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Editorial

Medical Education Breakthroughs: What Constitutes Milestones in Curriculum, Teaching and Assessment?

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As a discipline, the medical sciences stand behind a history and foundation of breakthroughs that have led to some extraordinary advances in medicine. In compiling a list of the greatest breakthroughs since 1840, the *British Medical Journal* received nominations from 11,362 readers in identifying the top 15 most important.¹ The decision was understandably difficult. If it is based on the number of lives saved then vaccines would have to be one of the top choices. If societal consequences are of major importance, however, then the introduction of the pill as a symbol of women's contraceptive autonomy is undeniable.² In the end, *sanitation* received the greatest number of votes as infectious diseases during the 19th century resulted in inexplicable rates of morbidity and mortality. As explained by Mackenbach, the consequences of economic growth through industrialization and international trade and transport resulted in overcrowding and the spread of infectious diseases such as smallpox, tuberculosis, diphtheria, measles, typhoid, cholera and flu viruses.³ To this day, improvement in clean water systems and sewage disposal have been credited with saving millions of lives, and sanitation is viewed as a standard of how best to improve public and population health.

In a recent book titled *Breakthrough! How the 10 Greatest Discoveries in Medicine Saved Millions and Changed Our View of the World*, Queijo⁴ acknowledges the *BMJ* list, but recognizes the contributions Hippocrates made to medicine as one of the first physicians. A large body of writings collectively known as the *Corpus Hippocraticum* expound on his works and teachings some 23 centuries earlier, where today medical students continue to plead his oath, and physicians and others are inspired by his scientific and clinical insights.

In some regards, these medical breakthroughs or milestones constitute advances in medicine that are espoused and ultimately championed through the educating of practitioners in health care and the public in general. For example, John Snow's interviews with local residents in a London district identified that the spread of cholera originated from a public water pump on Broad Street. The "sanitary revolution", however, was advocated for by a British lawyer committed to controlling the outbreak of disease through legal structures that would establish better urban drainage to prevent the loss of male workers and, hence, productivity caused by poor living conditions.³ As this infrastructure was expensive it took decades for England and then other European countries to adopt despite the

noted declines in mortality rates once piped drinking water and sewage systems were implemented. This begs the question, what role does medical education play in medical breakthroughs and what constitutes a noteworthy milestone within the field of study?

Medical Education Milestones?

One hundred years ago, the release of Abraham Flexner's report stimulated a transformation of medical education in the United States and Canada. Arguably, this marked a milestone or at least a turning point in altering medical education and subsequent practice. As stipulated in a 2002 Commonwealth Fund Task Force report *Training Tomorrow's Doctors*; "the quality of care that the public receives is determined to some extent by the quality of medical education students and residents receive."⁵ Ultimately, the primary goal of medical education is to produce physicians who provide high-quality patient health care.

The premise of medical education, however, resides in three interconnected educational components: curriculum, teaching and assessment. This is reflected in the overwhelming focus of research we find on identifying what types of curriculum are best suited to instill content to our medical students (e.g., traditional or integrated, system-based or problem-based), the approaches to teaching that are conducive to learning within these environments (e.g., lecture or small-group, didactic or inquiry) and the best methods to assess the knowledge (written or oral examinations) skills (OSCEs or direct observation) and attitudes (professionalism checklists or multisource feedback) expected of all health care practitioners. The introduction of problem-based learning, small group teaching, and the use of OSCEs to assess clinical competencies were important developments in medical education. To call these strategies or approaches milestones (let alone breakthroughs) would be more than presumptuous on my behalf. What then in medical education can we identify that leads to the production of high quality physicians and hence better clinical outcomes for patients and public health? In part, this question can be addressed through rigorous and sound medical education research. Inevitably, there are also many confounding variables that will arise in studying physician performance to gain insight into the efficacy of any one of the educational initiatives introduced during medical school, residency training or through continuing education.

Imperatives for Medical Education Research

While the research in medical education is becoming increasingly sophisticated there is still a narrow focus of this research. In a review of 599 articles from four data sources, Prystowsky and Bordage⁶ found only 4 (0.7%) of the studies used clinical outcomes of the patients to account for changes in performance related to medical education initiatives. In addition, the research focused on trainees (68.9%) in relationship to their performance on examinations (49.4%) or satisfaction with their educational experiences (34.1%).

The challenge in measuring physician quality of care as a function of patients' clinical outcomes is in part related to the short-term and single institutional focus of many medical education research projects. As suggested by Regehr, "community-level, programmatic lines of research are necessary to build knowledge and understanding of a domain...[otherwise] the value of the research is limited to the uncoordinated accrual of information."⁷ The need to identify research themes that have systematic and community based outcome implications for how we educate and train physicians is, however, daunting and impractical. In some regards, comparisons made between educational interventions that demonstrate improvements in clinical knowledge or skills meet the primary goal of producing better educated physicians. Expecting that the success associated with changes to curriculum, teaching or assessment methods be linked directly to better patient outcomes is anticipated, but from a research perspective improbable to measure at best.

In expecting researchers to demonstrate success outcomes in medical education, milestones will be defined by how to qualify and quantify the types of physicians and health care systems we produce. Therefore, the questions we need to address stem from the patients and public health systems our physicians serve through the care they provide. Ultimately, medical milestones are linked successfully to how we educate and train our next generations of health care practitioners to be altruistic, dutiful and competent physicians in their advocacy for quality patient health care. Coordinated research and longitudinal efforts in identifying best evidence for improvements to curriculum, teaching and assessment in the design and development of quality medical education are still our best approach to meeting this goal.

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In this second issue we have included five major contributions or research articles that investigate issues relating to the curriculum, teaching and assessment of students. Gill, Gill, Eardley and Marrie implemented a Political Action Day that introduced preclinical medical students from Alberta's two medical schools to the process of lobbying the provincial government as an experiential initiative to teach health advocate skills. They were able to show that while medical students understand the importance of their role as advocates for health care issues, most are uncertain as to how best to identify a solution to a large scale problem and develop an organized approach to communicate a message to elected government officials. As a core competency identified for all physicians, Gill *et al.* concluded that medical students' knowledge, skills and attitudes as a health advocate can be enhanced through immediate contact with elected representatives from the ministry of health and wellness. In acknowledgement of the limitations of the two-day format used in the Political Action Day initiative, further research into outcome benefits to the students and emphasis on the importance of a longitudinal health advocacy course in medical school are recommended by the authors.

Watt, Violato, Lake and Baig from the Medical Communication Assessment Project (M-CAP) from both the Universities of Calgary and Alberta investigated the efficacy of an intensive full-time medical communication and clinical skills education program. Watt *et al.* found that in two separate study analyses, international medical graduates (IMGs) had made significant gains in language proficiency (i.e., listening and speaking, reading and writing) and were able to outperform a comparison group of non M-CAP participants on clinical skills and measures of professionalism. While this study demonstrates the effectiveness of the 16 week program has had on enhancing the clinical and communication skills of IMGs, clearly the ambiguity found in previous studies emphasizes the importance of research in assessing the efficacy of educational programs for IMGs.

In identifying the socio-cultural differences between two groups of students from the same medical school at Tel-Aviv University in Israel, Lotan, Shenkman and Notzer compared the perceptions of American and Israeli students on satisfaction with their studies and educational workload, and in general terms their

observations of physician characteristics. They found that overall American students compared to Israelis are significantly more satisfied with their studies, have a more positive outlook towards career aspirations and perceive the role of physicians in a more positive light. Lotan *et al.* concluded that cultural differences between the students can have a potentially detrimental effect on students' perceptions of their educational experience and the practice of physicians. Their implications for medical educators is important in that the success of teaching and learning at medical school, in part, needs to reflect cultural understandings of groups of students with varying perceptions of their roles and responsibilities as future medical practitioners.

Expanding on the Script Concordance (SC) approach as a novel assessment format for testing clinical skills reasoning, Lemay, Donnon and Charlin introduce a paediatric version of the SC test with three groups representing novices (medical students), intermediates (paediatric residents) and experts (paediatricians). In support of the construct validity of the SC test, Lemay *et al.* found a significant increase in performance from medical students to expert paediatricians. Internal reliability coefficients were found to be supportive for all three different scoring key techniques used to score examinee performance on the 40 item SC test. In conclusion, Lemay *et al.* support the use of the SC approach across all medical disciplines as a reliable and valid method to assess the diagnostic, investigation and treatment knowledge of students and residents.

In the final study, Sevlever and Rice examine measures of perfectionism, depression, anxiety and academic performance between premedical and non-premedical undergraduate students. Although the two groups of students were found not to be significantly different on self-reported perfectionistic self-criticism, personal standards perfectionism, depression, or anxiety, self-critical perfectionism was correlated with depression and anxiety for both groups. Premedical students were found to report significantly higher academic performance as a function of grade point average which for this group was shown to be related to measures of personal standards perfectionism. Sevlever and Rice concluded that their findings would suggest that distress in the form of depression and anxiety endured by premedical students is unremarkable in undergraduate studies. The question remains, however, as to what

happens at the medical school environment that would manifest into subsequent distress for some students?

Conclusions

The acknowledgement of milestones in medicine reflect a progression in the advancement of health care that leads to, in many breakthroughs, to the reduction in the incidence of mortality and morbidity. Since the teachings of Hippocrates, medical education has played an important role in ensuring that physicians are prepared for the progression that comes with the establishment and eventual implementation of these medical advances. It is to the benefit of medical educators and researchers to promote educational initiatives that enhance the quality of life and public health outcomes through advances in curriculum, teaching and assessment. Research agendas that promote an understanding of the role medical education plays in making these connections, however, are worth striving for but will involve coordinated efforts to fund and share data between institutions and stakeholders.

In reality, the success of medical breakthroughs are derived through years of work and dedication as Francis Galton duly noted: "...in science credit goes to the man who convinces the world, not the man to whom the idea first occurs."

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