Canadian general internal medicine residents’ perception of a pedagogical tool of online cases in obstetric medicine

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Abstract
Background: Sufficient exposure to rarer medical problems around pregnancy is a challenge during short rotations in obstetric medicine (OM). A Canadian research group created online clinical cases, the CanCOM cases, to overcome this.

Methods: We conducted an exploratory study to document the use and perceived utility of the CanCOM cases. 77 residents doing an OM rotation participated in our study. We used a survey to document their perception of CanCOM cases (12 items, 7-point scale), clinical exposure to several conditions (pre and post rotation; 41 items, 7-point scale) and use of the educational tool (1 item, 4-option scale).

Results: CanCOM cases was perceived as an accessible and useful tool. Participants completed a median of 6/20 cases (range 1–20), and highly recommended the cases (6.48 ± 0.73 SD on a 7-point Likert scale).

Conclusion: Despite some technical limitations, CanCOM cases was shown to contribute to clinical exposure to rare but essential medical conditions.

Keywords
Obstetric medicine, curriculum development, core competencies, case based learning

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Introduction
Over the last few decades, conditions around pregnancies have greatly changed and have resulted in a considerable evolution to the care provided to pregnant women, particularly in developed countries.1–5 Obesity, advanced maternal age above 40 years-old, and the use of assisted reproductive technologies, among others, are associated with higher risks of medical complications during pregnancy.6–8 As a result, medical causes such as cardiovascular disease are responsible for 75% of all maternal deaths in the developed world.5–8

It is unsurprising that medical conditions in pregnancy are considered an essential component of the curriculum of health care providers caring for high-risk pregnant women in several countries including Canada and the United Kingdom.19 In a previous survey-based study, Canadian general internists in their first decade of practice identified a large difference between training in medical problems of pregnancy (26% in agreement) and importance in practice (61% in agreement).10 A subsequent survey targeting a similar group of Canadian general internists showed that a majority considered obstetric medicine as an area that required proficiency rather than expertise.11 The Royal College of Physicians and Surgeons of Canada (RCPSC) has since defined which obstetric medicine competencies are required in general internal medicine (GIM) residency programs. In parallel, a national validation of curriculum content was undertaken by the Canadian Consensus for a curriculum in Obstetric Medicine in Canada (CanCOM), subject-matter experts and other stakeholders.12–14

Specialists in obstetric medicine (OM) have observed difficulties exposing residents to all the essential conditions of obstetric medicine through the short 1–2 months rotations they have in their 2 years GIM training. Given the limited exposure to medical problems around pregnancy, members of the CanCOM group agreed that extra learning opportunities need to be provided to trainees. The development of a web-based educational tool to optimize the teaching of medical problems around in pregnancy; (2) perceived accessibility and flexibility of the educational tool; and (3) achievement of personal learning objectives related to the rotation.

Objective
The overall purpose of this study is to describe whether the CanCOM cases present an added value to increase residents’ clinical exposure. Our specific objectives are to document (1) exposure to essential medical conditions in pregnancy; (2) perceived accessibility and flexibility of the educational tool; and (3) achievement of personal learning objectives related to the rotation.

Methods
We conducted a multi-site (n = 7) exploratory study. Ethical approval was obtained with the University of Sherbrooke (REB approval #2016-32) as well as in participating sites. Participant consent was obtained for this study.

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Study sample

Our study population was composed of residents doing a rotation in OM in one of seven tertiary care centers with over 2000 deliveries/year (Université de Sherbrooke (CHUS), Université de Montréal (CHU Ste-Justine and CHUM), McGill University (MUHC), University of Alberta (Royal Alexandra Hospital), University of Calgary (Foothills Medical Center) and University of British Columbia (BC Women’s Hospital) from January 2017 to January 2019. Residents were invited via email to participate in the study with administrative support from their program. OM rotation directors at each site gave their agreement for this recruitment, explained the research project to the residents, and answered their questions.

Development of a web-based educational tool- the CanCOM cases

The CanCOM cases is a web-based educational tool that includes 20 different clinical vignettes. Case content was aligned with the essential content items that were identified in the OM curriculum content blueprint by subject-matter experts during the validation phase. The cases were conceived by ten pairs of Canadian specialists in OM.

According to the template created by conceptors of the CanCOM cases, each clinical case provides an inpatient or outpatient evolving scenario that allows the resident to receive information while performing their case analysis. All information related to diagnostic tests requires the interpretation of raw results to better simulate a real clinical case. Each stage of the case is accompanied by specific learning objectives. In addition, multiple choice and open-ended questions assist the resident in their diagnostic reasoning process. A marked response to the multiple choice questions is provided once the user has selected an answer so that immediate feedback can be given. When relevant, one or more references are provided to give residents the opportunity to acquire knowledge related to the questions and take their learning further.

The creation of the web-based educational platform was informed by a review of other initiatives that highlight technology at the service of medical education. These studies and the New England Journal of Medicine Interactive medical cases were used as models to develop our web platform and case format.

Questionnaires

Sociodemographic questionnaire. A socio-demographic questionnaire was used to document year of training (Post-Graduate Year 4 or 5 (PGY4-5); timing of their rotation (before or after their certification examination); and motivation towards using the CanCOM cases and towards the OM rotation.

Perceived usefulness questionnaire. Twelve statements with a 7-point Likert scale (from 1 completely disagree to 7 completely agree). Twenty-four items with a 7-point Likert scale.

Clinical exposure questionnaire. Residents had to indicate which clinical conditions they have been exposed to from a list that mirrors the CanCOM blueprint as well as the type or setting of exposure (inpatient, outpatient, journal club, CanCOM clinical cases, independent reading, etc.).

Data collection

Data collection occurred from January 1, 2017 to January 31, 2019. One week before the start of their rotation, residents received an invitation to participate in the study. It provided the project’s objectives, the hyperlink to the CanCOM cases, as well as a user code, and a link to the sociodemographic questionnaire. If interested, they signed the electronically consent form. The clinical supervisors in OM had the opportunity to discuss this project with their residents.

The week before the end of their rotation, a second email was sent to the respondents of the socio-demographic questionnaire to invite them to complete the clinical exposure and perceived usefulness questionnaires. Two reminders were sent, spaced between 15- and 25-days post rotation.

Statistical analyses

We performed basic descriptive statistics including means, standard deviations and percentages. When the distributions were skewed, we also presented the median values.

Results

Seventy-seven residents agreed to participate from one of the seven sites targeted by the study. A majority of 86.9% were from three participating sites in Quebec. One study site did not recruit during the study period. Sociodemographic data are presented in Table 1.

Most participants (69.6%) were PGY4 level residents that had not completed their certification examination. Only 30.4% of them had done a previous Obstetric Medicine rotation. 13 residents (56.5%) had some previous exposure to medical diseases in pregnancy in other non-OM rotations.

At the end of their rotation period, 84.4% (65) of the participants answered to the “perceived usefulness questionnaire” and 42.9% (33) answered both (perceived usefulness and clinical exposure). 74.0% (57) consulted the CanCOM clinical cases and 29.9% (23) of participants completed all questionnaires and consulted the CanCOM cases during the study (Figure 1).

The participants who completed both exit questionnaires (perceived usefulness and clinical exposure questionnaires) reported having completed a median of 8/20 cases. This estimation was compared to actual case completion according to CanCOM cases platform. We recorded a median of 5/20 completed cases.

Self-reported clinical exposure to a selection of clinical conditions from the CanCOM essential curriculum blueprint is presented in Table 2 highlighting exposure through the CanCOM cases. The majority of exposure to medical problems around pregnancy came from the current rotation followed by CanCOM cases and independent reading. Other sources of exposure were also documented.

Table 3 details the results from the perceived usefulness questionnaire. CanCOM cases was received favorably with 95.6% of participants indicating they were motivated to very motivated about using the CanCOM cases. Participants did not feel the need for further discussion with supervisor or colleagues, with mean results of 3.74 ± 2.12 and 2.91 ± 2.11, respectively.

Table 1. Sociodemographic data of 23 participants who completed Q1, Q2 and used CanCOM cases.

| Option                        | Option | % (n) |
|-------------------------------|--------|-------|
| Language                      | English| 43.5% (10) |
|                               | French | 56.5% (13) |
| Residency level               | PGY4 before examination | 69.6% (16) |
|                               | PGY4 after examination | 4.3% (1) |
|                               | PGY5 before examination | 8.7% (2) |
|                               | PGY5 after examination | 17.4% (4) |
| Did a previous OM rotation    | Yes    | 30.4% (7) |
| Did a previous OM rotation    | No     | 69.6% (16) |
| Previous exposure to medical problems around pregnancy | Yes | 56.5% (13) |
Participants were also asked to provide feedback on the web platform. Many residents think that the platform should be improved and 43.5% of them had technical problems (for example with firewalls). The most common suggestion for improvement was to be able to interrupt and resume cases without having to start from the beginning.

**Discussion**

This multi-site study provides us with observational data on current clinical exposure in OM rotations in several Canadian training sites as well as participants’ feedback on the usefulness of an online educational tool to support additional clinical exposure.

Analysis of clinical exposure from the rotation alone confirms the anecdotal evidence that these short 1–2-month clinical rotations will provide a variety of clinical exposure with reliable exposure to certain conditions (for example hypertensive disorders of pregnancy, management of headache and palpitations) and less exposure to rare but important conditions (for example acute fatty liver of pregnancy and cardiomyopathy). Our data underlines the importance of multiple sources of educational interventions including Journal Clubs, dedicated teaching sessions, and independent study.

Participants in our study gave very positive feedback on the CanCOM cases as a Supplementary educational intervention. The cases were deemed sufficiently varied, realistic, and relevant. There did not appear to be a single pattern of use. Of interest, the CanCOM cases related to hypertensive disorders of pregnancy were amongst the most popular cases completed even though residents were most certainly exposed to the topic in many ways.

While the CanCOM authors believe in the added value of exchange between learner and supervisor, the participants reported little necessity for a discussion with a supervisor or with colleagues. Bligh and Bleakly remind us of the importance that the simulated learning activity be well structured, well managed with planned opportunities for reflection and feedback. Our cases were structured around a template with built-in moments for reflection and some, albeit limited, feedback (for example around the multiple-choice correct and wrong answers). This simulation activity has the potential to act as a bridge between class-based learning and the complex clinical environment. We can raise the question of whether our participants had sufficient experience with a more hybrid

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**Table 2. Excerpt of reported clinical exposure to different conditions.**

| Medical problem                        | Clinical exposure during an obstetric medicine rotation | Clinical exposure outside of an obstetric medicine rotation | Exposure through a course | Exposure through the CanCOM cases | Exposure through articles | Other exposures |
|----------------------------------------|--------------------------------------------------------|----------------------------------------------------------|---------------------------|----------------------------------|--------------------------|-----------------|
| Acute care and maternal resuscitation  | 2                                                      | 5                                                       | 2                         | 17                               | 7                        | 1               |
| Acute respiratory failure              | 5                                                      | 0                                                       | 3                         | 14                               | 8                        | 1               |
| Hypertensive disorders of pregnancy    | 0                                                      | 23                                                      | 6                         | 5                                | 17                       | 15              |
| Chronic hypertension                   | 0                                                      | 23                                                      | 4                         | 5                                | 21                       | 16              |
| Preeclampsia                           | 0                                                      | 19                                                      | 2                         | 1                                | 15                       | 7               |
| Cardiology                             | 3                                                      | 18                                                      | 2                         | 1                                | 5                        | 5               |
| Congenital/acquired heart disease      | 2                                                      | 14                                                      | 4                         | 1                                | 11                       | 10              |
| Cardiomyopathies                       | 4                                                      | 11                                                      | 1                         | 2                                | 10                       | 9               |
| Neurology                              | 2                                                      | 20                                                      | 1                         | 0                                | 9                        | 9               |
| Seizure (epilepsy)                     | 4                                                      | 15                                                      | 6                         | 1                                | 9                        | 9               |
| Immunological diseases                 | 4                                                      | 15                                                      | 6                         | 1                                | 9                        | 9               |
| Systemic lupus                        | 3                                                      | 18                                                      | 4                         | 2                                | 7                        | 10              |
| Erythematous                           | 8                                                      | 7                                                       | 5                         | 2                                | 5                        | 7               |
| Anti-phospholipid Syndrome             | 0                                                      | 23                                                      | 5                         | 4                                | 13                       | 14              |
| Rheumatoid arthritis                   | 0                                                      | 23                                                      | 5                         | 4                                | 13                       | 14              |
| Pulmonary disorders                    | 0                                                      | 23                                                      | 5                         | 4                                | 13                       | 14              |
| Thromboembolic disorders               | 0                                                      | 23                                                      | 5                         | 4                                | 13                       | 14              |
| Hepatic disorders                      | 0                                                      | 20                                                      | 3                         | 2                                | 10                       | 12              |
| Hepatitis and liver dysfunction in pregnancy (acute fatty liver of pregnancy) | 0                                                      | 20                                                      | 3                         | 2                                | 10                       | 12              |
Table 3. Residents’ perception of the CanCOM cases on a 7-point Likert scale (from 1 completely disagree to 7 completely agree).

| Perception of CanCOM cases | Median | Mean | Standard Deviation |
|----------------------------|--------|------|--------------------|
| Appreciation of CanCOM cases | 7 | 6.35 | 0.89 |
| Reality of CanCOM cases | 7 | 6.65 | 0.49 |
| Relevance of key points | 7 | 6.61 | 0.58 |
| Assistance in achieving internship objectives | 7 | 6.13 | 1.36 |
| Discussion with supervisor for further study | 4 | 3.74 | 2.12 |
| Sufficient variety of cases | 6 | 6.04 | 1.15 |
| Discussion with colleagues | 2 | 2.91 | 2.11 |
| Recommend the case bank | 7 | 6.48 | 0.73 |

Declaration of conflicting interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethical approval
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Guarantor
Annabelle Cumyn.

Contributorship
All authors meet the ICMJE criteria for authorship by contributing to the study design, data analysis and interpretation, and drafting and revision of the work. AC, NS and CSO have given their final approval for publication.

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Supplemental material
Supplemental material for this article is available online.

References
1. Nelson-Piercy C, Peek MJ and Swiet MD. Obstetric physicians: are they needed? The workload of a medical complications in pregnancy clinic. J R Coll Physicians Lond 1995; 30: 150–154.
2. Nelson-Piercy C, Mackillop L, Williams DJ, et al. Maternal mortality in the UK and the need for obstetric physicians. BMJ 2011; 343 :d4993 doi:10.1136/bmj.d4993
3. Magee LA, Cote A-M, Joseph G, et al. Obstetric medical care in Canada. Obstet Med 2016; 9: 117–119.
4. Frederiksen LE, Ernst A, Brix N, et al. Risk of adverse pregnancy outcomes at advanced maternal age. Obstet Gynecol 2018; 131: 457–463.
5. Curtis SL, Marsden-Williams J, Sullivan C, et al. Current trends in the management of heart disease in pregnancy. Int J Cardiol 2009; 133: 62–69.
6. Negrer YH. Trends in maternal mortality in the United States. Reprod Toxicol 2016; 64: 72–76.
7. Grodzinsky A, Florio K, Spertus JA, et al. Maternal mortality in the United States and the HOPE registry. Curr Treat Options Cardiovasc Med 2019; 21: 42.
8. Organization WH. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA, World Bank Group and the
9. Jakes AD, Watt-Coote I, Coleman M, et al. Obstetric medical care and training in the United Kingdom. *Obstet Med* 2017; 10: 40–42.
10. Card SE, Snell L and O’Brien B. Are Canadian general internal medicine training program graduates well prepared for their future careers? *BMC Med Educ* 2006; 6: 56.
11. Card SE, Pausjenssen AM and Ottenbreit RC. Determining specific competencies for general internal medicine residents (PGY 4 and PGY 5). What are they and are programs currently teaching them? A survey of practicing Canadian general internists. *BMC Res Notes* 2011; 4(Journal Article): 480-0500-4-480.
12. Cumyn A and Gibson P. Validation of a Canadian curriculum in obstetric medicine. *Obstet Med Med Pregnancy* 2010; 3: 145–151.
13. Cumyn A and Harris IB. A comprehensive process of content validation of curriculum consensus guidelines for a medical specialty. *Med Teach* 2012; 34: e566–e572.
14. Cumyn A, Card SE and Gibson P. Mapping of essential content of an obstetric medicine curriculum from the perspective of two groups. *Canadian J General Internal Med* 2019: 13–20.
15. Cumyn A, Card SE and Gibson P. Education Research-GIM. *Canadian J General Internal Med* 2019; 14: 13–29.
16. Dolmans DH, Wolfhagen IH, Essed GG, et al. The impacts of supervision, patient mix, and numbers of students on the effectiveness of clinical rotations. *Acad Med* 2002; 77: 332–335.
17. Yardley S, Tenhuisen PW and Dornan T. Experiential learning: transforming theory into practice. *Med Teach* 2012; 34: 161–164.
18. Cook DA, Hamstra SJ, Brydges R, et al. Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. *Med Teach* 2013; 35: e867–e898.
19. Zendejas B, Brydges R, Wang AT, et al. Patient outcomes in simulation-based medical education: a systematic review. *J Gen Intern Med* 2013; 28: 1078–1089.
20. Shinnick MA and Woo MA. Learning style impact on knowledge gains in human patient simulation. *Nurse Educ Today* 2015: 35: 63–67.
21. Zary N, Johnson G, Boberg J, et al. Development, implementation and pilot evaluation of a web-based virtual patient case simulation environment – Web-SP. *BMC Med Educ* 2006; 6: 1.
22. Wong G, Greenhalgh T and Pawson R. Internet-based medical education: a realist review of what works, for whom and in what circumstances. *BMC Med Educ* 2010; 10: 1.
23. Kleinpell R, Ely EW, Williams G, et al. Web-based resources for critical care education. *Crit Care Med* 2011; 39: 541–553.
24. Likert R. A technique for the measurement of attitudes. *Arch Psychol*. Published online 2010.
25. Bligh J and Bleakley A. Distributing menus to hungry learners: can learning by simulation become simulation of learning? *Med Teach* 2006; 28: 606–613.
26. Jeffries PR. A framework for designing, implementing, and evaluating: simulations used as teaching strategies in nursing. *Nurs Educ Perspect* 2005; 26: 96–103.
27. O’Donnell JM, Decker S, Howard V, et al. NLN/Jeffries simulation framework state of the science project: simulation learning outcomes. *Clin Simul Nurs* 2014; 10: 373–382.