

## Refereed papers

# Perceived barriers to completing an e-learning program on evidence-based medicine

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### ABSTRACT

**Purpose** The Continuing Professional Development Center of the Faculty of Medicine at Laval University offers an internet-based program on evidence-based medicine (EBM). After one year, only three physicians out of the 40 who willingly paid to register had completed the entire program. This descriptive study aimed to identify physicians' beliefs regarding their completion of this online program.

**Methods** Using theoretical concepts from the Theory of Planned Behaviour, a semi-structured telephone interview guide was developed to assess respondents' attitudes, perceived subjective norms, perceived obstacles and facilitating conditions with respect to completing this internet-based program. Three independent reviewers performed content analysis of the interview transcripts to obtain an appropriate level of reliability. Findings were shared and organised according to theoretical categories of beliefs.

**Results** A total of 35 physicians (88% response rate) were interviewed. Despite perceived advantages to completing the internet-based program, barriers remained, especially those related to physicians' perceptions of time constraints. Lack of personal discipline and unfamiliarity with computers were also perceived as important barriers.

**Conclusions** This study offers a theoretical basis to understand physicians' beliefs towards completing an internet-based continuing medical education (CME) program on EBM. Based upon respondents' insights, several modifications were carried out to enhance the uptake of the program by physicians and, therefore, its implementation.

**Keywords:** continuing medical education, e-learning, evidence-based medicine

## Introduction

Learning the principles of evidence-based medicine (EBM) has not yet been shown to improve health outcomes.<sup>1,2</sup> Nonetheless, EBM is increasingly recognised as the current paradigm of best clinical practice. In fact, there is a general consensus that translating EBM into clinical practice would reduce health inequities, an important goal of healthcare systems.<sup>3</sup> Therefore, many medical schools are currently providing continuing medical education (CME) activities on components of EBM such as critical appraisal of medical literature.<sup>4</sup> However, teaching critical appraisal skills and information mastery remains a challenge.<sup>5,6</sup> With the number of online CME activities growing exponentially,<sup>7,8</sup> the use of the internet to teach EBM principles might be one strategy to address part of this challenge.<sup>9,10</sup>

The Continuing Professional Development Center of the Faculty of Medicine at Laval University (Quebec, Canada) has implemented an online self-tutorial program to help healthcare professionals develop critical appraisal and information mastery skills.<sup>11</sup> An overview of the program content (in French) can be accessed through the website [infocritique.fmed.ulaval.ca](http://infocritique.fmed.ulaval.ca). The program is unique in that it was developed following a survey among French-speaking physicians that identified a need to improve knowledge and competence in EBM. The instructional method consists of problem-centred and self-directed learning from clinical cases, critical reading of scientific articles, interactive exercises and post-tests with feedback. The program was modelled on established approaches to teaching critical appraisal and information mastery.<sup>12,13</sup> Information about the program was disseminated through various means, such as advertisement on the Faculty's website, flyers and word of mouth. Physicians

were offered 12 CME credits for completing the program.

A total of 40 physicians registered during the first year of the program and thus willingly paid to complete the entire program. However, only three of the registrants had completed all modules available after the first year. To better understand why so few registrants had completed the program, a study was conducted to assess the factors that could explain the lack of participation among physicians.

## Conceptual framework

It is believed that the lack of a conceptual and theoretical basis could explain the limited success of initiatives to change behaviours of healthcare providers.<sup>14-17</sup> This study was based upon Aizen's Theory of Planned Behaviour (TPB),<sup>18</sup> a model that has proved relevant for understanding several behaviours of healthcare providers.<sup>19-22</sup> Figure 1 illustrates the theoretical relationships between behaviour and its determinants, as proposed by the TPB.

The TPB postulates that the realisation of a given behaviour (B) depends on the individual intention (I) to perform this behaviour. In turn, the individual intention is explained by three factors: attitude towards action (AACT), subjective norm (SN) and perception of behavioural control (PBC). AACT represents the evaluation of the advantages and disadvantages associated with the performance of a given behaviour. SN consists of the perception by an individual that significant others will approve or disapprove of the behaviour in question. Finally, PBC represents the extent to which an individual believes that she or he possesses the resources and opportunities required to perform the behaviour.

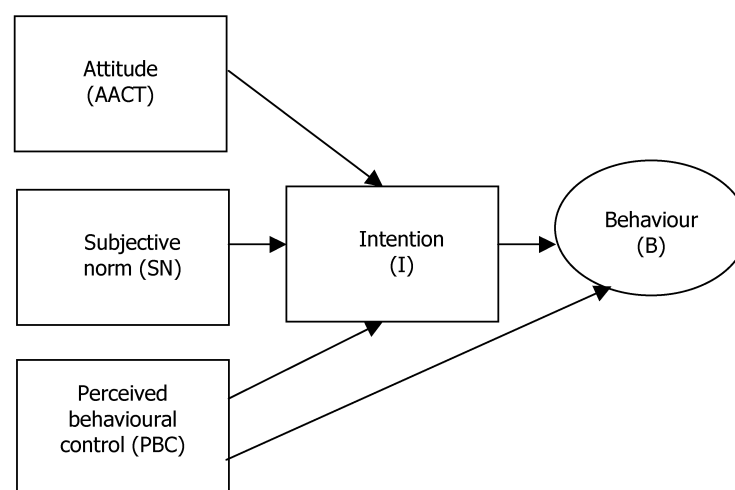


Figure 1 Aizen's Theory of Planned Behaviour<sup>18</sup>

According to Aizen,<sup>18</sup> the three determinants of the intention (AACT, SN and PBC) depend on underlying attitudinal, normative and control beliefs, respectively. The modally salient beliefs are thus the most frequently reported beliefs regarding the attributes of performing a particular behaviour in the target group.<sup>23</sup> These modally salient beliefs are important to understand the intention to perform a specific behaviour in a given situation.

## Methods

### Participants and setting

All 40 physicians who registered for the program were invited to participate on a voluntary basis in a telephone interview at a time of their convenience. Up to five attempts were made to contact all potential participants at different hours of the day over a two-month period. Participants were classified into three categories, according to the number of modules they had completed:

- 1 users (CUs) – completed all five modules
- 2 partial users (PUs) – completed between one and four modules
- 3 non-users (NUs) – did not complete any modules.

Some of the NUs had accessed the program but never completed any module. This *a priori* classification was devised by the members of the research team and based on the information tracked down from the software by the program webmaster. The information was further validated at the time of the interview.

### Data collection procedures

This study was part of the formative evaluation process of the program and was approved by the Continuing Professional Development Center of the Laval University. Verbal informed consent was received from participants before interview. The interviewer, an experienced research professional trained as an anthropologist, explained the process and clearly detailed what was expected from participants as well as outlining anonymity and confidentiality issues. No financial compensation was offered to the participants.

The same questions were asked of all participants, but the wording of questions was adapted to each category of user. The interview guide consisted of semi-structured open-ended questions based on the TPB<sup>18</sup> and inspired by previous research among health-care professionals.<sup>24</sup> Questions assessed physicians' beliefs regarding attitudes and subjective norms, as

well as barriers and facilitators to completing the program within one year. For example, CUs were asked: 'In your opinion, what are the conditions that have facilitated your completion of the e-learning program within one year?' The same question adapted for PUs and NUs was: 'In your opinion, what are the conditions that could facilitate your completion of the e-learning program within one year?' Interviews lasted from 10 to 30 minutes. They were not recorded, but the interviewer collected participants' answers and comments on a structured schema.

### Analyses and coding

Interview content was transcribed into a computer database. Three researchers proceeded independently to content analysis. First, all transcripts were read for a general understanding. Then, a data extraction sheet was created by using a template analytic approach, beginning with a basic set of codes based on theoretical categories. Themes were identified and classified under the three theoretical categories of beliefs based on the theoretical framework that was used: attitudinal, normative and control. Free categories were also used to classify other types of content, such as suggestions for improvement. Within each belief category, similar response items were aggregated into themes. For example, 'Problem with internet connection', 'Having slow internet connection' and 'Losing connection' were grouped under the theme 'Technical problems'. The number of quotes referring to the same theme was compiled for each category of users (CUs, PUs, NUs).

## Results

### Characteristics of respondents

Of the 40 physicians who registered for the e-learning program, 35 (88%) participated in this study. Three were classified as CUs (completed the program), 11 as PUs (partially completed the program), and the remaining 21 as NUs (did not complete any of the program). Five registrants to the program (three PUs and two NUs) did not participate in this study. Of the five non-participants, one declined to participate and the other four could not be contacted.

Characteristics of participants are presented in Table 1. The majority of participants (83%) were family physicians. Women represented just over half (51%) of the sample. Mean age was 43.8 years  $\pm$  6.5, ranging from 27 to 60 years. Participants in each category of users were similar with respect to age, gender and practice location.

**Table 1** Characteristics of participants according to category of users of the online CME program on EBM

Characteristics	User category			
	CU ( <i>n</i> = 3)	PU ( <i>n</i> = 11)	NU ( <i>n</i> = 21)	Total ( <i>n</i> = 35)
Gender female	1 (33%)	7 (65%)	10 (49%)	18 (51%)
Mean age ± SD (years)	42.0 ± 7.5	42.8 ± 8.7	44.6 ± 7.9	43.8 ± 6.5
Professional status				
Family physician	3 (100%)	9 (82%)	17 (81%)	29 (83%)
Specialist		1 (9%)	4 (19%)	5 (14%)
Resident		1 (9%)		1 (3%)
Practice location*				
Private clinic	1 (33%)	6 (55%)	11 (52%)	18 (51%)
Hospital	1 (33%)	5 (45%)	12 (57%)	18 (51%)
Community health centre	1 (33%)	2 (18%)	1 (5%)	4 (12%)
Emergency			5 (24%)	5 (14%)
Public health		2 (18%)		2 (6%)
Other			1 (5%)	1 (3%)

CU = complete user (all 5 modules completed); PU = partial user (1–4 modules completed);

NU = non-user (no module completed); SD = standard deviation

\* Some physicians practised in more than one location.

## Salient beliefs

Overall, physicians perceived several benefits related to completing the online CME program. As shown in Table 2, perceived advantages to completing the program included acquisition of critical appraisal skills, knowledge update and acquisition of skills for searching clinical information on the internet. Other benefits related to program completion were to provide tools to teach residents and to interact with pharmaceutical representatives. According to a CU, the program succeeded in providing tools to appraise the relevance of information to one's practice:

'It's always good for my practice to have strict criteria for evaluating multiple information sources such as scientific journals, websites, pharmaceutical representatives ... It allows me to better assess the relevance of this information.' (Respondent 25)

Few significant persons or groups appeared to have influenced respondents' completion of the online CME program. Many respondents believed that completing the program was a personal process, so they did not identify any person or group who could support them in that activity. It is worth mentioning that all three CUs answered in that manner. Thus, completing the program seems to have been mostly perceived as a personal decision. Nonetheless, teamwork, whether with residents or peers, was reported as a source of motivation by a number of respondents.

Control beliefs explaining the barriers to completing the program can be related to the program itself, the technology or the individual. Among the barriers related to the program, respondents mentioned the length of the modules, their complexity and the lack of sufficient feedback. As for the technology, some respondents reported problems with the internet connection and with the program software. Also, lack of familiarity with computers was seen as a barrier for some respondents, such as this PU:

'I'm not familiar with computers ... One needs to use computers regularly to become familiar with them. Completing it [the module] was not easy for me. I thought it would have been easier.' (Respondent 18)

However, the majority of perceived barriers were those related to the users themselves, such as the perception of time constraints and having other priorities. As this NU indicates:

'It requires time and discipline. You have to be autonomous. For a procrastinator like me, this is very hard!' (Respondent 3)

Similarly, conditions believed to facilitate completing the program were mainly related to individual factors, such as motivation and imposing one's self-discipline to achieve the task. Other potential facilitating factors mentioned were related to the program itself, such as a closer and more individualised follow-up, and a reorganisation of the modules into shorter parts.

**Table 2** Frequency of salient beliefs associated with completing the online CME program on EBM by category of users

Salient beliefs	User category			
	CU ( <i>n</i> = 3)	PU ( <i>n</i> = 11)	NU ( <i>n</i> = 21)	Total ( <i>n</i> = 35)
<b>Perceived advantages</b>				
Gives knowledge on critical appraisal	2	3	8	13
Develops internet research skills		4	4	8
Updates knowledge	1	2	3	6
Provides additional professional training		3	3	6
Gives tools to teach residents			3	3
Provides tools to interact with pharmaceutical representative	1	2		3
<b>Normative beliefs</b>				
Colleagues		2	4	6
Being in charge of teaching residents		3	2	5
Program managers		1	2	3
College of Physicians (CME credits)		2		2
<b>Control beliefs – barriers</b>				
Lack of time	1	1	11	14
Technical problems		2	2	4
Lack of familiarity with computers		3	1	4
Lack of relevance to one's interests	1		1	2
Lack of personal discipline			2	2
<b>Control beliefs – facilitating factors</b>				
Extended time to complete the modules			5	5
Interest towards the topic	1	2	2	5
Personal discipline	2		2	4
Flexibility of the method		3		3
User-friendliness of the modules		3		3
Teamwork		2		2
Simplifying the modules		2		2
Recalls from program manager			2	2

CU = complete user (all 5 modules completed); PU = partial user (1–4 modules completed); NU = non-user (no module completed)

## Suggestions for improvement

Participants' suggestions to improve the online CME program were also collected (see Table 3). The possibility of completing the modules through online interaction and collaboration with other learners was proposed as a way of improving the program. Other suggestions were to provide a printable version of the modules (for example, as a pdf document), to divide each module into smaller sections, and to get a summary of one's progress through the program with periodic feedback. Some respondents also suggested an extension of the period allocated to complete the program.

## Discussion

This study sought to identify factors that could explain why many physicians did not complete an online CME program on EBM principles for which they have registered. This study is the first, to the best of our knowledge, to use a theoretical approach to the evaluation of an internet-based CME program on EBM. Its results should improve our understanding on how to effectively translate e-learning of EBM into healthcare professionals' clinical practice for the following reasons.

**Table 3** Frequency of participants' suggestions to facilitate the completion of online CME on EBM by category of users

Suggestions	User category			
	CU ( <i>n</i> = 3)	PU ( <i>n</i> = 11)	NU ( <i>n</i> = 21)	Total ( <i>n</i> = 35)
Printed version/access to material	1	3	1	5
Time extension			3	3
Individual profile and follow-up		1	2	3
Online collaboration	2			2
Dividing modules into shorter sections		1	1	2
Teamwork	1	1		2

CU = complete user (all 5 modules completed); PU = partial user (1–4 modules completed); NU = non-user (no module completed)

First, it is worth noting that the perceived advantages of completing the program were in agreement with general benefits of CME, such as updating knowledge and developing skills that can induce effective change in professional practice.<sup>25,26</sup> This finding suggests that emphasising benefits related to the quality of patient care could be useful in promoting the value of e-learning on EBM among physicians.

Second, lack of time was by far the most frequently reported barrier to completing the program. Physicians' perception of time constraints can be related to contextual factors (such as the length of the modules *per se*), but also to personal factors since it might refer to their perception of the personal investment needed. A lack of computer knowledge and skills has often been identified as a major obstacle to internet adoption in medical practice.<sup>19,27</sup> Thus, completion of the program could be encouraged by improving physicians' perception of ease of use and self-efficacy. Also, technological barriers, including problems with internet connection, should be taken into account since they could be easily modified.

Third, results regarding the influence of social factors were mixed. Previous studies on physicians' behaviours have shown that social factors were not related to the adoption of a new technology.<sup>21,28</sup> Conversely, other studies have found a strong relationship between physicians' normative beliefs and their intention to modify their behaviour.<sup>22,24</sup> Some respondents mentioned the possibility of teamwork as a facilitating factor in completing the program. Learning has been conceptualised as a social process,<sup>29</sup> and interaction between learners and facilitators could enhance participation in e-learning programs. Perhaps a virtual collaboration should be integrated into the course framework. As Wong *et al*<sup>30</sup>

have pointed out, interaction with other participants has been promoted as the key to e-learning, but this might not be relevant to all curricula.

Although the present program was not constructed with this in mind, some CME programs offer interactive video-conference courses where many participants connect at the same time and are guided by a facilitator.<sup>31,32</sup> Indeed, this program addresses the development of individual skills in critical appraisal and EBM and opts for a self-tutorial method of instruction. A recent study<sup>33</sup> found no significant differences between two forms of EBM teaching: one consisting of directed workshops and the other consisting of a self-directed computer-assisted program. However, self-directed learning might not suit everyone. In their evaluation of an online course, Greenhalgh *et al*<sup>34</sup> found that a structured online discussion, supported by a tutor, was one of the learning strategies that worked best. Thus, it would be interesting to further investigate the influence of social factors on e-learning about EBM.

Finally, it appears that the evaluative process associated with the present study itself had an impact on program achievement, since eight physicians completed the program after being interviewed. Thus, this study can be seen as a formative process which addresses users' perceptions and provides useful insight to adapt the e-learning CME program to their needs.<sup>35</sup>

### Strengths and limitations of the study results

Previous studies have shown that online CME is a viable option.<sup>33–37</sup> However, knowledge is still lacking to assess the effectiveness of e-learning CME.<sup>34</sup> In that

regard, this study adds to the developing body of knowledge on learners' experiences with respect to e-learning in the medical sphere by exploring qualitatively the perceptions of different types of e-learners (adopters, partial adopters and non-adopters). This is also the first study to focus on e-learning of EBM in a French-speaking environment, thus adding to the cultural diversity in the field of implementation sciences.

A major strength of this study is its use of the TPB to assess beliefs regarding perceived advantages as well as barriers and facilitators to online CME. Using a theory has the potential to: (1) facilitate the comparison between similar studies; (2) make it possible to carry out a systematic review in this area; and (3) contribute to the elaboration of a theoretical base for understanding the decision making leading to this behaviour. Further research could thus follow this process.

In spite of its interesting findings, this study has some limitations. A first limitation is the fact that it was conducted with a small group of physicians who paid registration fees to access a very focused e-learning program. Therefore, we cannot assume that our results are transferable to other clinicians and e-learning CME activities.

Second, the data collection procedure was adapted to fit the schedule of busy clinicians. Interviews and field notes were used as the sole data sources. However, interviews were not recorded. Therefore, it is possible that other comments from the participants were overlooked since we used semi-directed questions. Using member checking could have increased the likelihood that our interpretation of the data is in line with what the participants had expressed.<sup>38</sup>

Our qualitative approach was based on a content analysis using an existing theoretical framework that was selected *a priori*. Other researchers might have preferred a more inductive approach. Given the specificity of the research question, we used the TPB as our guide to organise interview content. The purpose of using a theory was not to test hypotheses, but rather to help us understand the reality and, eventually, to generate hypotheses that could be tested in further investigation.<sup>39</sup>

As a final note of caution, it is not clear whether the present results relate more to the completion of an e-learning program or to the completion of a program on critical appraisal skills and information mastery, or both. More studies comparing the teaching of EBM skills through e-learning versus other delivery modes are needed to address these issues.

## Implications for practice and research

This study provides an example of a formative evaluation process that addressed family physicians' perceptions and provided useful insight to adapt the

e-learning CME program to their needs. The results of this study were considered in the development of a second version of the program. This improved version includes shorter and more interactive modules, instructions to download content to a personal digital assistant, the capacity for participants to follow their progression through the modules, and communication tools (email and forum) allowing online interactions between learners themselves and between learners and facilitators.

## Conclusions

The role of information technologies in supporting physicians' practices and providing them with CME will increase. This paper discussed the results from a theory-based study of the salient beliefs of physician intention to complete an internet-based e-learning program on EBM. Findings suggest that although physicians do perceive some advantages in completing this program, barriers remain, most importantly time constraints. Further research is needed in order to understand e-learning integration into healthcare professional practice.

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#### CONFLICTS OF INTEREST

None.



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*Accepted February 2007*

