

# A Strategic View for Intraoperative Neuromonitoring in Canada 2017

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Intraoperative neuromonitoring (IONM) seeks to protect the nervous system in patients undergoing surgery, where portions of the nervous system are vulnerable to iatrogenic injury. Intraoperative neuromonitoring uses a variety of electrophysiological techniques to accomplish this goal, but the development and use of IONM in Canada has largely been confined to large academic centers. In Canada, the growth of this discipline is generally influenced by local factors such as surgeon demand and hospital budgetary constraints, while more universal acceptance has been hampered by the lack of randomized controlled trials supporting IONM use. Recently, a letter appearing in *The Journal of Neurology and Stroke* inaccurately described the status of IONM in Canada.<sup>1</sup> This prompted us to correct the record here and outline the working philosophy of the Canadian Association of Neurophysiological Monitoring (CANM) in a distinctly Canadian forum. In the present commentary, members of the CANM Executive Committee will present recent developments in Canadian IONM, as well as outline where we see the future direction of this important patient safety discipline. This is an exciting time for the field of IONM in Canada and the United States, because IONM is at a crossroads in both nations.

In Canada, IONM is performed by a relatively small number of people. A survey conducted by CANM in 2015 revealed that there were 26 full-time and 44 part-time people employed in IONM across Canada. Of the full-time CANM practitioners, half of them possessed doctoral degrees or held a DABNM, which contradicts statements made that “the majority” are practicing technologists.<sup>1</sup> Similar to our American counterparts, the background of people involved in IONM is varied, with in-house training being the established pathway for most people entering the field. The need for IONM-specific education remains an issue not only for new entrants into IONM but also for current IONM practitioners seeking continuing education opportunities. The Canadian Association of Neurophysiological Monitoring was established in 2008 after consultations with existing Canadian IONM practitioners at our inaugural national symposium. Overwhelmingly, it was felt that CANM’s mandate should focus on IONM education. To facilitate this goal, and overcome geographical barriers, an online platform was deemed to be the best method to meet the needs of those interested in IONM education. The Graduate Certificate in IONM was launched in 2014 in partnership with the Michener Institute in Toronto.

The Canadian Association of Neurophysiological Monitoring’s strategic plan was developed in consultation with the Canadian IONM community and in recognition of clinical needs and

economic realities. Our goal has been to seek optimal patient care by coupling education/training with the philosophy that the interpreting IONM practitioner should be situated in the operating room. We have adopted the principle of “The expert in the room.” This means that a well-trained and experienced IONM professional maintains a continual presence in the operating room, optimizing patient care through ongoing and immediate interactions with other surgical professionals (anesthesia, surgeons). The advantage of situational awareness (including changing patient vital signs and surgical status) affords the IONM practitioner the interpretive context to prioritize relevant patient data and expeditiously initiate IONM alerts so that remedial efforts can be implemented. Studies have shown that diagnostic test accuracy (e.g., IONM results) *per se* is an insufficient basis for clinical effectiveness.<sup>2</sup> Effectiveness may be enhanced when the surgeons receive the information from IONM practitioners with higher “skill” levels (where skill = int (experience + degree + certification + cases + role/4)).<sup>3</sup> This study also noted that there was greater interpretive agreement in test situations among experienced monitorists compared with those with less experience.<sup>3</sup> These data were derived from a small segment of the 2004 ASNMM attendees (92 of 220 polled) but provided a novel look into aspects of interpretive reliability, including degree held. Although some in our country have argued for a more hierarchical professional oversight interpretation model<sup>1,4</sup> (such as practiced in the United States), there is currently no evidence, as the above study suggests, that this is a superior method for IONM or that it is cost-effective.

The Canadian Association of Neurophysiological Monitoring’s educational strategy has always been to establish the online course program as our initial thrust to meet the immediate needs of IONM professionals and the needs of the surgical community in Canada. This program was introduced in 2014 and represents the contributions from IONM practitioners within Canada and the United States, as well as from Europe. The IONM education

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program provides instruction in IONM relevant anatomy, physiology, as well as the core principles of bioelectric recording and electrical stimulation of tissue. The course builds on these fundamentals to foster a synthesis of basic principles with clinical skills and problem-solving that we see as key to IONM practitioner development. It is vital to remember that a formal, comprehensive and accessible IONM training program has been absent, both in Canada and the United States, until only very recently.

To date, there are several CANM/Michener graduates working in IONM in Canada, as well as current students who have been hired in IONM while pursuing their studies. Since 2014, 20 students have enrolled in the 2-year CANM/Michener program. Of these students, 18 are Canadian, thereby directly contributing to Canada's need for training in this field, despite claims to the contrary.<sup>1</sup> There remains much to do to further CANM's education and training goals, and we are under no illusion that the completion of the CANM/Michener course transforms the graduate into the "Expert in the Room." However, the establishment of an apprentice program (8-12 months duration) to provide directed, practical training and a national certification examination are in active planning, and these steps will provide the foundation to achieve the training levels we believe are necessary for professional-level IONM practitioners. As we move forward, we welcome input from not only CANM members but from surgeons, clinical neurophysiologists, anesthesiologists, neurologists and others with an interest in IONM.

One of the weaknesses in the training of IONM professionals in Canada is the lack of a comprehensive examination that allows for the assessment of a candidate's core knowledge, as well as their interpretative acumen. Although the American Board of Registration of Electrodiagnostic Technologists Certification for Neurophysiological Intraoperative Monitoring has been the national standard for technologist competence in the United States (and in many Canadian IONM centers too), it was never meant to assess a candidate's interpretive ability. The Canadian Association of Neurophysiological Monitoring, in consultations with its members, is planning for a national certification examination that aims to assess the IONM practitioner's core competencies, as well as interpretive ability. The Certified Intraoperative Neurophysiology Practitioner examination will be a comprehensive evaluation of candidates that will include both a written and oral assessment. Our anticipated rollout for this examination is 2020. To qualify for the examination, candidates will be required to fulfill 300 independently monitored cases and a minimum of 36 months of experience. Although we have outlined several pathways leading to this exam, the minimum requirements are an undergraduate degree in a Life Science, completion of the CANM/Michener course, the case load requirements outlined above and completion of the CANM apprenticeship. We believe that our education, training and evaluation process will form a foundation so that the individual performing and interpreting the IONM will become the "expert in the room." The notion that an interpreter must have a doctoral-level education misses the important detail that experience and the establishment of trust with the surgical team are keys to determining and implementing best practice in IONM.<sup>3,5</sup> There are no programs in Canada that specifically address IONM training, regardless of the academic credential, and our proposal is the first to address this need.

Although a recent survey of Canadian surgeons seemed to suggest that surgeons prefer doctoral-level interpreters,<sup>4</sup> careful

examination of the survey reveals irregularities that may have biased the responses and compromised the conclusions. First, in the survey questions (e.g., questions 10, 11) the terms neurophysiologists/neurologists are used (instead of a more generic "neuromonitoring practitioner," for example), which can bias the respondents by suggesting that these two groups should be the ones involved with and interpreting IONM. Second, the response rate from the survey is unknown.<sup>4</sup> Without knowing the proportion of the target population represented by the survey data, the results lack statistical rigor. These are classic pitfalls in survey-style research and compromise any major conclusions drawn from this work.<sup>4</sup> Although CANM is supportive of the study's research goals, it is clear that more work is needed to accurately reflect the opinions of Canadian surgeons involved in IONM.

The "expert in the room" IONM delivery model is not a technologist interpretative model as claimed by others<sup>1</sup> but a program of education and training to position the best trained and qualified person in the operating room. The survey by Norton et al<sup>4</sup> may, perhaps, reflect the concerns of surgeons regarding a lack of recognized training in IONM (including their own lack of training) rather than the desire for a specific credential or oversight model. Achieving the "expert in the room" is what CANM and its members, as well as others,<sup>5</sup> believe is best practice for patient care, with the added benefit of being cost-effective and logistically feasible. An IONM practitioner in the operating room observes not just neurophysiological data but also incorporates patient history, systemic physiological variables (blood pressure, body temperature, hemoglobin, pH), anesthesia and surgical events into the interpretative context of the IONM results. As described by Skinner and Sala, "IONM is not the static reading of a test at one point in time, rather it is the ongoing analysis of a data stream over time within a constantly changing surgical context."<sup>5</sup> In this way the IONM interpreter, alongside other OR professionals, can quickly be involved in interventional discussions should the need arise.

Like others, we believe that IONM practitioners play a key role in the event of signal loss but do not independently implement interventional measures.<sup>5</sup> At present, the argument for an oversight model in Canada has been based upon the operational design of clinical neurophysiology labs<sup>4</sup> or based on the "success" and "advanced nature" of the American method of oversight.<sup>1</sup> Unfortunately, a professional oversight model cannot always provide a timely response to operating room events as a time delay is introduced during transfer of information from the present IONM practitioner to the situationally naïve overseer for assimilation of patient data and relevant surgical events. Moreover, live data interpretation, such as cranial nerve electromyographic activity, must be viewed in real time, which is not possible even if an interpreting professional is on-site but not in the OR. We acknowledge that Telemedicine methods have been successfully adapted to some aspects in medicine such as the diagnosis and treatment of stroke, for example. It remains unclear how telemedicine-based approaches would perform in the more dynamic environment of the OR. Recent preliminary data from the US demonstrate that off-site IONM interpretation models underperform compared with in-OR "professional"-level interpretation using several end measures,<sup>6</sup> suggesting the need for professional-level IONM training and positioning these experts in the OR.

The Canadian Association of Neurophysiological Monitoring's goals will require time to fully implement, and we concede that there remains much work ahead. We emphasize that our strategy is focused on the long term with a vision toward the next generation of neuromonitorists. The Canadian Association of Neurophysiological Monitoring's aim is to provide the vehicle for proper education and training to enhance patient safety, as compared with financial or personal gain of the IONM provider. Our efforts will always be openly collaborative, and we welcome input and constructive criticism from not only the IONM community but other clinical professionals. Additional information may be found at [www.CANM.ca](http://www.CANM.ca).

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#### DISCLOSURES

The authors are members of the Canadian Association of Neurophysiological Monitoring (CANM) and sit on the Executive or Education Committees for CANM. MW and DH serve as consultants for Medtronic.

#### STATEMENT OF AUTHORSHIP

MW wrote the initial draft of the manuscript and all co-authors contributed to the editing and final draft of the manuscript. The conceptual incentive for the manuscript was shared equally among the authors.

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