



CANADIAN IONM NEWS

Official Newsletter of CANM

Message from the PRESIDENT

I am honoured to be presiding over CANM as President for the next two years. I cannot presume to fill the shoes of my esteemed predecessor, Dr. Marshall Wilkinson, whose tenure oversaw two very successful symposia (see highlights from the 2019 symposium below), significant improvements to CANM's website, e.g., streamlining the process of membership registration, and the initiation of collaborations with two sister societies. In fact, thanks to Marshall, we have in the works two exciting events – a combined symposium with ASNM for 2020 and a combined symposium/educational program with ACNS for 2021. These two events will provide opportunities for our members to engage with different groups with varied expertise and expand their professional circles.

As I begin my tenure, I would like to remind our membership of our mission, i.e., "to promote the field of intraoperative neurophysiological monitoring and foster the development of the profession through education and certification, so as to provide optimum patient care." Over the last 12 years we have provided our membership with a variety of high-quality educational programs, from our CANMtalks to our newsletter and annual symposium. Most recently, CANM partnered with The Michener Institute of Education at UHN to develop an online Intraoperative Neurophysiological Monitoring Certificate Program. This program marked CANM's first step towards self-regulation, i.e., a process of certification leading to professional accreditation in IONM across Canada. With these advances in mind, the CANM Executive has put forth an ambitious list of priorities for the next two years.

First, we will develop Standards of Practice for the field of intraoperative neuromonitoring in Canada. Our standards will delineate the expected competencies, professional requirements,

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and level of performance for Canadian IONM practitioners. The drafting of these standards will require input from all Canadian IONM experts, i.e., you, our members, will be given many opportunities to have your voices heard. We cannot do this without you!! In fact, we will be convening a Standards of Practice committee for which member volunteers would be required. Please contact info@canm.ca if you would like to sit on this committee.

CANM believes that having a Standards document necessarily precedes and will segue into the development of a National Certification Exam. Thus, our second goal during my tenure will be to develop a National Certification Exam providing IONM professionals with the designation of Certified Intraoperative Neurophysiology Practitioner (CINP). Such certification will ensure standardized practice of IONM across Canada and provide employers and the public we serve with confidence in our knowledge and skills. In order to administer the credentialing process, we need to create a stand-alone body - the Canadian Board of Intraoperative Neurophysiology Practitioners (CBINP). Here again, we ask for volunteers to sit on this board (contact info@canm.ca).

Lastly, we will be providing more services to our members through the website. Specifically, we will be adding a membership directory, a CME repository and creating forums of discussion. We are also interested in developing research initiatives and a process by which members can establish across-site research projects. If there are further services you would like us to provide, please contact info@canm.ca.

Until next time,

Jamie Johnston, Ph.D.

President, CANM

Neurophysiologist, Foothills Hospital, Calgary, AB

Adjunct Research Assistant Professor, University of Calgary



Meet your 2020 CANM Executive Board

President

Jamie Johnston, PhD, CNIM
Foothills Medical Centre, Calgary, AB

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University of Alberta Hospitals, Edmonton, AB

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Foothills Medical Centre, Calgary, AB

Director

Kelvin Jones, PhD, CNIM
University of Alberta Hospitals, Edmonton, AB

Director

Tara Palmater, MSc, CNIM
Elita'sit Neuromonitoring, Inc., NB

Director

Kristine Pederson, BSc, CNIM
Health Sciences Centre, Winnipeg, MB



MEET YOUR NEWEST CANM DIRECTORS

CANM is pleased to welcome some new faces to the Executive Board for the 2020 term.

We'd like to take this opportunity to introduce some of our new directors – Chris, Kelvin, Tara, and Kristine – and Francois, our new Vice President who will join the board for a four-year term. We thank each one of them for their commitment and dedication to CANM and the profession.



Chris Drummond-Main, MSc, CNIM

Foothills Medical Centre, Calgary, AB

My name is Chris Drummond-Main, and I am a casual Neurophysiologist working at Foothills Medical Centre in Calgary, Alberta. In addition to my role in the OR, I also work as a Research Associate, using patch-clamp electrophysiology to understand how ion channel interactions control neuronal activity. My path towards IONM began with the Michener Graduate Certificate program and a clinical internship at the Alberta Children's Hospital, which ultimately led to my current role at Foothills Medical Centre. In the future, I hope to see an increased awareness of the value that IONM brings to a variety of surgical procedures, so that IONM can be utilized to its full potential.



Kristine Pederson, BSc, CNIM

Health Sciences Centre, Winnipeg, MB

I was born and raised in rural Saskatchewan. After high school, I obtained a Bachelor of Science in Physiology & Pharmacology from the University of Saskatchewan. From there, I moved to Vancouver to complete the British Columbia Institute of Technology program in Electroneurophysiology. I was fortunate enough to be hired by Dr. Marshall Wilkinson in Winnipeg, MB where I began my IONM career. I completed the Michener Institute course in IONM in 2018 and am enjoying the ongoing learning experience that is neuromonitoring.

Because Canada has so relatively few practicing neuromonitorists, it is difficult for us to provide opportunities for continuing education. I realized this over the course of the last year as a member of the 2019 CANM Symposium planning committee. This is a field that is constantly changing and evolving, and neuromonitorists all over the world are coming up with new ideas and techniques. It is my hope that in the future it will be easier for Canadian IONM practitioners to learn from one another, whether this happens in the form of publications, webinars, or conferences.

**Tara Palmater, MSc, CNIM**

Elita'sit Neuromonitoring, Inc., NB

I was born and raised in New Brunswick and my educational credentials include a Bachelor degree from the University of British Columbia in Vancouver, with a major in Cognitive Systems (via the "Cognition and Brain" stream of the program) and a minor in Philosophy, and a Masters degree in Clinical Neuroscience from the University College of London's Institute of Neurology in London UK.

Prior to joining the field of IONM, I worked in various capacities in the areas of surgical outcomes research, corporate communications, and administration. In 2006, I relocated to the US to begin training with an IONM company which happened to have some stellar Canadians at a helm (Rob Snow and Dr. Richard O'Brien). I obtained CNIM certification just under a year later, and relocated to Los Angeles. During my time with that company, I learned from strong clinician managers (Dr. Hillary LeClair and Brian West). In the years to follow, the "business" of IONM in the US underwent significant growth and upheaval, through various corporate mergers and acquisitions across the US. During that time, I had the experience of working for two quite different IONM companies, monitoring patients within well over thirty hospitals across nine states.

When I learned of the Canadian Association of Neurophysiological Monitoring (CANM) in 2008, I joined as a member and began attending the annual symposia whenever possible. Over the

years, I have come to know many of the CANM members through these high quality educational conferences. Back in 2012, one such member, Dr. Susan Morris, kindly introduced me to two spine surgeons practising in my home province of New Brunswick. These introductions would later prove invaluable, when I returned to Canada to be near family in 2017, and was able to reconnect with that group of surgeons and begin practising IONM in my home province. My most sincere thanks to Sue, and to the networking opportunities made possible by CANM!

If you perform IONM in Canada, I hope you will consider joining CANM as a member (or renewing, if you're a past member). We need your perspective, to fully represent the diverse views and practices of IONM in Canada, and we need your help, to grow stronger in our abilities, and to support one another as colleagues.

**Kelvin Jones, PhD**

University of Alberta, Edmonton, AB



Francois Roy, PhD

University of Alberta, Edmonton, AB

I completed my undergraduate and master's training at the University of Toronto in Biophysics and Biomedical Engineering, and then completed my doctoral training in Neurophysiology at the University of Alberta. I am jointly appointed as a Neurophysiologist with Alberta Health Services and as Assistant Adjunct Professor with the Department of Surgery at the University of Alberta. My research interests are in spinal cord injury, the corticospinal tract, Parkinson's disease, and the circuitry of the human spinal cord. It has been very exciting working with Aleks and Kelvin in Edmonton, and I look forward to continuing to participate in IONM education, training, and research.

Intraoperative Neurophysiological Monitoring Certificate Program

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Prepare for
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The Michener Institute and the Canadian Association of Neurophysiological Monitoring (CANM) have partnered to offer a one of a kind online certificate program towards professional accreditation in intraoperative neurophysiological monitoring (IONM).

YEAR 1 September 2020 to August 2020

- | | | |
|---|----------------------------|-----------|
| 1 | Clinical Sciences for IONM | SEP - DEC |
| 2 | Basic Principles of IONM | JAN - APR |
| 3 | IONM Modalities I | APR - JUL |

YEAR 2 September 2021 to August 2022

- | | | |
|---|-------------------------|-----------|
| 4 | IONM Modalities II | SEP - DEC |
| 5 | Considerations for IONM | JAN - APR |
| 6 | Advanced Topics in IONM | MAY - AUG |

For more information and to register visit [MICHENER.CA/CE/IONM](https://michener.ca/ce/ionm)

Winnipeg

2019 Symposium Recap

To those of you who attended and contributed to the 12th annual CANM Symposium this September your hosts graciously extend their thanks for your support. Special thanks go to Karissa Rosen, Kristine Pederson and Jeremy Spence for their efforts in creating the program and to our sponsors Kego, Roxon, Neurosource, and Cabrel Medical Inc. for their support. It is noteworthy that the majority of attendees at this year's meeting were our American colleagues who expressed many times the value they derive from CANM's trademark interactive sessions. It must be said that without the participation of the neuromonitorists from the US this year's symposium would not have been as successful as it was.

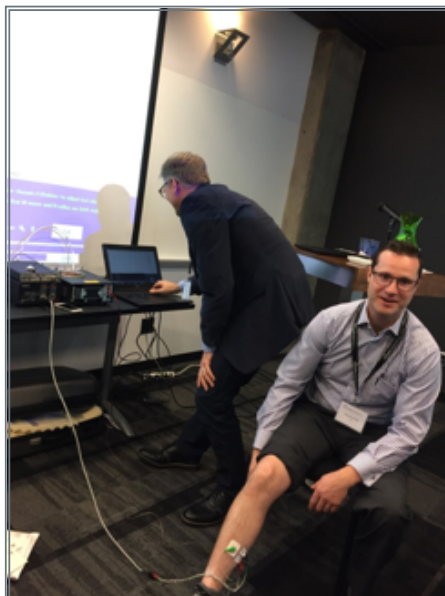
The program was highlighted by having Dr. Stan Skinner as our keynote speaker. Dr. Skinner's interest in research methods and data analysis highlight the notion that evidence based approaches to IONM can be derived from many different quantitative perspectives. While this may sound dry to some it is vitally important to our field where there is increasing pressure to provide evidence-based support for the use of IONM.

We were also pleased to feature the tandem of Dr. Francois Roy and Dr. Kelvin Jones who presented a live demonstration of the H wave. The vision of Dr. Roy's contracting soleus muscle was no doubt a highlight for all in attendance.

Other highlights included Dr. Parthasarathy Thirumala from the University of Pittsburg Medical Center who talked about the predictive power of IONM for detecting intraoperative stroke. Dr.

Thirumala publishes extensively in the IONM field and his discussion on intraoperative strokes and IONM is another excellent contribution to our field. His data were compelling and we should keep our eyes open for publication of this new and provocative line of research. In keeping with the CANM interactive tradition we had two excellent sessions of case presentations that emphasized the heterogeneity of the human neurophysiological spectrum. There is always someone who has an interesting case and these sessions were no exception. The value of case

reports cannot be overstated. They are designed to foster learning and not to diminish the presenter or highlight anyone's ignorance. If the question



2019 Symposium Recap

is posed to a neuromonitorist: Have you ever experienced a perplexing case or had an interesting observation? Almost universally the answer will be yes. Case presentations are the equivalent to clinical rounds and provide the opportunity for us discuss cases with our peers. If you have not presented a case for discussion at a CANM symposium it's time we heard from you.

As a final note, next year's symposium will aim for a new approach. CANM is currently in discussions with ASNM to hold a joint conference for Fall 2020. These talks are in the preliminary stages but Vancouver BC is a favoured location at this juncture. When further details for this allied venture emerge we will let the CANM community know.

Until then, everyone keep up the good work!

Marshall Wilkinson BSc (Hon.), MSc, PhD

Neurophysiologist
Section of Neurosurgery
Health Sciences Centre
Winnipeg, MB

Thank You!
See you next year!



(left to right): Francois Roy, Tara Palmater, Sam Strantzias, Dave Houlden

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Control Muscles are Important Too!

A Case Report

Jamie Johnston, PhD
Foothills Hospital, Calgary, AB

Patient

The patient is a relatively active 72 year old male presenting with several years of chronic low back pain and heaviness in his lower extremities due to a degenerative spinal deformity. He came to our facility for a two-stage spinal deformity correction, i.e., a four-level direct lateral interbody fusion followed three days later by a T10 – pelvis posterior fusion with navigation. Neuromonitoring was requested for both cases. The first stage of the procedure was without incident. The second stage will be discussed further below.

Procedure Setup

For the T10 – pelvis posterior fusion, the patient was positioned prone with his forearms raised beside his head. For the neuromonitoring, we monitored bilateral posterior tibial nerve somatosensory evoked potentials (SEPs), motor evoked potentials (MEPs) from bilateral hands (ADM-APB), iliopsoas, 2 recordings for the vastus (Medialis-Lateralis), tibialis anterior, extensor hallucis, longus, and abductor hallucis, as well as spontaneous electromyography (EMG) from those same muscles. The anesthetist was running no neuromuscular block and no gases (full TIVA - MAC: 0.0) to aid in MEP and EMG recording.

Neurophysiological Data

The neuromonitorist achieved robust baseline measures for both MEPs and SEPs. The SEP amplitudes and latencies remained consistent with the baseline measures throughout the surgical procedure and will not be discussed further. Our MEP amplitudes were stable throughout the placement of screws, iliac bolts, and a vertebroplasty that was performed at T10. Furthermore, the surgeons had completed an L1-L5 laminectomy and were working on the lateral recess decompression. At this point, the patient had lost approximately 1500mL and the surgeons were commenting on the significant bleeding. Blood products were being given by the anesthetist.

It was at this time, about 6 ½ hours into the procedure, that the neuromonitorist observed the right hand MEP was absent (Fig. 1, arrow). The surgeons were made aware of this change, but as this was above the level of concern, i.e., a control muscle, they continued with the procedure. To the neuromonitorist, this looked like a technical issue. In fact, one of the surgeons suggested that he may have been leaning on the arm, so the neuromonitorist performed an impedance check and examined the equipment for other potential technical issues. Finding no technical issues, the MEPs were run again and the hand MEP continued to be absent. The anesthetist was then consulted about potential for ischemia in the arm, to which he replied the pulse oximeter on that hand

suggested no issues. The MEPs were run a third time, with the right hand MEP still absent. At this point, the neuromonitorist asked the anesthetist to check the right arm, to which he said, "I am having difficulty pumping blood into the arm." The examination of the arm revealed that the IV had gone interstitial. The patient's arm was tight in the hand, forearm and just above the elbow with extensive bruising and blistering circumferentially.

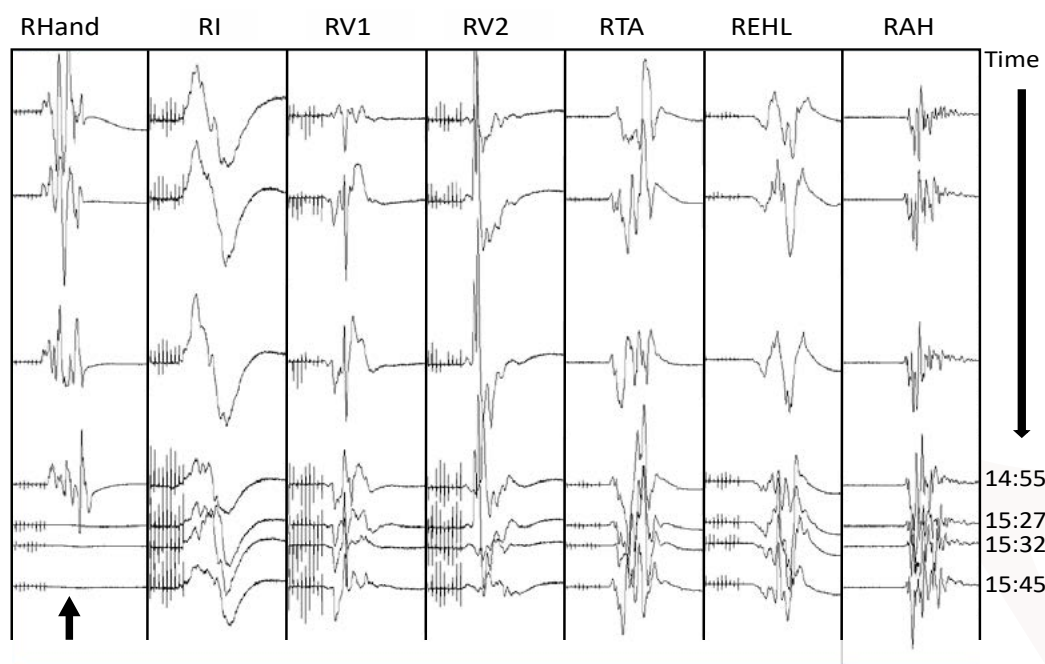
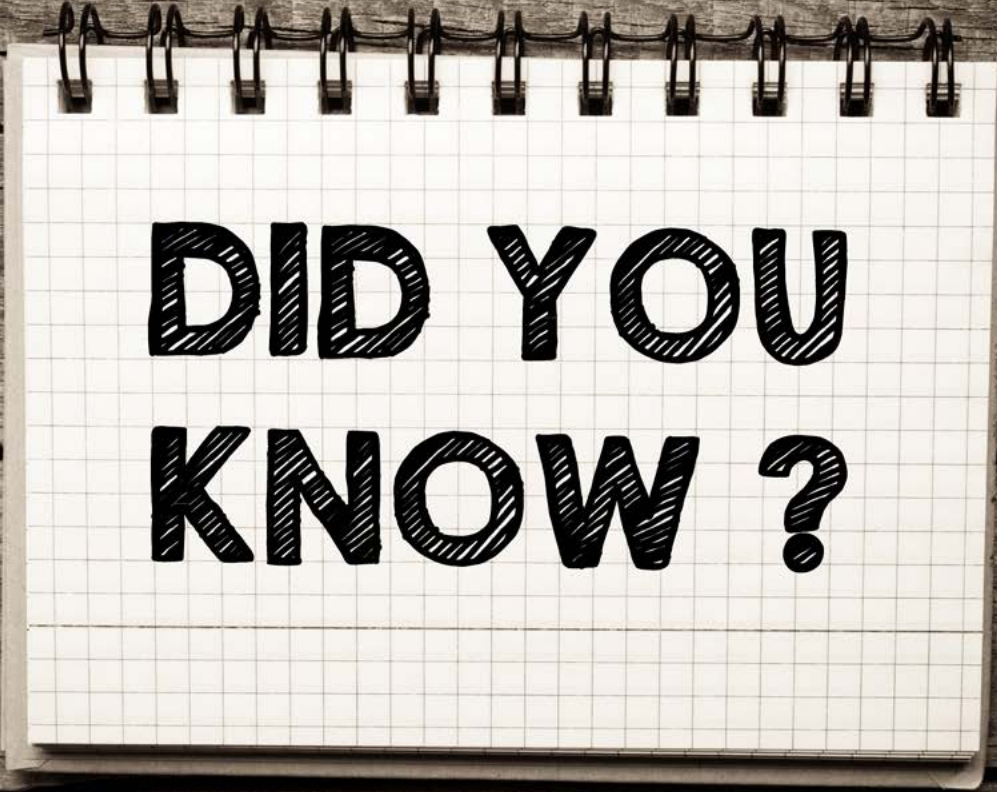


Fig. 1. Motor evoked potentials from the right hand (ADM-APB), iliopsoas, vastus 1 (Medialis-Lateralis), vastus 2 (Medialis-Lateralis), tibialis anterior, extensor hallucis longus, abductor hallucis. Note the reduction in the MEP amplitude of the right hand (arrow).

By this point, it was estimated that the IV had been interstitial for approximately 45 – 60 minutes. The surgeons quickly inserted the rods and closed to allow for an emergency 4-compartment fasciotomy. The estimated amount of time between the detection of the compartment syndrome and the fascial compartment releases was approximately 1 - 1½ hours. During the fasciotomy, all muscles appeared viable and the patient was moving his hand and fingers by post-operative day 15.

Conclusion

During spine surgery, surgeons use neuromonitoring to detect potential spinal cord injury or ischemia and are most concerned when those issues are directly related to their surgical manipulations. This case demonstrates the importance of the neuromonitorist in detecting peripheral ischemia or a plexopathy, outside of surgical manipulations, that could be due to patient positioning or, in this case, an interstitial IV. Furthermore, this case illustrates the importance of good communication with the surgical team and a process by which the source of a change in neurophysiological data can be determined.



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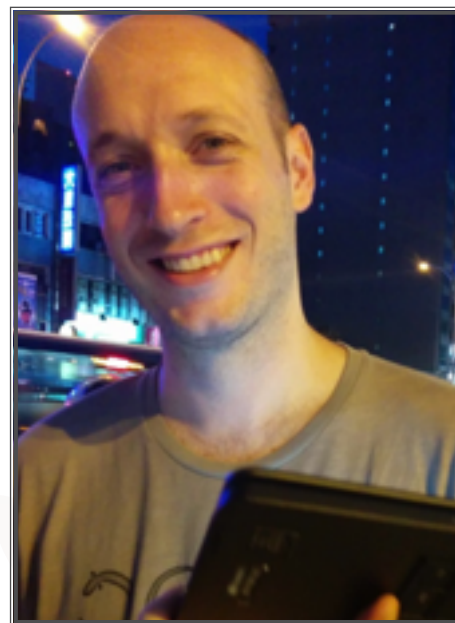
		START DATE	REGISTER BY
IONM 120	Basic Principles of Intraoperative Neurophysiological Monitoring	January 13, 2020	December 20, 2019
IONM 150	Considerations for Intraoperative Neurophysiological Monitoring	January 13, 2020	December 20, 2019
IONM 130	Intraoperative Neurophysiological Monitoring Modalities I	April 27, 2020	April 10, 2020
IONM 160	Advanced Topics in Intraoperative Neurophysiological Monitoring	April 27, 2020	April 10, 2020

For more information and to register visit [MICHENER.CA/CE/IONM](https://michener.ca/ce/ionm)

SPOTLIGHT

Rob Doole

My name is Rob Doole. I am 42 years old and live in Georgetown, Ontario. My path to Michener began from a long-held interest in the brain, neurotechnology, and neuroethics. While earning an Honours Bachelor of Science, dual majoring in anthropology and psychology, from Trent University in Peterborough, I wrote my undergraduate thesis on spatial adaptation of the visual system to novel tools through motor learning. I lived overseas in the U.K., South Korea, and Taiwan, enjoying many years of travel and working mainly in education and academic editing. Eventually, I returned to studying neuroscience by obtaining a Master of Science in Biological Science and Technology from National Chiao-Tung University (NCTU) in Hsinchu, Taiwan. My master's thesis used fMRI to investigate culture-related differences on contextual memory recall and was part of a project which I continued as a researcher after graduating. Now at Michener, I am relying heavily on knowledge of neuroanatomy that I gained from my time at Trent and neural biophysics and EEG signal processing from NCTU.



How did you hear about the Michener Institute Graduate Certificate in IONM and why did you enroll?

I learned of Michener's IONM program through the CANM website. I enrolled because of Michener's excellent reputation and the flexibility of the online courses.

Why would you recommend the Michener Institute Graduate Certificate in IONM?

In my opinion, Michener deserves its reputation. The course modules are highly dense with useful information. The readings, as a whole, form a resource which I expect to reference for the entirety of my IONM career. As a relatively young sector of medicine, I believe that IONM needs highly rigorous training programs, such as Michener's, in order to continue to develop in a way that can best serve our goals of improved postsurgical outcomes for patients.

How did you find out about the profession of IONM and what interested you in this career path?

I found out about IONM through an electrical engineering course I took on neural prosthesis design at NCTU. We watched a video on the surgical implantation of a deep brain stimulator which prominently featured an IONM-specialized neurophysiologist. The field interested me because it uses technology and

techniques with which I was already familiar to directly help people in a way that I could not as an academic. Also, my favorite aspect of working as a neuroscience researcher was running participants through fMRI experiments. Despite it being a strange and potentially frightening setting, my subjects were overwhelmingly calm and left with positive feelings about their experience. I felt that this could be somewhat attributed to my ability to clearly communicate the experiment's science, risks, and rewards, and also to how I could complete the technical tasks involved in a fast and accurate way. These skills all seemed to me to be very useful for working with patients in a medical setting, such as in IONM.

What has surprised you about the field of IONM?

I like how the techniques of IONM exploit the natural biological functions of neural structures to get them to talk to us through artificial means. The most surprising thing I have learned about IONM is the F-wave. While I certainly knew that neural membranes could theoretically depolarize in all directions, it was not something that seemed to matter much in the normal monodirectional operation of the firing cell. I was delighted to hear about how the technique made use of this property in such a creative way. That is really inspiring to me for the possibility of further tools deriving from unexpected places.

What are your career aspirations?

I would like to be part of a surgical team and to continue to improve as an IONM technologist. My next step towards these goals is to start to gain firsthand experience in the operating room. In the long-term, I would like to build expertise in brain-machine interface implantation techniques.

IONM in Canada: A Roadtrip

– PART 1

David Houlden, PhD

One of my dreams while working full-time was to visit the different IONM centres across Canada so that I could increase my knowledge and improve my work. Unfortunately, I never got the time but now that I am semi-retired I thought I would take a shot at it. I hoped the IONM practitioners in those centres would share their knowledge with me and give me permission to relay it to you.

First, I drove to Winnipeg to attend the CANM symposium. I went to the meeting with the hopes of talking to the attendees and scoring a visit to their facilities. What do they know that I don't? What do they do that I don't? I started asking for invites and am happy to say it all worked out. All of the teams I approached invited me into their facilities and some into their homes (thanks Francois Roy and Aleksandra King).

From Winnipeg to the Pacific via car, here is some of what I learned that I'd like to share with you. In Part 1, I will talk about my adventures in Winnipeg. In future issues I will feature Saskatoon, Edmonton, Calgary and Vancouver. I must thank all of you who took the time out of your busy lives to talk to me. I am truly honoured. It is my hope that you, the reader, will learn something (even if it's small something) from others in this expansive, wonderful country of ours. In this way we may evolve and improve.



Health Sciences Centre Winnipeg, MB

IONM SERVICE



- ➔ **Marshall Wilkinson, PhD,**
Karissa Rosen, BSc, CNIM,
Jeremy Spence, BScH, CNIM,
Kristine Pederson, BSc, CNIM
- ➔ **Health Sciences Centre** has 11 neurosurgeons and 3 orthopedic surgeons who use IONM.
- ➔ **Caseload** is **75% spine** (15% deformity, 5% tumour, 80% other), **20% brain tumour** (50% skull base and 50% other), and **5% cerebrovascular**.
- ➔ **They are all unionized**, except Dr. Wilkinson. Karissa, Jeremy, and Kristine work in the OR 100% of the time, whereas Marshall splits his time with research and administrative duties.
- ➔ **Data storage:** log sheets are in office. Case data from IONM machine, including waveforms go onto a memory stick. No IONM forms/data go onto the patient's chart.

WHAT THEY THINK THEY ARE GOOD AT

Determining best MEP stimulation intensity: Use contra response T, then determine ipsi response T, and then use something in between. Trade off intensity when depth of stimulation is important. This can sometimes be difficult when ACA territory must be activated. In this case, use latency of M response to determine how deep stimulation is going. ***They believe that ipsi response is mainly result of cathodal activation*** due to longer latency (i.e. C3-C4 easy to get ipsi but not with Cz-C4 or Cz-C3).

Aside: They discovered that they can use the Cadwell MEP quadrapolar cable to increase current at lower voltages. The linked quadrapolar cable has 5 input jacks (3 black and 2 red) that connect to electrodes on scalp. The other end has only 2 connectors that attach to the TCS box (one in red, one in black). By putting one scalp electrode (i.e. C3) into a black input jack and another (i.e. C4) into one of the other 2 black input jacks (on the 5 input jack connector) ***they get higher current output at lower voltages***. This is likely because the 2 scalp electrodes connected to the 2 black input jacks acts as a parallel circuit resulting in lower resistance (R) within the circuit thereby increasing current (I) by Ohms law ($V/R = I$). I am not sure Cadwell intended the quadrapolar for that use.

Health Sciences Centre Winnipeg, MB

IONM SERVICE

Facial MEP: Stimulating electrodes placed 2 cm lateral to C3 or C4 (cathode at Cz). Use needle electrode so can easily adjust placement to optimize response. 100-3K bandwidth, 100 μ V/div, 1 ms ISI, 3 – 5 in train (sometimes up to 8). Recording electrodes are pairs in orb. oris (lower mouth) and mentalis (needles angled lateral to medial at both recording sites). Use Medtronic pre-set pairs (needles set 1 cm apart).

Microvascular Decompression (MVD): Lots of experience because they do approximately 3 cases per week. Use facial MEP (all or nothing as criterion for change), lateral spread reflex (report as it goes down); ABR (warning at 0.5 msec shift; typically surgeon takes action (ie. release retractors) after 1 msec shift); Triggered EMG for CN VII identification; free run EMG with masseter, orb. oris, mentalis for CN VII in hemi-facial spasm surgery. Use masseter, temporalis, orb. oculi, mentalis for CN V for trigeminal neuralgia. Starting to use blink reflex (mainly for research purposes).

Utilization of remote access to IONM machines in OR: Allows for a) visualization when cautery stops (indicating when to go back to OR) b) observation if something gets pulled out c) 2nd opinion from those not in the OR.

Deep Brain Stimulation (DBS): Marshall is experienced in DBS and is solely in charge of neurophysiology and monitoring of clinical function.

Teamwork: Each staff members works 4 days/week, 10 hours/day. Everyone is present on Tuesday and Thursday which are the busy days. They know their on/off schedule ahead of time.

WHAT THEY THINK THEY COULD IMPROVE

Things that are not done regularly like sub-cortical stimulation for maximum resection of glioma (both surgeon and IONM practitioner are new to the technique), spinal cord mapping for identifying dorsal commissure, speech testing, BCR (10% success in adults but higher in children). They also rarely go into angio suite or do AAA surgery.

Creating a procedure manual: They do not have a formal procedure manual but requested that someone who has a manual post it on the CANM website so they (and others) could use it as a template. Perhaps it could be accessible only to CANM members.

I had the good fortune of going into the OR during my visit on September 19, 2019. There were 3 cases that day – a brain surgery for tumor, a spine surgery, and a DBS case. The set-up procedures are beyond the scope of this article but I am still surprised to see how similarly we set-up and monitor cases and I have visited many ORs over my career. The Winnipeg visit was no exception.

I would like to thank Karissa, Jeremy, Kristine, and Marshall for inviting me into their workplace, and for sharing their expertise and experience so that I may relay it to you. Most of all, it was a pleasure to get to know each of them a little better.

Stay tuned
for the next part of my IONM roadtrip.



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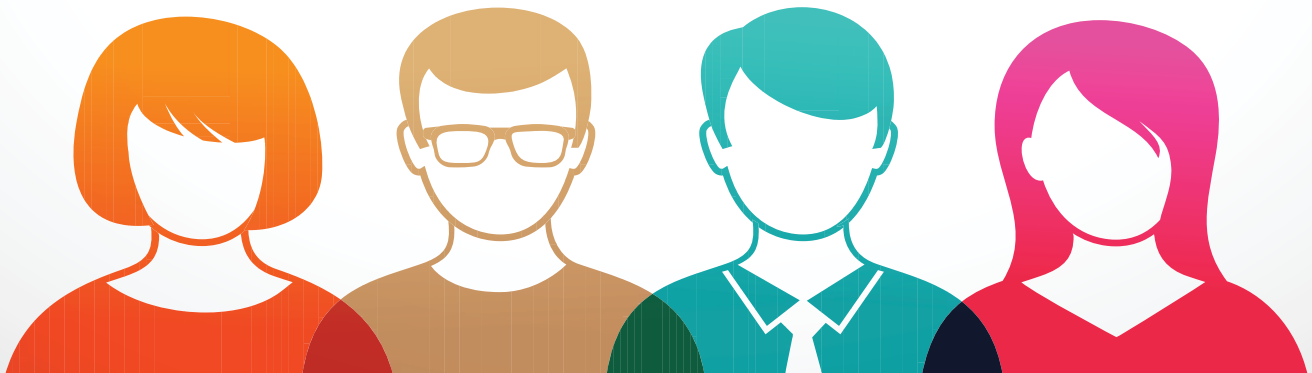
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