles et al [61] “provide[d] encouragement for the contention that there is a predictable relationship between the intentions of a health professional and their subsequent behaviour,” CPD activities making use of the determinants of intention as dependent variables should also integrate methods to close the intention-behavior gap such as audit and feedback, eliciting of implementation intentions (“if-then” plans), commitment to change statements, and supervision to support clinicians in following through on their intentions [62-64].

Conclusions
Beliefs about capabilities, moral norm, and belief about consequences partially explained physicians’ behavioral
intention. To address these beliefs, CPD activities could focus on building physicians’ confidence about overcoming obstacles and on strategies for helping them align moral values with new behaviors, as well as providing information about their proven benefits.

As mentioned in our previous work [12], the use of CPD-Reaction helps CPD developers reflect on the nature of their training objectives in relation to the impact they seek. This study provides insights as to how to optimize physicians’ intention to adopt a new behavior as a result of web-based CPD activities. CPD-Reaction contains the relevant theory-informed and validated items needed to assess intention and its determinants for CPD developers targeting clinical behavior change.

Acknowledgments
The authors thank Louisa Blair for editing this manuscript.

Conflicts of Interest
None declared.

Multimedia Appendix 1
CPD-Reaction questionnaire.
[PDF File (Adobe PDF File), 169 KB-Multimedia Appendix 1]

Multimedia Appendix 2
Bivariate regression analysis and multivariate regression analysis of psychosocial determinants associated with intention to change a clinical behavior for each continuing professional development course (n=5). Course topic 1: to adapt the frequency of cytological exams for gynecological patients 25-45 years old to new human papillomavirus recommendations; course topic 2: to use recommended lung cancer treatment and monitoring algorithms; course topic 3: to use a systematic leadership approach in community health endeavors (e.g., preventing suicides from a bridge in Montreal); course topic 4: to respect best practices in record keeping; and course topic 5: to identify patients who meet the criteria for identifying a potential organ donor.
[PDF File (Adobe PDF File), 39 KB-Multimedia Appendix 2]

References
1. A Concise Guide to Maintenance of Certification. Royal College of Physicians and Surgeons of Canada. URL: https://www.royalcollege.ca/rcsite/cpd/moc-program/concise-guide-maintenance-certification-e [accessed 2021-10-01]
2. Sullivan LG. A systematic review to compare the effectiveness of face-to-face versus online (including blended learning) delivery of CME/CPD for healthcare practitioners (HCPs). University of Queensland. 2017. URL: https://bit.ly/3lpsRvk [accessed 2022-05-03]
3. Archambault PM, van de Belt TH, Grajales FJ, Faber MJ, Kuziemsky CE, Gagnon S, et al. Wikis and collaborative writing applications in health care: a scoping review. J Med Internet Res 2013 Oct 08;15(10):e210 [FREE Full text] [doi: 10.2196/jmir.2787] [Medline: 24103318]
4. O’Brien Pott M, Blanshan AS, Huneke KM, Baasch Thomas BL, Cook DA. Barriers to identifying and obtaining CME: a national survey of physicians, nurse practitioners and physician assistants. BMC Med Educ 2021 Mar 19;21(1):168 [FREE Full text] [doi: 10.1186/s12909-021-02595-x] [Medline: 33740962]
5. Gravas S, Ahmad M, Hernández-Porras A, Furriel F, Alvarez-Maestro M, Kumar A, Office of Education and SIU Board of Directors. Impact of COVID-19 on medical education: introducing homo digitalis. World J Urol 2021 Jun 29;39(6):1997-2003 [FREE Full text] [doi: 10.1007/s00345-020-03417-3] [Medline: 32860555]
6. Samuel A, Cervero RM, Durning SJ, Maggio LA. Effect of continuing professional development on health professionals’ performance and patient outcomes: a scoping review of knowledge syntheses. Acad Med 2021 Jun 01;96(6):913-923. [doi: 10.1097/ACM.0000000000003899] [Medline: 33332905]
7. Lahti M, Häitonen H, Välimäki M. Impact of e-learning on nurses' and student nurses knowledge, skills, and satisfaction: a systematic review and meta-analysis. Int J Nurs Stud 2014 Jan;51(1):136-149. [doi: 10.1016/j.ijnurstu.2012.12.017] [Medline: 2384695]
8. Fredericks S, Martorella G, Catallo C. A systematic review of web-based educational interventions. Clin Nurs Res 2015 Feb 26;24(1):91-113. [doi: 10.1177/1054773814522829] [Medline: 24571963]
9. Cook DA, Levinson AJ, Garside S, Dupras DM, Erwin PJ, Montori VM. Internet-based learning in the health professions: a meta-analysis. JAMA 2008 Sep 10;300(10):1181-1196. [doi: 10.1001/jama.300.10.1181] [Medline: 18780847]
10. van der Keylen P, Tomandl J, Wollmann K, Möhler R, Sofroniou M, Maun A, et al. The online health information needs of family physicians: systematic review of qualitative and quantitative studies. J Med Internet Res 2020 Dec 30;22(12):e18816 [FREE Full text] [doi: 10.2196/18816] [Medline: 33377874]
11. Slater BJ, Kashyap MV, Calkins CM, Powell D, Rothstein DH, Clifton M, et al. Global dissemination of knowledge through virtual platforms: Reflections and recommendations from APSA/IJE. J Pediat Surg 2022 Jan 15:ahead of print [FREE Full text] [doi: 10.1016/j.jpedsurg.2022.01.006] [Medline: 35086680]

12. Légaré F, Freitas A, Thompson-Leduc P, Borduas F, Luconi F, Boucher A, et al. The majority of accredited continuing professional development activities do not target clinical behavior change. Academic Medicine 2015;90(2):197-202. [doi: 10.1097/acm.0000000000000543]

13. Rouleau G, Gagnon M, Côté J, Payne-Gagnon J, Hudson E, Dubois C, et al. Effects of e-Learning in a continuing education context on nursing care: systematic review of systematic qualitative, quantitative, and mixed-studies reviews. J Med Internet Res 2019 Oct 02;21(10):e15118 [FREE Full text] [doi: 10.2196/15118] [Medline: 31579016]

14. Cervero RM, Gaines JK. The impact of CME on physician performance and patient health outcomes: an updated synthesis of systematic reviews. J Contin Educ Health Prof 2015;35(2):131-138. [doi: 10.1002/chp.21290] [Medline: 26115113]

15. Atkins L, Francis J, Islam R, O'Connor D, Patey A, Ivers N, et al. A guide to using the Theoretical Domains Framework of behaviour change to investigate implementation problems. Implement Sci 2017 Jun 21;12(1):77 [FREE Full text] [doi: 10.1186/s13012-017-0605-9] [Medline: 28637486]

16. Conner M, Norman P. Predicting Health Behaviour. Berkshire, UK: McGraw-Hill Education; 2005.

17. Godin G. Le comportement clinique des professionnels de la santé: déterminants d'adoption et méthodes de changement. Université Laval. 2012 Jan 19. URL: http://research.chusj.org/getmedia/c47e1a6f-1206-4750-ad85-ef61abb9a460/recherche-clinique_URCAPresentation-conferencier-gaston-godin.pdf.aspx [accessed 2022-05-03]

18. Godin G, Bélanger-Gravel A, Amirault S, Vohl M, Pérusse L. The effect of mere-measurement of cognitions on physical activity behavior: a randomized controlled trial among overweight and obese individuals. Int J Behav Nutr Phys Act 2011 Jan 11;8(1):2 [FREE Full text] [doi: 10.1186/1479-5868-8-2] [Medline: 21223565]

19. Godin G, Bélanger-Gravel A, Eccles M, Grimshaw J. Healthcare professionals' intentions and behaviours: a systematic review of studies based on social cognitive theories. Implement Sci 2008 Jul 16;3:36 [FREE Full text] [doi: 10.1186/s13012-017-0605-9] [Medline: 28637486]

20. Accme data report shows increasing growth and diversity in accredited continuing medical education. Accreditation Council for Continuing Medical Education. 2018 Jul 12. URL: http://www.accme.org/news-releases/2017-data-report [accessed 2022-05-03]

21. Casper ES. The theory of planned behavior applied to continuing education for mental health professionals. Psychiatrie Serv 2007 Oct;58(10):1324-1329. [doi: 10.1176/ps.2007.58.10.1324] [Medline: 17914010]

22. Légaré F, Borduas F, Jacques A, Laprise R, Voyer G, Boucher A, et al. Developing a theory-based instrument to assess the impact of continuing professional development activities on clinical practice: a study protocol. Implement Sci 2011 Mar 07;6(1):17 [FREE Full text] [doi: 10.1186/1748-5908-6-17] [Medline: 21385369]

23. Légaré F, Stacey D, Brière N, Fraser K, Desroches S, Dumont S, et al. Healthcare providers' intentions to engage in an interprofessional approach to shared decision-making in home care programs: a mixed methods study. J Interprof Care 2013 May;27(3):214-222 [FREE Full text] [doi: 10.3109/13561820.2013.763777] [Medline: 23394265]

24. Goulet F, Hudson E, Gagnon R, Gauvin E, Lemire E,Arsenal I. Effects of continuing professional development on clinical performance: Results of a study involving family practitioners in Quebec. Canadian Family Physician 2013;59(5):518-525. [doi: 10.1111/cfp.12106]

25. Légaré F, Freitas A, Turcotte S, Borduas F, Jacques A, Luconi F, et al. Responsiveness of a simple tool for assessing change in behavioral intention after continuing professional development activities. PLoS One 2017 May 1;12(5):e0176678 [FREE Full text] [doi: 10.1371/journal.pone.0176678] [Medline: 28459836]

26. Moon J. Using reflective learning to improve the impact of short courses and workshops. J Contin Educ Health Prof 2004;24(1):4-11. [doi: 10.1002/chp.130240103] [Medline: 15069907]

27. Armson H, Elmslie T, Rodier S, Wakefield J. Is the cognitive complexity of commitment-to-change statements associated with change in clinical practice? An application of Bloom's taxonomy. J Contin Educ Health Prof 2015;35(3):166-175. [doi: 10.1002/chp.21303] [Medline: 26378422]

28. Kirkpatrick D. The Four Levels of Evaluation: Measurement and Evaluation. Alexandria, VA: American Society for Training & Development; 2007.

29. Armstrong P. Bloom’s Taxonomy. Vanderbilt University Center for Teaching. 2010. URL: https://cft.vanderbilt.edu/guides-sub-pages/blooms-taxonomy/[accessed 2022-05-03]

30. Grimes DA, Schulz KF. An overview of clinical research: the lay of the land. The Lancet 2002 Jan;359(9300):57-61. [doi: 10.1016/S0140-6736(02)07283-5]

31. von Elm E, Altman DG, Egger M, Pocock SJ, Gotzsche PC, Vandenbroucke JP, STROBE Initiative. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. PLoS Med 2007 Oct 16;4(10):e296 [FREE Full text] [doi: 10.1371/journal.pmed.0040296] [Medline: 17941714]

32. Training. Fédération des médecins spécialistes du Québec. URL: https://fmsq.org/fr/propos-de-nous/qui-sommes-nous [accessed 2021-10-01]
34. National Standard for Support of Accredited CPD Activities. Royal College of Physicians and Surgeons of Canada. URL: [https://www.royalcollege.ca/rcsite/cpd/providers/tools-resources-accredited-cpd-providers/national-standard-accredited-cpd-activities-e](https://www.royalcollege.ca/rcsite/cpd/providers/tools-resources-accredited-cpd-providers/national-standard-accredited-cpd-activities-e) [accessed 2021-10-01]

35. Ajzen I. The theory of planned behavior: Frequently asked questions. Human Behav and Emerg Tech 2020 Jun 10;2(4):314-324. [doi: 10.1002/hbe2.195]

36. About CanMEDS. The Royal College of Physicians and Surgeons of Canada. URL: [http://canmeds.royalcollege.ca/en/about](http://canmeds.royalcollege.ca/en/about) [accessed 2021-10-01]

37. Légaré F, Borduas F, Freitas A, Turcotte S. The Continuing Professional Development (CPD) Reaction Questionnaire User Manual. Université Laval. 2015. URL: [https://www.dropbox.com/s/lt7hrygvx835fz65/CPD%20Reaction_User%20Manual.pdf?dl=0] [accessed 2022-05-03]

38. Martha ASD, Santoso HB. The design and impact of the pedagogical agent: a systematic literature review. Journal of Educators Online 2019 Jan;16(1):n1. [doi: 10.9743/jeo.2019.16.1.8]

39. Mayer RE. Applying the science of learning: Evidence-based principles for the design of multimedia instruction. American Psychologist 2008;63(8):760-769. [doi: 10.1037/0003-066x.63.8.760]

40. Ben Charif A, Croteau J, Adekpédjou R, Zomahoun HTV, Adisso EL, Légaré F. Implementation research on shared decision making in primary care: inventory of intraclass correlation coefficients. Med Decis Making 2019 Aug;39(6):661-672. [doi: 10.1177/0272989X19866296] [Medline: 31423898]

41. Poole M, O’Farrell P. The assumptions of the linear regression model. In: Transactions of the Institute of British Geographers. London, UK: Academic Journal Offprint; Mar 1971:145.

42. Campbell MK, Fayers PM, Grimshaw JM. Determinants of the intraclass correlation coefficient in cluster randomized trials: the case of implementation research. Clin Trials 2005 Sep 03;2(2):99-107. [doi: 10.1191/1740774505cn071oa] [Medline: 16279131]

43. López Cabrera MV, Olivares Olivares SL, Heredia Escorza Y. Professional culture in medical schools: a medical educator interpretation. Med Sci Educ 2020 Mar 03;30(1):281-286 [FREE full text] [doi: 10.1007/s40670-019-00896-x] [Medline: 34457668]

44. Al-Rumayyan A, Van Mook WNKA, Magzoub ME, Al-Eraky MM, Ferwana M, Khan MA, et al. Medical professionalism frameworks across non-Western cultures: A narrative overview. Medical Teacher 2017 Mar 05;39(sup1):S8-S14. [doi: 10.1080/0142159X.2016.1254740]

45. Wyatt TR, Rockich-Winston N, White D, Taylor TR. "Changing the narrative": a study on professional identity formation among Black/African American physicians in the U.S. Adv Health Sci Educ Theory Pract 2021 Mar 22;26(1):183-198. [doi: 10.1007/s10459-020-09978-7] [Medline: 32572728]

46. Boland L, Lawson ML, Graham ID, Légaré F, Dorrance K, Shepherd A, et al. Post-training shared decision making barriers and facilitators for pediatric healthcare providers: a mixed-methods study. Acad Pediatr 2019;19(1):118-129. [doi: 10.1016/j.acap.2018.05.010] [Medline: 29860134]

47. Unni EJ, Lian N, Kuykendall W. Understanding community pharmacist perceptions and knowledge about HIV preexposure prophylaxis (PrEP) therapy in a Mountain West state. J Am Pharm Assoc (2003) 2016;56(5):527-532.e1. [doi: 10.1016/j.japh.2016.05.004] [Medline: 27594106]

48. Michie S, Richardson M, Johnston M, Abraham C, Francis J, Hardeman W, et al. The behavior change technique taxonomy (v1) of 93 hierarchical clustered techniques: building an international consensus for the reporting of behavior change interventions. Ann Behav Med 2013 Aug;46(1):81-95. [doi: 10.1007/s12160-013-9486-6] [Medline: 23512568]

49. Michie S, van Stralen MM, West R. The behaviour change wheel: a new method for characterising and designing behaviour change interventions. Implement Sci 2011 Apr 23;6:42 [FREE full text] [doi: 10.1186/1748-5908-6-42] [Medline: 21513547]

50. Lucero KS, Chen P. What do reinforcement and confidence have to do with it? A systematic pathway analysis of knowledge, competence, confidence, and intention to change. J Eur CME 2020 Oct 12;9(1):1834759 [FREE full text] [doi: 10.1016/j.japh.2016.05.004] [Medline: 27594106]

51. Godin G, Conner M, Sheeran P. Bridging the intention-behaviour 'gap': the role of moral norm. Br J Soc Psychol 2005 Dec;44(Pt 4):497-512. [doi: 10.1348/014466605X17452] [Medline: 16368016]

52. Vaidis D, Halimi-Falkowicz S. La théorie de la dissonance cognitive: une théorie âgée d’un demi-siècle. Revue électronique de Psychologie sociale 2007;1:9-18 [FREE full text]

53. Hennekam S, Lodge J, Shymko Y. From zero to hero: An exploratory study examining sudden hero status among nonphysician health care workers during the COVID-19 pandemic. J Appl Psychol 2020 Oct;105(10):1088-1100. [doi: 10.1037/apl0000832] [Medline: 32897086]

54. Ibarra H. Provisional selves: experimenting with image and identity in professional adaptation. Administrative Science Quarterly 1999;44(4):764-791. [doi: 10.2307/2667055]

55. Campbell DT, Stanley JC. Experimental and Quasi-Experimental Designs for Research. Chicago: Rand McNally College Publishing Company; 1963.

56. Eccles MP, Hrisos S, Francis JJ, Stamp E, Johnston M, Hawthorne G, et al. Instrument development, data collection, and characteristics of practices, staff, and measures in the Improving Quality of Care in Diabetes (iQuaD) Study. Implement Sci 2011 Jun 09;6(1):61 [FREE full text] [doi: 10.1186/1748-5908-6-61] [Medline: 21658211]
57. Eccles MP, Hrisos S, Francis JJ, Steen N, Bosch M, Johnston M. Can the collective intentions of individual professionals within healthcare teams predict the team's performance: developing methods and theory. Implement Sci 2009 May 05;4:24 [FREE Full text] [doi: 10.1186/1748-5908-4-24] [Medline: 19416543]

58. Maas CJM, Hox JJ. Sufficient sample sizes for multilevel modeling. Methodology 2005 Jan;1(3):86-92. [doi: 10.1027/1614-2241.1.3.86]

59. Mackenbach J. Roaming through methodology. XXVI. The ecological fallacy and its less well-known counterpart, the atomistic fallacy. Nederlands tijdschrift voor geneeskunde 2000;144(44):2097-2100. [doi: 10.4135/9781412983907.n612]

60. Webb TL, Sheeran P. Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. Psychol Bull 2006 Mar;132(2):249-268. [doi: 10.1037/0033-2909.132.2.249] [Medline: 16536643]

61. Eccles MP, Hrisos S, Francis J, Kaner EF, Dickinson HO, Beyer F, et al. Do self-reported intentions predict clinicians' behaviour: a systematic review. Implement Sci 2006 Nov 21;1(1):28 [FREE Full text] [doi: 10.1186/1748-5908-1-28] [Medline: 17118180]

62. Trivasse H, Webb TL, Waller G. A meta-analysis of the effects of training clinicians in exposure therapy on knowledge, attitudes, intentions, and behavior. Clin Psychol Rev 2020 Aug;80:101887. [doi: 10.1016/j.cpr.2020.101887] [Medline: 32736152]

63. Toli A, Webb TL, Hardy GE. Does forming implementation intentions help people with mental health problems to achieve goals? A meta-analysis of experimental studies with clinical and analogue samples. Br J Clin Psychol 2016 Mar;55(1):69-90. [doi: 10.1111/bjc.12086] [Medline: 25965276]

64. Arnold Rehring SM, Steiner JF, Reifler LM, Glenn KA, Daley MF. Commitment to change statements and actual practice change after a continuing medical education intervention. J Contin Educ Health Prof 2021 Mar 16;41(2):145-152. [doi: 10.1097/ceh.0000000000000340]

Abbreviations

CPD: continuing professional development
FMSQ: Federation of Medical Specialists of Québec
ICC: intraclass correlation coefficient
STROBE: Strengthening in the Reporting of Observational Studies in Epidemiology

Edited by T Leung; submitted 15.10.21; peer-reviewed by P van der Keylen, DS Mukkalwar, A Joseph; comments to author 09.01.22; revised version received 02.03.22; accepted 26.04.22; published 02.06.22

Please cite as:
Bergeron L, Décary S, Djignefa Djade CD, Daniel SJ, Tremblay M, Rivest LP, Légaré F
Factors Associated With Specialists' Intention to Adopt New Behaviors After Taking Web-Based Continuing Professional Development Courses: Cross-sectional Study
JMIR Med Educ 2022;8(2):e34299
URL: https://mededu.jmir.org/2022/2/e34299
doi: 10.2196/34299
PMID: 35476039

©Lysa Bergeron, Simon Décary, Codjo Djignefa Djade, Sam J Daniel, Martin Tremblay, Louis-Paul Rivest, France Légaré. Originally published in JMIR Medical Education (https://mededu.jmir.org), 02.06.2022. This is an open-access article distributed under the terms of the Creative Commons Attribution License (https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in JMIR Medical Education, is properly cited. The complete bibliographic information, a link to the original publication on https://mededu.jmir.org/, as well as this copyright and license information must be included.