Sharing best practices in applications of evidence-based medicine, problem-based learning and self-directed learning principles in medical training: A McMaster-Brazil collaboration workshop report

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Abstract

In order to enhance the knowledge of different aspects of active teaching methods in medical education, and to introduce self-directed learning activities in home curriculum as well as to implement the research capacity building, a group of professors and researchers from two Brazilian Universities, namely, Universidade Estadual Paulista (UNESP), Botucatu Medical School, São Paulo, and Pontifícia Universidade Católica (PUC-MINAS), Minas Gerais, visited McMaster University in Canada in July 4-8, 2016. This paper is a brief report of the 5-day workshop and discussions among the McMaster and Brazilian colleagues. Among the topics covered, a detailed overview of the medical curriculum, "The COMPASS Curriculum”; in this learning process, students development of the problem-solving strategy, and helping cover learning objectives and knowledge transfer while discussing the clinical case-scenarios; other attention was given for strategies on how to provide institutional learning support for undergraduate students in order to achieve proposed learning objectives were presented, including discussions of a variety of integration possibilities between researchers and students, from different areas as well as joint supervision of PhD programs. Emphasis was given to the Research in Global Health with their inter-disciplinary methods, and transcultural care, that has created an impact on the professional practice. About Evidence Based Medicine was strengthened how its methods have moved to evidence-informed health systems which contribute to collective problem-solving, and in sharing the supporting tools for policies in public health. All talks and discussions were of very high quality and provided the basis for us to start discussing an implementation of the learned content in the curriculum. Finally, the opened opportunity of partnership among McMaster University, with two Brazilian medical schools, expanded medical education experience, possibilities for change, training and implementation of
community programs, but also reinforced research methods and technology, promote collaboration aimed at health education.

**Keywords:** Academic Medical Centers, faculty; McMaster; Brazil; capacity building; knowledge translation

**Introduction**

Medicine is an area with constant changes that require continuous updates. In general, after graduating, medical students have little stimulation or motivation to update their knowledge. While Flexner’s contribution on medical education consolidated improvement on the quality of medical care, the model was centered on scientific practice of medicine as the standard of medical learning process (Anderson and Kanter, 2010). Hence, the process of medical learning was tipped towards diagnosis and treatment of a given disease, while being a patient elevated to a secondary point into this learning process. In a seminal paper, Peabody raised concern about this issue and stated that while a given disease treatment might not be personal, patient care must be directed to the patient, with the physician being responsible delivering the patient care; and equated neglect of patient’s emotional life to a scientific investigator who neglects the control conditions that might influence his/ her experiment (Peabody, 1927).

Medical schools need to capacitate their students not only to proven scientific medical education, but also to the several other aspects of patient care; which means developing learning skills to provide a long-life learning education process (Berkhout et al. 2015). All three collaborating institutions, namely McMaster University, UNESP, and PUC-Minas share the same concerns about their students’ power of association of teamwork, ability of critical evaluation of the new literature, and their use of the best evidence to make decisions about the care of individual patients. These qualities have become even more essential with the exponential growing demand for medical information, critical evaluation of its methods and applicability to a given patient and population.

Hence, the group of professors from UNESP and PUC-MINAS decided to visit McMaster University, which is widely recognized as the birthplace of Evidence Based Medicine (EBM) (Sackett et al., 1996) and Problem Based Learning (PBL) (Barrows, 2006), in order to gain deeper insight into pro-active innovative learning methods used in their medical curriculum.

**Workshop Report**

**Location:** Organized by Lehana Thabane, Associate Chair (Department of Health Research Methods, Evidence, and Impact (HEI)), the workshop took place from July 4th to July 9th, 2016, at McMaster University, Hamilton, Ontario, Canada.

**Aims:** The purpose of the workshop were: i) to provide a meaningful understanding in the application of the fundamental concepts of PBL, EBM, Self-Directed Learning (SDL) (Silén and Uhlin, 2008) and how to incorporate these principles in the training of medical students; and ii) to share best practices, experiences and strategies for building research capacity, and cultivating a culture of research as part of the training of medical students.

**Participants:** Four professors from the Universidade Estadual Paulista, Botucatu Medical School – UNESP and one from Pontificia Universidade Católica de Minas Gerais - PUC-MINAS Medical School. These professors were from different areas as follows: Dermatology and Radiotherapy, Surgery, and Internal Medicine.

**Facilitators:** The workshop discussions were facilitated by McMaster University professors from the Departments of Health Research Methods, Evidence, and Impact, Pediatrics, Anesthesia, Psychiatry; the School of Nursing; Health Professional Education - Faculty of Health Sciences; Faculty of Graduate Studies; Faculty Engineering; Institute for Innovation & Excellence in Teaching & Learning; Faculty of Science and Undergraduate Medical Education.
Methodology applied to exchange experience: This collaboration model has allowed integration of teaching and research through exchange programs and visits to participating institutions by faculty and trainees. Here were lectures followed by group discussion with local professors and researchers, sharing of knowledge with trainees via skype lectures, and visit to research centers by both faculty members and trainees. The collaboration model has been dynamic, and has included visits to McMaster’s Campus Units and its teaching Hospitals.

TOPICS COVERED:

"The COMPASS (Concept-Oriented; Multidisciplinary Problem-based; Simulations in clerkship; Streaming) Curriculum"

A detailed overview of the medical curriculum at Michael G. De Groote School of Medicine at McMaster University, enhancing the actual model "COMPASS curriculum" that focuses on integration and critical analysis, and training students to optimize their learning (Neville and Norman, 2007) was provided. Furthermore, there were presentations about teaching experiences during elective clinical rotations, as well as on the important role of medical simulation, that provided a good scope for the training of medical students and residents.

PBL: Problem-based learning

McMaster undergraduate medical program curriculum is presented to the students by using several real clinical case-scenarios focusing on problem-based learning (Barrows, 2006) and supported by major review of medical literature. This learning process are clearly stimulated by in-depth discussions of several aspects of the presented clinical case, with a detailed review leading by students itself with the support of a professor, whose gives an important contribution helping students on the development of the problem-solving strategy, and helping cover learning objectives and knowledge transfer while discussing the clinical case-scenarios (Yew, Chng and Schmidt, 2011). In this learning process, students discover the importance of learning strategies in his/her medical formation and how the information might affect your medical skills not only during undergraduate level, but as a life-long learning process of continuum medical education.

Simulation

Among the innovations perceived during our visit to McMaster, that deserves special remark was the simulation-based learning for its students that raised important discussions and clarity. The training focuses on the skills needed to design, develop, facilitate and evaluate simulation cases and sessions; provide effective feedback and debriefing; describe the principles that enlighten the performance-based assessment and describe the fundamentals of program evaluation with simulation.

Support for undergraduate MD students

Strategies on how to provide institutional leaning support for undergraduate students in order to achieve proposed learning objectives were presented, including discussions of a variety of integration possibilities between researchers and students, from different areas as well as joint supervision of PhD programs, that creates an environment of scientific reasoning directed to the community-associated problems on medical care, planning and development. However, these strategies might include new courses, seminars and workshops designed to introduce to the students the basics of research methods and best medical practices, ethical skills and University policies, starting up at undergraduate level, depending upon real time class evaluations. These support tools and its effects on medical learning and training has been outreached the McMaster's frontiers, raising interest of majority of undergraduate community in Canada.

The visit of the Institute of Innovation and Excellence in Teaching and Learning (MIIETL) demonstrated ways to improve understanding as to how to support and disseminate a wide range, and high-quality research. The
characteristics of MIIETL’s principles are focused on the teaching and learning concepts of the integration and partnership of students, such as student centrality, evidence-based practice, collaboration and interdisciplinarity.

Research capacity building

The Department of Biochemistry and Biomedical Sciences shared their amazing experiences as they have attracted talented postdoctoral trainees who are committed to supporting post-doctoral training in their multi-user and multi-disciplinary research laboratory and career development.

This energetic group of postdoctoral trainees have taken the lead in organizing a local postdoctoral training program at McMaster College of Health Sciences.

Health Science Education

Emphasis was given to the Research in Global Health with their inter-disciplinary methods, and transcultural care, that has created an impact on the professional practice as specialty education for nurses who are interested in the role of being a primary health care provider, nurse practitioner or who are seeking advanced skills.

Evidence Based Medicine

A historical overview lecture about EBM took place, and demonstrated how its approach changed interpretation of decision making, and how its methods have moved to evidence-informed health systems which contribute to collective problem-solving, and in sharing the supporting tools for policies in public health (Sackett et al., 1996). Furthermore, this lecture also explained the meaning of a Pilot Study (Thabane et al., 2010) its purpose and challenges, how to evaluate its success, the common misconceptions of the ethics of pilot studies, relationships between pilots and proof-of-concept studies and adaptive designs, how to review a pilot study proposal or manuscript, and reporting results of a pilot and CONSORT extension for pilot trials (Eldridge et al., 2016), the concept of scientific evidence in the context of the formulation of health policies, along with an explanation of a systematic review and its usefulness (Oxman et al., 2009). A specific attribute of policy and program decisions in health systems and clinical practice was presented as: be clear about the goal; pick locally appropriate ways to get there; do what you can from the "outside"; do what you can from the "inside" and make a sustained commitment. Thus, this scenario emphasized continuous learning of their own works and partners, which include Evidence-Informed Policy Network (EVIPNet Brasil) (Li et al., 2017; BIREME/PAHO/WHO Bulletin).

The visiting professors had an opportunity to understand particularities of the proposal MAGIC (making GRADE the irresistible choice) that it is a research and innovative programme and non-profit initiative within the health sector, working to improve the creation, dissemination and dynamic updating of clinical practice guidelines, evidence summaries, and decision aids. The MAGIC has been created by using GRADE methodology, and international collaboration, combined with the latest web technology, intuitive design, and emphasis on open and linked digitally structured data. In addition, the Evidence Ecosystem which is a project based on the need for overarching solutions to solve major challenges for patients and society was also explained, and there have been some indications that. This ambitious research and innovation project represents the next major step for MAGIC.

At the end of the workshop details on building capacity for searching for evidence was conferred as well as the necessity for training to be able to assess the value of evidence, create and evaluate guidelines, and conduct clinical decisions (Schunemann H. (2015). Focus on practical application by researchers and clinicians through their contributions to the guideline development tool (wwwGRADEpro.org), the guideline checklist (cebgrade.mcmaster.ca/guidecheck.html) and GRADE evidence to decision frameworks (www.decide-collaboration.eu) as well as maintenance of an active clinical practice to ensure that research is people-oriented was encouraged.
The Scientific Research initiation must be included to enable essential competencies to be developed. Research is instrumental in maintaining curiosity, as it teaches the students to raise questions and promote guidance in how to deal with uncertainty and creation of feasible solution. Thinking critically, in the light of the scientific method is essential in clinical practice and in writing any scientific paper. The use of EBM is a methodological strategy especially suited to the development of the ability to critically evaluate information with the best available research tools, and apply it into clinical decision making.

Figure 1 provides a Wordle™, word cloud that visually displays the subjects that marked the visit of Brazilians in McMaster. Among all the opportunities offered was a prominent highlight for EBM, promising to cultivate the culture of healthy collaborations in the research.

Figure 1: Wordle™, the subjects that marked the visit of Brazilians in McMaster.
The summary of lead facilitators, departments, topic covered and lessons shared is depicted in Table 1.

**Table 1: The summary topic covered and lessons shared, lead facilitators and departments from McMaster University.**

<table>
<thead>
<tr>
<th>Topic covered</th>
<th>Lessons shared</th>
<th>Applications in Brazil</th>
<th>Lead Facilitator and Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem-based learning</td>
<td>The students learn an important skill in transferring knowledge from one problem to another. Thus, they will acquire a habit of remarkable and life-long learning.</td>
<td>Method that mobilizes the integration of knowledge and provides a basis for a case-based learning strategy to be adopted at Botucatu Medical School</td>
<td>Geoff Norman, professor Department of Clinical Epidemiology &amp; Biostatistics CE&amp;B</td>
</tr>
<tr>
<td>Institutional support for undergraduate students</td>
<td>Integration between researchers and students, from different areas including joint supervision of PhD programs, creating an environment of scientific reasoning.</td>
<td>Contributed to the formative axis &quot;scientific reasoning&quot; of Botucatu Medical School</td>
<td>Doug Welch, Dean of Graduate Students</td>
</tr>
<tr>
<td>The characteristics of MIIETL's principles</td>
<td>The teaching and learning concepts of the integration and partnership of students, such as student centrality, evidence-based practice, collaboration and interdisciplinary.</td>
<td>Principles shared with pedagogical support core of Botucatu Medical School</td>
<td>Arshad Ahmad, Institute for Innovation &amp; Excellence in Teaching &amp; Learning (MIIETL)</td>
</tr>
<tr>
<td>Evidence Based Medicine (EBM)</td>
<td>EBM changed interpretation of decision making, and this method have moved to evidence-informed health systems which contribute to collective problem-solving, and in sharing the supporting tools for policies in public health</td>
<td>Subject of great interest, determining the second Workshop</td>
<td>Lehana Thabane, Department of Clinical Epidemiology &amp; Biostatistics CE&amp;B</td>
</tr>
<tr>
<td>MAGIC (making GRADE the irresistible choice)</td>
<td>MAGIC is a research and innovative programme working to improve the creation, dissemination and dynamic updating of clinical practice guidelines, evidence summaries, and decision</td>
<td>Principles acclaimed by congress attendance</td>
<td>Gordon Guyatt, Department of Clinical Epidemiology and Biostatistics CE&amp;B</td>
</tr>
<tr>
<td>Capacity building for searching for evidence</td>
<td>The guideline development tool, the guideline checklist and GRADE evidence to decision frameworks to ensure that research is people-oriented.</td>
<td>Effective exchange with postdoctoral opportunity</td>
<td>Holger Schünemann, Department of Clinical Epidemiology and Biostatistics CE&amp;B</td>
</tr>
</tbody>
</table>
Collaborative work between the Brazilian institutions and McMaster

After visiting Canada, we held a workshop titled "Incorporating Evidence-Based Principles in Medical Training. Sharing experience with McMaster". This activity took place at UNESP Botucatu, Brazil in March 2017. Its main purpose was to share with the Brazilian professors and students how to include evidence-based concepts in their daily teaching activities. The workshop was facilitated by Lehana Thabane.

In November, 2017, we invited Lehana Thabane to be a special speaker at Botucatu Medical School and CEVAP (Centro de Estudos em Venenos e Animais Peçonhentos) in our Post Graduation Discipline in Clinical Research Program event. He delivered a talk titled "Evidence-Based Health in Clinical Research". After the event, he became a Collaborative Professor in our Clinical Research and Nursing Programs at Botucatu Medical School. Nowadays he is co-supervising three post-graduating and four undergraduate students. Under his co-supervision our students are put in contact with many professors and students from McMaster.

In December, 2017, Lehana Thabane was again invited to be a speaker in our 1st Symposium of Clinical Research in Brazil titled: "Not for beginners Challenges, innovation and entrepreneurship". He delivered a talk about "Key factors of clinical research network capacity-building".

Excellent feedback was received from all participants about all three workshops, and have increased our hope that more Brazilian Institutions who are committed to excellence in education and research will get to know this wonderful way of collaboration. McMaster University through its Office of International Affairs engages every year in many international partnerships and collaborations through faculty exchanges, research collaboration, capacity building, join supervision of doctoral students, mobility agreements and students exchanges. The Office of International Affairs is a first point of contact to any Institution that wishes to have further information.

Conclusion

McMaster's innovative methodology of medical learning and education surpasses by far our expectations about this workshop on Problem-Based Learning strategies and methods, being the group objectives fully accomplished. The concept of medical education and training is quite complex by nature and demands several learning strategies in order to provide to the undergraduate student opportunities of successful learning. Also, bringing research methods during medical education is an interesting strategy that faces the future physician even closer to the community problems. The research tools covered during undergraduate training is shown to be of value on helping these upcoming physicians formulating adequate research questions to the relevant local community demands, helping improving the quality of medical care.
This unique way of providing medical education seems to facilitate the implementation of proven medical strategies and improving the quality of delivered medical care, as one might expect involvement of community and patients onto this process.

Even though knowing that a 5-day workshop would not be enough to fully understand McMaster’s problem-based learning process and implementation, our experience clearly shows that we need to rethink about our medical undergraduate programs. One important step is start up changes in our medical teaching model to accommodate Research methods to all undergraduate medical students, and fully implement the Brazilian National Guidelines of Medical Education (Ministério da Educação, 2014).

Our Medical Schools are undergoing to a moment of curricular transformation, also driven by the guidelines. Our visit to McMaster gave us an opportunity to revisit the diversification of practical scenarios, creation of elective internships, establishment of partnerships, integration of interdisciplinary activities that were constantly evident in the environments visited, including realistic simulation.

It is important to highlight that better understanding of the Canadian models would enable us to analyze if it could be adapted into the Brazilian reality and assist Universidade Estadual Paulista (UNESP), Botucatu Medical School and Pontifícia Universidade Católica (PUC-MINAS) that were seeking for curricular changes and creation of a new medical course. These conditions favored our interest to visit McMaster in the diverse scenarios of medical education. The knowledge and contacts established in these visits brought a possibility of integration between research and graduate education.

Finally, the opened opportunity of partnership among McMaster University, PUC-Minas and UNESP not only on changing experiences on medical education, training, and implementation of community programs, but also on research methods and technology is definitely a important way to foster collaboration directed towards better effectiveness of medical care delivery to the community.

The final authors’ message was recorded in Edwards Arch (Figure 2), one of the most photographed places on campus.

Figure 2: Message of recognition to McMaster for the opportunity of internationalization.
Take Home Messages

- This workshop was the first activity of the collaboration between the McMaster University, Botucatu Medical School- São Paulo State University (UNESP) and Pontifical Catholic University of Minas Gerais – PUC Minas.
- This collaboration model has allowed integration of teaching and research through exchange programs and visits to participating institutions by faculty and trainees.
- The collaboration model has been dynamic, and has included visits to McMaster’s Campus Units and its teaching Hospitals.
- Finally, the opened opportunity of partnership with McMaster University, in the diverse scenarios of medical education. The knowledge and contacts established in this visit brought a possibility of
integration between research and graduate education.

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Appendices

None.

Declarations

The author has declared that there are no conflicts of interest.

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Ethics Statement

The present manuscript is a report of a workshop and does not involve research in animals or humans.
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