

## Letter From the Guest Editors



The field of medicine has changed enormously in the span of a single professional lifespan. Many of us remember when senior professors were sought after to offer personal anecdotes and to reminisce on the “art of medicine.” In the current era, senior professors are valued because of their ability to look at medicine beyond individual cases and to derive insight based on descriptive and inferential statistics brought to bear on series or metaserries of patients. (Of course, this should not come at the expense of relating to the individual patient in the therapeutic relationship.)

Indeed, in the last several decades, medicine has evolved to become more evidence based, a movement that we have attempted to capture in this issue. In the realm of imaging, an important turning point was reached in 1947 with the landmark studies of Birkelo et al,<sup>1</sup> which were originally designed to rigorously compare diagnostic efficiency of four methods of capturing chest radiographic images (35-mm photofluorogram, 4 × 10 inch stereophotofluorogram, 14 × 17 inch paper negative, or 14 × 17 inch celluloid film). This statistically well-designed study instead “discovered” the then-surprising fact that agreement between the five expert image interpreters varied to a greater degree than the variation between image storage techniques, that is, the assumption that experts provided an objective standard of “truth” was erroneous. Not only did this study highlight fallibility of the eminent physician experts, but also demonstrated the power of properly constructed and executed studies to evaluate performance of modalities and image interpreters with potential to overturn long-held core assumptions and beliefs.

The modern era of evidence-based medicine (EBM) began in the 1970s and these concepts subsequently started to penetrate into radiology and diagnostic imaging by the late 70s. Of note, an issue of *Seminars in Nuclear Medicine* on the topic of clinical decision-making was published in 1978 and contained a landmark article by Metz (cited over 5400 times), which popularized the use of receiver-operator characteristic methodology in imaging.<sup>2</sup> The term “evidence-based medicine” was introduced in the 1990s by investigators from McMaster’s University<sup>3,4</sup> and its meaning was elaborated by Sackett et al in a landmark 1996 editorial as “the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients.”<sup>5</sup>

While scattered reviews featuring the term EBM as applied to nuclear medicine have appeared in the medical literature, this has occurred primarily in non-English<sup>6-9</sup> or less-mainstream<sup>10</sup> medical publications. It is therefore timely and appropriate to dedicate this issue of *Seminars in Nuclear Medicine* to evidence-based nuclear medicine.

We have been fortunate in being able to recruit an outstanding roster of recognized experts to explicate topics related to EBM, including a large contingent of Canadian authors, among them many investigators from the University of Ottawa, reflecting the excellence that has been achieved by our Canadian colleagues.

The studies in the issue progress from topics related to acquisition and evaluating high-quality data, to aggregation of data and finally, to methods used to rigorously update and improve the practice of medicine via creation of practice guidelines and appropriate use criteria (AUCs). While many of the submissions are topics relevant to EBM or evidence-based imaging in general, the authors have generally endeavored to illustrate their work with examples from nuclear medicine.

Dr Dean Fergusson has joined with Dr Michael Chassé to author the opening article on the critical topic of promoting diagnostic randomized trials as a superior option to traditional diagnostic cohort studies.<sup>11</sup> Dr Martin Yaffe has reviewed emergence of “big data” and its potential and current limitations in medical imaging with some consideration of topics related to mammography and histology, areas featured in Dr Yaffe’s research program.<sup>12</sup> In a very topical submission, Dr David Moher, an international figure in EBM, has written a timely article with Mitch Wilson on the changing landscape of publication in medicine.<sup>13</sup>

Drs Gregoire Le Gal and Pierre-Yves Le Roux then addresses the question of assessing quality of primary research studies in the medical literature by critically appraising studies reviewing tomographic lung scintigraphy in the diagnosis of pulmonary emboli, a domain of their expertise.<sup>14</sup> Dr Matthew McInnes et al have submitted an article on reporting guidelines in diagnostic imaging studies, an area where they have made seminal contributions.<sup>15</sup> Dr Brian Hutton et al have written a piece on meta-analyses and systematic reviews, as we move to examine methods of evaluating, aggregating, and summarizing the burgeoning

medical literature in a comprehensive and nonbiased manner.<sup>16</sup>

In the final section of the issue, three articles are devoted to the critical topic of development of practice parameters and AUCs. Dr Melissa Brouwers et al have written an informative overview of the guideline creation process.<sup>17</sup> Bringing the topic of EBM back full circle to nuclear medicine, Drs Sukhjeet Ahuja and Kevin Donohoe have authored a review of the specific processes used at the Society of Nuclear Medicine and Molecular Imaging to develop guidelines and AUCs,<sup>18</sup> while Dr Rathan Subramaniam et al have contributed an article “Development of Appropriateness Criteria at the American College of Radiology,” highlighting formulation of appropriateness criteria by this instrumental professional group.<sup>19</sup>

In closing, we wish to thank the editors and authors for helping us move our concept into reality. *Seminars* continues to be the flagship review journal in the specialty of nuclear medicine, and has often led the way in introducing novel and rigorous concepts to the imaging sciences in general. For these reasons, we are honored to present a review of the state of EBM as it applies to the field of nuclear medicine, which seems very timely and appropriate as *Seminars* approaches its semicentennial anniversary.

Dean Fergusson, MHA, PhD

Lionel S. Zuckier, MD, MBA, FRCPC

*Clinical Epidemiology Program, Ottawa Hospital Research  
Institute, Ottawa, ON, Canada*

*Department of Medicine, University of Ottawa,  
Ottawa, ON, Canada*

*Department of Medicine, Division of Nuclear Medicine,  
University of Ottawa, Ottawa, ON, Canada*

*E-mail address: lzuckier@toh.ca (D. Fergusson).*

## References

1. Birkelo CC, Chamberlain WE, Phelps PS, et al: Tuberculosis case finding: A comparison of the effectiveness of various roentgenographic and photofluorographic methods. *JAMA* 133:359, 1947
2. Metz CE: Basic principles of ROC analysis. *Semin Nucl Med* 8:283-298, 1978
3. Claridge JA, Fabian TC: History and development of evidence-based medicine. *World J Surg* 29:547-553, 2005
4. Smith R, Rennie D: Evidence-based medicine—An oral history. *JAMA* 311:365-367, 2014
5. Sackett DL, Rosenberg WM, Gray JA, et al: Evidence based medicine: What it is and what it isn't. *BMJ* 312:71-72, 1996
6. Oka H: Evidence based medicine for nuclear medicine technology. *Nihon Hoshasen Gijutsu Gakkai Zasshi* 61:1486-1489, 2005
7. Alvarez Ruiz S, Cortes Hernandez J, Rodeno Ortiz De Zarate E, et al: Evidence based medicine. Generalizations on the application to nuclear medicine. Part I. *Rev Esp Med Nucl* 20:313-328, 2001. quiz 329-331
8. Alvarez Ruiz S, Canut Blasco A, Rodeno Ortiz de Zarate E, et al: Evidence based medicine. Application to nuclear medicine. Diagnostic slope. Part II. *Rev Esp Med Nucl* 20:393-412, 2001. quiz 413-415
9. Carreras Delgado JL: Evidence-based nuclear medicine and experience-based nuclear medicine. *An R Acad Nac Med (Madr)* 117:625-649, 2000. discussion 649-654
10. Sadeghi R, Zakavi R, Kakhki VR: How to apply the evidence-based medicine concept to nuclear medicine diagnostic studies—A review. *Nucl Med Rev Cent East Eur* 12:59-64, 2009
11. Chassé M, Fergusson DA: Diagnostic accuracy studies. *Sem Nucl Med* 49:87-93, 2019
12. Yaffe MJ: Emergence of 'big data' and its potential and current limitations in medical imaging. *Sem Nucl Med* 49:94-104, 2019
13. Wilson M, Moher D: The changing landscape of publications in medicine. *Sem Nucl Med* 49:105-114, 2019
14. Le Gal MDG, Le Roux PY: How to assess quality of primary research studies in the medical literature. *Sem Nucl Med* 49:115-120, 2019
15. McInnes MDF, Lim CS, van der Pol CB, et al: Reporting guidelines in diagnostic imaging studies. *Sem Nucl Med* 49:121-135, 2019
16. Garrity C, Stevens A, Hamel C, et al: Knowledge synthesis in evidence-based medicine. *Sem Nucl Med*, in this issue
17. Brouwers MC, Florez ID, McNair SA, et al: Clinical practice guidelines: Tools to support high quality patient care. *Sem Nucl Med*, in this issue
18. Donohoe K, Ahuja S: Society of Nuclear Medicine and Molecular Imaging efforts toward standardization: From procedure standards to appropriate use criteria. *Sem Nucl Med* 49:136-143, 2019
19. Subramaniam RM, Kurth DA, Waldrip CA: American College of Radiology appropriateness criteria: Advancing evidence-based imaging practice. *Sem Nucl Med* 49:144-148, 2019