# CONTENTS


1. **Message from the Department Head**
2. **Department Highlights:**
    a. **Annual Research Day and Awards**
    b. **Simulation in the Spotlight**
    c. **Research in Anesthesiology Spotlight – Dr. Donald Griesdale**
    d. **Research in Pharmacology & Therapeutics Spotlight – Dr. Tillie Hackett**
    e. **Education Spotlight – Pharmacology and Patient Safety in the new curriculum**
    f. **Medical Undergraduate Teaching**
    g. **Pain Management in BC Spotlight**
3. **Hospitals and Health Centres**
4. **Pharmacology and Therapeutics**
5. **Education**
6. **Research**
7. **Global Outreach**
8. **Appendices:**
    a. **Faculty Lists**
    b. **Site department full reports**
    c. **Division Head reports**
    d. **Residency Programs full reports**
    e. **Hugill Centre**
    f. **Therapeutics Initiative Newsletter**
    g. **Research Publications**

## *Message from the Department Head*

Thank you for taking a few minutes to go through this report. This year the report highlights a few areas in our department, with the usual detailed information placed as appendices. Please share with colleagues in your department, so they too can celebrate the successes of our colleagues as well as hopefully understand this diverse department a little better.

The Department continues to work on the strategic priorities determined in late 2013. We have not yet looked at some of the suggested outcome measures to see what has been accomplished.

**Our Strategic Priorities for the next few years:**

1. Fostering more collaboration within APT
2. Branding and identity
3. Relevance and value
4. People
5. Sustainability
6. Culture of Engagement

**<u>Strategic Planning Exercise on Research</u>**

The Department needs faculty renewal in Pharmacology and Therapeutics as there will be no Assistant Professors by July 2016. Alignment with the Faculty of Medicine research priorities is needed for recruitment. Therefore, we held the first departmental research strategic planning day on October 7, 2015, during which presentations were given and research themes were discussed. The top themes identified were: neurosciences, cardiopulmonary, clinical outcomes and patient safety, and perioperative technology integration. On February 2, 2016, a second Research Strategic Planning Meeting was held to discuss strategies: use of the four previously identified themes to develop collaboration with research centers, future hiring, and fund-raising for Departmental needs. At that meeting, consideration was given to developing an endowed professorship in the department. Two key theme areas to develop were identified: pain research and pharmacoinformatics.

- "Pain" may attract potential collaboration with the Brain Institute, Spinal Cord Centre, St. Paul's, the Health authorities and the Ministry of Health.
- The University of Illinois at Chicago has a Department of Pharmaco-informatics. They define pharmacoinformatics as "the scientific field that focuses on medication-related data and knowledge within the continuum of healthcare systems". This is an area that does not currently exist at UBC.

The Department's financial state is precarious as accumulated soft funds have been almost entirely spent on paying off the > $1 million dollar deficit incurred in a research account over more than a decade in combination with loss of endowment funds due to the 2008 economic downturn. However, the Department recently received a one-time royalty payment from UBC's sale of a research venture which used to belong to Pharmacology. This royalty, in conjunction with funds we previously placed into the FoM investment can be used to create a named professorship in a research domain that aligns with our identified research themes. Since initiation of a professorship will require $2-3 million, we will need to work with other departments or centers

and/or the Development office to find matching funds to reach the goal. The expected rate of return is 3.5% from endowments/professorships. This means that if APT can raise $3 million, we will have $105,000 per annum to support this professorship.

The Department has continued to build on faculty development with the second annual Faculty Development Day on November 21, 2015. Dr. Alana Flexman, as Director, pulled together a well-received program that tackled effective communication and feedback. Dr. James Brown is the new Faculty Development Director and is working on the November 2016 event, which will be on Competency-based education.

Building on the success of the first two years of the Vancouver Summer Program course in Pharmacology, Dr. Andrew Horne has put together a full program of two courses including this time a course on Critical Analysis in Medicine and Science which will be held in July/August of 2016.

The study program for international medical graduates to prepare for the Royal College Exams in Anesthesiology was created and run for a second year, from October 2015 to June 2016. Many anesthesia faculty were engaged as session reviewers and practice oral examiners. If success is candidates who pass their exams after prior failed attempts, then we had a successful program.

Once again the Whistler Anesthesia Summit held in February 2015 was an enormous success, with a star-studded list of anesthesia experts and some excellent workshops. The co-chairs, Dr. Cynthia Yarnold and Dr. Juliet Atherstone are truly formidable organizers!

The new Pain Medicine Residency Program will begin in July 2016 with its first resident. The Program Director, Dr. Brenda Lau has put together an excellent curriculum, drawing on colleagues in a variety of specialties for this 2 year program that focuses on non-interventional multidisciplinary management of pain.

Research continues to flourish within the department. We have some very strong pharmacology researchers with well-established careers, and some young researchers such as Tillie Hackett who is proving very successful in the highly competitive grant and scholarship opportunities available in Canada. On the anesthesia side, we have clinician-researchers such as Mark Ansermino, Stephan Schwarz, Don Griesdale, David Ansley, Alana Flexman, Himat Vaghadia, Ray Tang, Steve Head, Kevin Froehlich, Juliet Atherstone, Gord Finlayson, Jens Lohser, Calvin Au, Peter Choi, Angela Enright, Joanne Douglas, Andrew Sawka, Vit Gunka, whose work is making a difference in health outcomes. On an exciting note, the department took on its first Partner appointment, which essentially is an externally funded appointment. Matthias Georges was approved as Partner Appointed Assistant Professor in the Department. He is an engineer who currently holds a Research Scientist position with Child & Family Research Institute (CFRI) and is part of Dr. Ansermino's anesthesia research team. He was previously a post-doctoral fellow of Dr. Ansermino. His primarily research focus is in biomedical engineering.

Teaching is what connects our department, with passion amongst so many for teaching students of all levels and interests. I would like to thank everyone who engages in teaching undergraduates and medical students as I know how important it is for the future of the department to incite passion for our work in our learners. Those teaching in pharmacology receive consistently excellent teaching evaluations and our undergraduate and graduate programs in Pharmacology are highly competitive. Our anesthesia training core sites (VGH, SPH, BCCH, BCWH, RCH) and our

affiliated sites (Lions Gate, Richmond, Burnaby, Surrey, Delta, Langley, Abbotsford, Chilliwack, Victoria, Nanaimo, Prince George, Kelowna Vernon, Kamloops, Penticton, Terrace/Mills, Kootenay) all have numerous trainees from various disciplines, and have constant pressure to take on more.

We have had many changes in the office staff as well as in some leadership positions in 2015/16. Aileen To, our formidable Senior Administrator will start a new position in the Faculty of Medicine in early 2016, and Allison Rintoul will be the new Senior Administrator. Jessica Yu and Winnie Yung have also found new careers and have been replaced by Michelle Ho and Shermeen Imtiaz. Dr. Cathy Pang will be finishing her term as Associate Head at the end of June 2016 and a search committee has been struck to find a new Associate Head.

I would like to thank all of you for continuing to be generous with your time, your energy, your knowledge and your passion. We continue to be in a difficult financial position in the department, as is the Faculty of Medicine, and this does not allow me to reward you for all your contributed time and effort as I would like to be able to. Let us work on our strategic priorities together, of which the most important is fostering the strengths of our people.

Most appreciatively

Roanne Preston, MD FRCPC
Department Head

## Department Leadership

Roanne Preston – Department Head
Cathy Pang – Associate Department Head to June 30, 2016
James Wright – Therapeutics Initiative Co-Managing Director
Ken Bassett – Therapeutics Initiatives Co-Managing Director

Site Chiefs:
Hamed Umedaly – Head, VGH Department of Anesthesia
Randy Moore – Head, St. Paul's Hospital Dept of Anesthesia to Dec 31, 2015
Jim Kim –Head, St. Paul's Hospital Department of Anesthesia from Jan 2016
Norbert Froese – Head, BC Children's Hospital Department of Anesthesia
David Lea and Simon Massey- Co-heads, BC Women's Hospital Department of Anesthesia
John Ramsden – Head, Royal Columbian Hospital Department of Anesthesia
Marshall Cheng – Head, Surrey Memorial Hospital Anesthesia Department
Bryon McCarter – Head, Lions Gate Hospital
Anup Navsarikar – Head, Richmond General Hospital
Gerald Lim – Chilliwack General Hospital
Curt Smecher – Abbotsford Regional Hospital (MSA)

Site Chiefs:
Hamed Umedaly – Head, VGH Department of Anesthesia
Jim Kim – Head, St. Paul's Hospital Department of Anesthesia
Norbert Froese – Head, BC Children's Hospital Department of Anesthesia
David Lea and Simon Massey- Co-heads, BC Women's Hospital Department of Anesthesia
John Ramsden – Head, Royal Columbian Hospital Department of Anesthesia
Marshall Cheng – Head, Surrey Memorial Hospital Anesthesia Department
Bryon McCarter – Head, Lions Gate Hospital
Anup Navsarikar – Head, Richmond General Hospital
Gerald Lim – Chilliwack General Hospital
Curt Smecher – Abbotsford Regional Hospital (MSA)
Tom Ruta – Head, Victoria General/Royal Jubilee Hospitals Department of Anesthesia
Aaron Jackson – Head, Kelowna General Hospital Department of Anesthesia
Rod Cameron – Head, Royal Inland Hospital Kamloops
Kevin Smith – Vernon Jubilee Hospital
Nazar Murad – Head, University Hospital of Northern BC Department of Anesthesia

**Academic Leadership**
Matt Klas – Anesthesia Residency Program Director
Don Griesdale – Anesthesia Research Director
Sastry Bhagavatula – Director/Advisor, PCTH Graduate Program
Brad Merriman – Medical Undergraduate Program Director
John McAlpine - Family Practice Anesthesia Residency Program Director
T. Laine Bosma - Simulation Program Director
James Brown - Faculty Development Chair
Stephan Malherbe – Visiting Professor & Continuing Professional Development Program Director
Cynthia Yarnold and Juliet Atherstone - Whistler Anesthesia Conference co-chairs
Stephan KW Schwarz – Hugill Centre Chair

**Divisions of Anesthesia**
Steve Head – Division Head, Regional Anesthesia
Bobby Lee – Division Head, Cardiac Anesthesia
Alana Flexman – Division Head, Neuroanesthesia
Michael Negraeff – Division Head, Pain Management
Norbert Froese – Division Head, Pediatric Anesthesia
Roanne Preston – Division Head, Obstetric Anesthesia
Jens Lohser – Division Head, Thoracic Anesthesia

**Administrative Staff**
Allison Rintoul – Administrative Manager
Katharine Garcia – Executive Assistant
Michelle Ho – Associate Head Administrative Assistant
Jill Delane – Residency Program Coordinator
Susan vanBruggen – Residency Program Secretary
Shermeen Imtiaz – Reception/Medical Undergraduate Program Secretary
Wynne Leung – PCTH Undergraduate and Graduate Program Coordinator
Andy Jeffries – Operations Manager

# DEPARTMENT HIGHLIGHTS

## 9th Annual Research Day and Awards Night

**Objective:** To review research currently conducted by graduate and post-graduate trainees and fellows in the Department of Anesthesiology, Pharmacology & Therapeutics at the University of British Columbia.

*This event is an accredited group learning activity as defined by the Maintenance of Certification Program of the Royal College of Physicians and Surgeons of Canada (6.5 h under CPD Section 01).*

*Guest Judge & Keynote Speaker*
**Dr. Ronit Lavi – Western University**

Acknowledgments:
*UBC APT Judges*
Dr. Juliet Atherstone
Dr. Peter Choi
Dr. Laura Duggan
Dr. Alana Flexman
Dr. Vit Gunka
Dr. Stephan Malherbe
Dr. Richard Merchant
Dr. Carolyne Montgomery
Dr. Ray Tang
Dr. Simon Whyte
Dr. Clinton Wong
Dr. Cynthia Yarnold
Dr. Ricardo Rivera Acevedo
Dr. Tillie Hackett
Dr. Andrew Horne
Dr. Tim Kaan
Dr. Bernie MacLeod
Dr. Stephan Schwarz

The Research Day Organizing Committee:
Dr. Don Griesdale — Research Day Coordinator (ANA Section)
Dr. Pascal Bernatchez — Research Day Coordinator (PCTH Section)
Dr. Matt Klas — Research Day Consultant (ANA Section)
Ms. Aileen To — Administrative Manager
Ms. Jessica Yu — PCTH Administrative Assistant
Ms. Susan vanBruggen — ANA Residency Program Secretary
Ms. Jill Delane — ANA Residency Program Coordinator

## Winning Presentations:

ORAL ABSTRACT # 19
Complications Increase with Greater Than One Endotracheal Intubation Attempt; Experience Throughout a Canadian AdultTertiary-Care Teaching Centre
Peter Rose, Kuljit Minhas, Laura Duggan

ORAL ABSTRACT # 14
Implementation of an Extubation Algorithm in the Intensive Care Unit at Vancouver General Hospital
Cristin McRae, Donald E. G. Griesdale, Andrea Wnuk

ORAL ABSTRACT # 25
All-or-none' effects of retigabine on KCNQ potassium channels
Michael C. Yau, Runying Yang, Robin Y. Kim, Harley T. Kurata

ORAL ABSTRACT # 29
Investigating the Nature of Small Airway Obstruction and Obliteration in Chronic Obstructive Pulmonary Disease
Steven Booth, Hyun-Kyoung Koo, Dragos Vasilescu, James C. Hogg, Tillie-Louise Hackett

POSTER ABSTRACT # 6
Novel 3D-ultrasound-guided midline lumbar epidural placement, utilizing Epiguide needle guide in porcine model: a comparison of standard versus Pajunk epidural needles
J Stone, P Beigi, R Rohling, V Lessoway, A Dube, V Gunka,

POSTER ABSTRACT # 8
Assessment of postoperative cesarean section pain using the visual analogue scale in patients at Mulago Hospital
Andrew Kintu  Sadiq Abdulla

POSTER ABSTRACT # 33
Investigating Retigabine Modulation of KCNQ Channels Using Voltage Clamp Fluorometry
Robin Y. Kim, Harley T. Kurata

## ***AWARDS NIGHT***

RESEARCH COMPETITION WINNERS:

**1st Place - Anesthesia Oral Presentation:**
Peter Rose

**2nd Place - Anesthesia Oral Presentation:**
Cristin McRae

**1st Place - Pharmacology & Therapeutics Oral Presentation:**
Michael Yau

**2nd Place - Pharmacology & Therapeutics Oral Presentation:**
Steven Booth

**1st Place - Anesthesia Poster Presentation:**
Jeannine Stone

**2nd Place – Anesthesia Poster Presentation:**
Sadiq Abdulla

**1st Place - Pharmacology & Therapeutics Poster Presentation:**
Robin Kim

## AWARDS

*Dr. Dimitri Giannoulis Memorial Award in Regional Anesthesia* – **Dr. Jason Wilson**

*Dr. John A. McConnell Memorial Award for Academic Excellence* – **Dr. Lindi Thibodeau**

*Dr. Derek Daniel WolneyMemorial Prize for Clinical Proficiency* – **Dr. Lindi Thibodeau**

*Dr. Jone Chang Memorial Award in Anesthesiology Excellence* – **Dr. Sara Waters**

*Dr. Jone Chang Memorial Prize in Chronic Pain* – **Dr. Alex Wong**

*Dr. Anthony Boulton Award for FPA Clinical Excellence* – **Dr. Kevin Woudstra**

*Dr. James Kimme Golden Epidural Award* –
**Dr. Jamie Oentoro (Jr. Resident) and Dr. Sadiq Abdulla (Sr. Resident)**

*Dr. Michael Smith Award for Pediatric Anesthesia* – **Dr. Lindi Thibodeau**

*RCH Resident Award for Clinical Excellence* - **Dr. Lindi Thibodeau**

*Ken C.K. Wong Award for Clinical Teaching* – **Dr. Carrie Goodine**

*Kenny Wong Award for Clinical Excellence and Collegiality (Formerly "Resident Award for Clinical Excellence and Collegiality, Vancouver Hospital")* – **Dr. Graham Noble**

*UBC APT Advance Simulation Training Program* –
**Dr. Anne –Marrie Madden** and **Dr. Steven Moore**

### Pharmacology & Therapeutics Undergraduate Awards

*Esther Anderson Memorial Prize (highest graduating average in Honors Pharmacology*
**Johnson, Fraser Dale**

*Prakish Gill Memorial Prize (highest graduating average in Majors Pharmacology*
**Dhir, Arun**

*MERCK Canada (formerly FROSST) Medical Scholarship (final year medical student who has made achievement in Therapeutics* - **Hsiao, Michael Li-Hsuan**

*MERCK Canada Scholarship in Medicine* - **Fox, Joel**

*Thomas L. Perry Memorial Prize in Medical Pharmacology & Therapeutics*
**Hsiao, Michael Li-Hsuan**

**Pharmacology & Therapeutics Graduate Awards**

*Sacks Prize (Best presentations in 2014/15 PCTH 514)*

**PhD: Robin Kim**
**MSc: Yat Him (Vincent) Suen**

## *FACULTY AWARDS*

***Master Teacher Awards:***

**Vancouver General Hospital–** Dr. Alana Flexman
**St Paul's Hospital –** Dr. John Bowering
**Royal Columbian Hospital –** Dr. Kenneth Ryan
**BC Children's Hospital –** Dr. Mike Barker
**BC Women's Hospital –** Dr. Paul Kliffer
**Rural/Community hospitals –** Dr. John Veall (LGH)
**Medicine –** Dr. Don Griesdale (Critical Care)
**Family Practice Anesthesia Master Teacher Award –** Dr. John Veall (LGH)
**Family Practice Anesthesia Master Teacher Award –** Dr. Kelly Chatterson (LGH)
**Family Practice Anesthesia Master Teacher Award –** Dr. Mike Traynor (BCCH)
***Dr. Dimitri Giannoulis Resident Appreciation Award*** **-** Dr. Matt Klas

**PROMOTIONS, RESEARCH AWARDS, SCHOLARSHIPS AND OTHER KUDOS**
**In 2015:**

**Dr. Joanne Douglas – Member of Order of Canada**

Promotions:

Clinical Instructor to Clinical Assistant Professor:
Dr. Christopher Chin - BC Children's Hospital
Dr. Michael Wong – BC Women's Hospital
Dr. John McAlpine – Lions Gate Hospital
Dr. John Veall – Lions Gate Hospital
Dr. Andrea Vrana – Lions Gate Hospital
Dr.Kevin Rondi - St. Paul's Hospital
Dr. Aaron MacINNES – Surrey Memorial Hospital
Dr. Nazar Murad – University Hospital of Northern BC (Prince George)

Clinical Assistant Professor to Clinical Associate Professor:
Dr. Simon Whyte – BC Children's Hospital
Dr. Laura Duggan – Royal Columbian Hospital

Dr. Stephan Schwarz - voted Runner Up for the Teaching Excellence Award for the 2014/2015 academic year.

Dr. Stan Bardal - voted Runner Up for the Teaching Excellence Award for the 2015/2016 academic year.

# ***SIMULATION IN ANESTHESIA AT UBC***

Dr. T. Laine Bosma
Clinical Assistant Professor/Director, Anesthesia Simulation Program

## ***P. O. E. M.***

Since its pilot year in 2011, the interdisciplinary simulation course "Peri-Operative Emergency Management" (POEM) has been teaching junior anesthesiology, emergency medicine, and surgery residents how to manage crises in surgical patients within interdisciplinary teams. Founded by members of our Dept of Anesthesia and Dept of Surgery, POEM is novel in placing residents from various specialties with each other, and with nurses and respiratory therapists to undergo ten team-based simulations. POEM's aim is to help participants learn how to harness the strengths from a team of people to deliver excellent clinical care under crisis. It also seeks to replicate the challenges of the real world, where physicians of different specialties work side-by-side with nurses and respiratory therapists.

In 2015, Dr Douglas Smink, Harvard's Associate Medical Director STRATUS Center for Medical Simulation, and Dr Kathleen Ventre, Director of the Simulation Program at Children's Hospital, Colorado, travelled to Vancouver to observe and participate in the POEM course. Both Dr Smink and Dr Ventre have been using team simulations to train their in-hospital staff.
"We're trying to figure out a way to do something like this with our residents." Says Douglas Smink, who is also program director of the general surgery residency, vice chair for education in the Harvard Department of Surgery, and an Associate Professor of Surgery at Harvard Medical School. "It's a really impressive program, and the fact that all of these clinical faculty are here as instructors is fantastic. In an academic medical centre, to get all these groups in the same room at the same time is a real challenge."

POEM along with the interdisciplinary simulation work St Paul's Hospital has also inspired team training on a larger scale at other hospitals. In October 2015 staff anesthesiologists, surgeons and nurses underwent simulation cases in the VGH OR. St Paul's continues to lead with other novel interdisciplinary team based simulations and garnered attention from Global TV. Children's Hospital continues with innovative simulation programs to train residents and BC Women's continues with simulation in peri-partum emergencies.
"Team dynamics is a real, emerging, scientific field, based on decades of research on crisis resourse management, situational awareness, and other aspects of cognitive psychology. Furthermore, I'd even say that getting teams to execute well in complex, modern health care environments is a more urgent training priority that imparting knowledge from textbooks. We are on the cutting edge of a new and important scientific field in health care." Morad Hameed, Co-Founder of POEM.

Residents work though a simulated trauma scenario in the POEM course

## ***SimMom at St. Paul's Hospital***

While many of us know that Code Blue means cardiac arrest, fewer of us know what Code Pink means: a woman having a baby is in crisis.

St. Paul's anesthesiologist Dr. Trina Montemurro describes what a Code Pink is like. "Over the P.A. we hear, 'Code Pink, O.R.' which means at that moment the obstetrics team is running down the hall from Maternity to the O.R. with a mom who needs an emergency C-section. It happens very fast. It could happen right now."

*It's all "very real"*

Try to imagine a high-tech crash test dummy that can moan and cry—and deliver a simulated baby. While SimMom is, on the surface, a giant mannequin lying on a gurney, once she has been hooked up to the appropriate machines and monitors, she starts to seem very real. SimMom is hooked up to an IV, and specific doses of drugs must be put into her veins. She has an airway for a breathing tube, which mimics the physiological differences of a pregnant woman's airway. SimMom also has vital signs like heart rate and blood pressure and even has a voice box that makes noises when she is in distress because that's what real moms do.

*Simulation provides opportunities for learning*

The SimMom program is directed by anesthesiologist Dr. Laine Bosma, who has expertise in designing, implementing and supervising simulation programs to help care teams deal with crisis.

St. Paul's Foundation's Lights of Hope Greatest Needs fund provided $125,000 to support the Code Pink Simulation Project, with $38,000 to cover the cost of the SimMom unit and the remaining amount to support programming costs over the next three years.

# ***RESEARCH IN ANESTHESIOLOGY SPOTLIGHT:***

*Dr. Don Griesdale*
*Assistant Professor/UBC Director of Research*

Cardiac arrest is the sudden, unexpected loss of heart function, breathing and consciousness. During this time, there is a lack of blood flow and oxygen delivery to the brain. This is called hypoxemic ischemic brain injury (HIBI). Amongst survivors of cardiac arrest, the vast majority of subsequent deaths are directly attributable to HIBI, and less than 50% of survivors are neurologically intact 6 months after the arrest. In healthy volunteers, cerebral autoregulation maintains a constant blood flow over a wide range of mean arterial blood pressures (MAP). MAP below or above the zone of autoregulation may lead to cerebral ischemia or hyperemia, respectively. In HIBI, the zone of autoregulation becomes narrowed and right shifted with the degree of autoregulatory dysfunction differing markedly between patients. As such, the "one-size fits all" recommendation of the American Heart Association to keep MAP ≥ 65mmHg5 in all patients fails to account for the precise zone of autoregulation of a particular patient.

Near-infrared spectroscopy (NIRS) has been used as a marker of the adequacy of cerebral blood flow to determine the optimal MAP in other neurological diseases. With NIRS, an oximeter probe placed on the forehead emits and receives near-infrared light (700 – 950nm) to measure the regional tissue oxygen saturation (rSO2) in these first few millimeters of frontal lobe cortical brain tissue and provides continuous information on cerebral oxygen supply and demand. NIRS has a critical advantage of other measures of CBF in that it is non-invasive, continuous, and not dependent on expertise of signal acquisition.

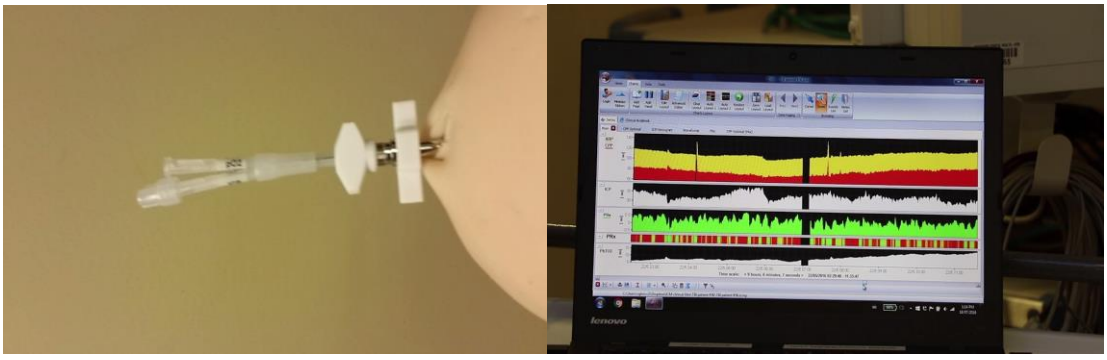
In my research program, rather than interpreting in its absolute rSO2 value, we can observe how rSO2 changes in response to fluctuations in MAP. If the patient's MAP and rSO2 trend in the same direction (e.g. increasing MAP leads to increasing rSO2), the patient's cerebral autoregulation is compromised. Conversely, if rSO2 remains constant during fluctuations in MAP, then autoregulation is intact. Over time, a moving correlation coefficient (a value between -1 and +1) between MAP and rSO2 can be calculated. This correlation coefficient is termed COx. A positive COx (MAP and rSO2 move in the same direction) indicates dysfunctional autoregulation18. A negative or near zero COx indicates intact autoregulation. Using this relationship, we can identify optimal MAP for that specific patient. As part of this program, we have completed a systematic review of the literature and a single-center proof-of-concept study. We have now started a multi-center feasibility study at Vancouver General Hospital, St. Paul's Hospital and Sunnybrook Health Sciences Center in Toronto. This study is a collaborative effort with colleagues from across the country in the Canadian Critical Care Trials Group.

*Dr. Griesdale In the News*

**BRAIN INJURY TREATMENT**

Vancouver General Hospital intensive care specialists/anesthesiologist, Dr. Donald Griesdale together with Dr. Mypinder Sekhon, a pair of critical care physicians who had been recently trained on new autoregulation monitoring technology and procedures developed at the University of Cambridge deemed Jamie Crane-Mauzy, a world renowned freestyle skier at the time of her horrific crash on the slopes of Whistler in April 2015, was the ideal patient for the new procedure while she was in a coma.

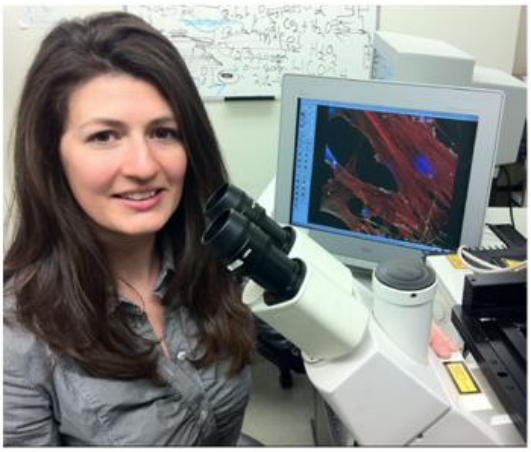
Doctors drill a hole into the patient's skull to insert catheters attached to equipment that allows for continuous, real-time measurements of oxygen and blood pressure levels in the brain. Inappropriate fluctuations in blood flow and pressure can then be treated with medications that boost heart pumping, for example, to ensure the brain is getting enough oxygen and blood circulation.



Article in the Vancouver Sun published on July 19, 2016
http://vancouversun.com/health/local-health/video-health-vgh-first-b-c-hospital-to-use-new-brain-injury-procedure

# ***RESEARCH IN PHARMACOLOGY & THERAPEUTICS SPOTLIGHT:***

*Dr. Tillie Hackett, PhD*
*Associate Professor*



Dr. Hackett's research is focused on obstructive lung diseases including asthma and chronic obstructive pulmonary disease (COPD) which affect the lives of 4.5 million Canadians. She uses cutting-edge imaging techniques to understand how asthma and COPD patients airways are scarred, and then uses intricate human lung cell models to understand how potential new therapies could help repair airway scarring. Over the course of her research training Dr. Hackett has won 36 awards including a New Investigator award from the Canadian Institutes for Health Research and Michael Smith Foundation for Health Research Scholar Award. In the last 11 years she has published 51 research articles in high impact scientific journals, and received over $4.5M in research funding from national and international sources. She is highly respected, nationally and internationally, in respiratory research as demonstrated by the international recognition awards she has won from the International Klosterfrau Foundation for pediatric asthma research and the Anne Woolcock Award from the American Thoracic Society for outstanding work in asthma by a young investigator. Her laboratory is located at the UBC Centre for Heart Lung Innovation (HLI) at St. Paul's Hospital, Vancouver. There she also plays a leadership role as an Associate Director, leading 32 Scientists and 27 research staff members. Dr. Hackett is also the Director of the HLI Lung Tissue Biobank, the largest lung tissue biobank in Western Canada. Since, 2013, Dr. Hackett has graduated 3 MSc and 2 PhD students and currently mentors 1 Research Associate, 2 Post Doctoral Fellows and 2 Graduate Students. As a champion of research education, she has developed many tutorials to help research students develop various knowledge translation skills including how to publish articles and write fellowship applications. All of these achievements show that Dr. Hackett is an exceptional scientist and leader who has made great contributions to lung disease research within UBC, Canada, and beyond.

# ***EDUCATION – BEYOND OUR BORDERS***

Pharmacology content is a vital part of medical student education in the first two years, with application of knowledge then applied in the clinical years and for the physician's career. In our Department we have excellent teachers, but in addition some individuals who are highly engaged in developing the pharmacology curriculum at UBC.

In the renewed curriculum, Patient Safety and Quality has become a theme, which means it threads throughout the four years of medical school training, from didactic teaching to having milestones around patient safety during the clinical years.

Dr. Malcolm Maclure, the BC Patient Safety Chair and faculty member in the Department, is Co-Lead of the Patient Safety and Quality Theme for the new competency-based curriculum for the MD undergraduate program (MDUP) that started in 2016. In collaboration with Carolyn Canfield, recipient of the first Patient Safety Champion award from the Canadian Patient Safety Institute, and Co-Lead Dr. Cheryl Holmes, Dr. Maclure is implementing a series of modules with educational activities to develop patient safety competencies threading through the Case-Based Learning topics. In year 1, the activities include:

- systems thinking about hand hygiene issues in relation to the 'Organizational Accident Causation Model' or 'Swiss Cheese Model'
- 'concept mapping' from a narrative of an influential US case of system failure to a causal model of medical error used in the UK National Health Service,
- in collaboration with nursing students, applying the ISBAR communication protocol (Identity-Situation-Background-Assessment-Recommendation) for patient handovers, to summarize the essential elements of a case at one point in time, and
- using an electronic decision support tool for deprescribing to a hypothetical elderly patient taking many medications, and
- Similar modules are being planned for year 2, reinforcing key competencies.

For year 3 students, Dr. Maclure is collaborating with Dr. Cheryl Holmes on a pilot course on 'Professional Identity Formation and the Hidden Curriculum' to prepare students as they enter the challenging culture of clerkships. The aims are: 1) to Prime students so they, 2) Notice aspects of healthcare culture that are potentially problematic for patient safety, 3) Reflect on opportunities they have as students to resist the effect of that culture on their attitudes and behaviours, and 4) Choose actions that strengthen their resilience and promote patient safety.

Dr. Maclure is faculty sponsor for a student group – the UBC Chapter of the Open School of the Institute for Healthcare Improvement – that helped to recruit and organize about 20 students to take the IHI Open School 'Basic Certificate' in Patient Safety and Quality Improvement during the FLEX period in April-May.

# *MEDICAL UNDERGRADUATE TEACHING*

*Drs. Jennifer Shabbits & Stan Bardal*

The past year marked an important milestone with the successful launch of the renewed MD Undergraduate Program (MDUP) curriculum in August 2015. In keeping with the integrative nature of the new curriculum, the pharmacotherapy theme, led by Drs. Stan Bardal and Jennifer Shabbits, was incorporated into a diverse range of first-year teaching and learning opportunities.

In collaboration with Course Directors and Week Leads, assessable pharmacology objectives were included in nearly every week of the first-year courses. The material was taught using a combination of traditional pharmacology lectures, multi-disciplinary clinical reasoning sessions, web modules, and case-based learning (CBL) cases. The pharmacotherapy leads also provided input into the development and revision of cases. Of particular note was a pharmacology-focussed week in term 2 of year 1, in which lecture content and a new CBL case was built around the important issue of drug safety and adverse drug reactions.

While the new curriculum was being delivered in year 1, simultaneous work preparing for the launch of the renewed year 2 experience in August 2016 was also underway. Phamacotherapy will continue to have a strong voice in lecture and small group sessions for all second year weeks.

Efforts are also underway to develop the clinical experiences in the renewed years 3 and 4. The pharmacotherapy theme has been assigned to collaborate with the Obs/Gyn, Psychiatry and Internal Medicine rotations, and pharmacology objectives have been submitted to the respective course directors.

The UBC Med Formulary app continues to be an important resource for students. The app focuses on the 150 drug classes that are contained in the UBC formulary. The formulary is updated with broad stakeholder input on an annual basis. A new version of the app will debut early in the Fall 2016 term, with significant improvements to performance and breadth of educational content.

While the renewed curriculum provides many opportunities for pharmacology education, it is not without its challenges. Securing limited and highly sought-after curricular time is the most significant and ongoing challenge. However, persistence and a willingness to collaborate with other theme groups (patient safety, evidence based medicine, addictions, palliative care, etc.) has allowed for pharmacology content to have a strong presence. Another challenge is to engage the APT faulty in delivering the pharmacology sessions. We need to establish ourselves as leaders in pharmacology education, and at present we risk losing these hard-earned pharmacology sessions to other departments. With the first two years of curriculum now mapped it is hoped that faculty members will begin to claim lectures/topics to deliver moving forward.

# *PAIN MANAGEMENT IN BRITISH COLUMBIA*

**Live Plan Be**

The most significant development in 2015-16 was the launch of ***LivePlanBe*** – an online tool:

Description

1. Free, practical, online self-management tool for people living with chronic pain
2. Accessible to anyone with an Internet connection: www.liveplanbe.ca
3. Created by Pain BC in partnership with people with chronic pain and leading health care providers.
4. Funded by the Ministry of Health
5. It is based on the best evidence about how people learn; how people adapt to living with pain; and how people can live well, despite pain.

**Live Plan Be** fulfills Pain BC's 2011 Pain Summit goal to better support self-management. It helps build the skills, knowledge and confidence people in pain need to successfully practice self-management.

Features:

- **Pain Education:** Evidence-based information ranging from pain science, mental health, anger, sleep, medications, breathing techniques, etc.
- **Self-assessments:** Interactive assessments used to track function, symptoms, medications over time. Compare up to four assessments. Share with healthcare providers.
- **Action Planning:** Using Brief Action Planning Framework, patients set meaningful, realistic goals, moving them towards better pain management, function and quality of life.
- **Peer support:** Moderated, private forum lets people share stories, strategies and questions to gain knowledge, increase confidence and develop positive coping skills

Usage stats:

Since we launched April 1, the following have been completed:

- 413 accounts
- 194 goals
- 305 self-assessments
- 266 check-ins

Live Plan Be training presentations to healthcare providers

- delivered in 6 clinics/sites across Vancouver Island and Lower Mainland, plus 4 PSP (Practice Support Program for GPs) presentations (Lower Mainland and Kootenay-Boundary).
- 9 more presentations scheduled for Aug-Oct covering Lower Mainland and Sunshine Coast.

Training for patients

- We are producing short “how to” videos showing how to create an account, do a self-assessment, use the action planning tool, and post on the forum. These will be available on the home page of the site by the end of July.
- Videos and additional training via webinars will be used to support PIPN (People in Pain Network support groups) leaders and Self-Management BC facilitators to train their participants.

## *Hospitals and Health Centres*

## *CLINICAL OVERVIEW*

Department Statistics

Full-time faculty - 20
Clinical Faculty - 336
Fellows - 10
Residents - 59
Medical Students - 293
Number of ORs - 210

## Vancouver General and UBC Hospital

In 2015, members of the Department of Anesthesiology and Perioperative Care were engaged in clinical interactive teaching and mentorship of medical students, residents and fellows. Members of the department continue to develop their clinical and academic capability, with lenses on perioperative care, quality improvement, safety, as well as tertiary and quaternary referral and community levels of care in subspecialized areas including neuroanesthesia, trauma, solid organ transplantation, cardiac and thoracic anesthesia, spinal injury and reconstruction, vascular anesthesia, complex and hepatobiliary general surgery, and ambulatory anesthesia. With the aforementioned clinical substrate, the department's 62 committed anesthesiologists continue to provide outstanding learning opportunities, with a focus on quality, and dedication to teaching and research.

The introduction of dedicated perioperative anesthesiologists has enhanced the quality and efficiency of patient care in managing complex and critical postoperative patients, as well as timely preoperative assessment, stabilization and resuscitation of perioperative patients. Enhanced exposure of trainees, in particular to consultations, investigations and optimization of complex preoperative patients has been achieved, allowing for improved teaching on the care of patients in these environments. Medical students, residents and fellows were immersed in the full spectrum of perioperative care including pre-, intra-, and postoperative care such as preoperative consultation, resuscitation and optimization, perioperative pain management, cardiac intensive care, and intensive and pathway PACU care.

## ST. PAUL'S HOSPITAL

St. Paul's is a Clinical Medical Academic Centre in downtown Vancouver that is integral to the University of British Columbia Faculty of Medicine. It is part of Providence Health, which comprises St. Paul's Hospital, Mt. St. Joseph's Hospital, and a number of residential facilities. The main foci of tertiary care is in Cardiac Sciences, Respiratory, HIV, and Renal disease.

Anesthesiology at St. Paul's Hospital is a major Department comprising 40 anesthesiologists. The Department also delivers anesthetic services at Mt. St. Joseph's hospital (a community hospital) where 4 Operating Rooms and 3 Ophthalmology Procedure Rooms are in operation. The Department supports a Trans-esophageal Echo Program as well as various initiatives in interventional cardiology and radiology. At present 2 anesthesiologists have sub-specialty training in Intensive Care as the Department continues to evolve care in the Cardiac Surgery Intensive Care Unit, and increase connections with ICU. Recruitment has resulted in two anesthesiologists with fellowships in regional anesthesia advancing the regional anesthesia program.

## BRITISH COLUMBIA CHILDREN'S HOSPITAL

The Department of Pediatric Anesthesia experienced mixed results in meeting its strategic priorities in 2015. These priorities included establishing a sustainable model for complex pain care, establishing an anesthesia assistant supervisor position, defining and evolving the role of the anesthesiologist in charge with an overall goal of establishing anesthesia oversight of anesthesia operations and ensuring anesthesia participation in procedural care operations at BCCH, streamlining pre-anesthesia clinic appointment booking and screening, recruitment of a new Director of Research, improving post-operative patient follow-up and meeting our mandate for Provincial Outreach for pediatric anesthesia.

In 2015 the department of pediatric anesthesia promoted and participated in multidisciplinary planning around the delivery of complex pain care to children in British Columbia. Participants included the Department of Pediatrics and Child Health BC. Discussions lead to a plan to development a comprehensive and collaborative proposal. This work is ongoing. The department explored ways in which to facilitate oversight of anesthesia operations at BCCH with particular attention to the anesthesiologist in charge role. Oversight and coordination of anesthesia operations will become particularly important in our new facility.

Our pre-anesthesia clinic continued to be challenged by limitations of space. A program of screening all clinic referrals for families which could either bypass the clinic, or have their clinic appointment replaced by a phone call from the PAC anesthesiologist has been established. A pilot project of screening all dental patients for cases that would benefit from a pre-anesthesia clinic visit or phone call has not yet been expanded to other services.

## BRITISH COLUMBIA WOMEN'S HOSPITAL & HEALTH CENTRE

PHSA's strategic plan based to guide the actions of all PHSA's agencies is founded on shared values and includes three strategic priorities. These priorities are Quality Outcomes and Better Value for Patients, promoting healthier populations and contributing to a sustainable health care system. In 2014/2015 BC women's continues to focus on aligning these priorities with the priorities set out by the Ministry of health by the BC health system in the 2014/15 Service Plan.

**New Initiatives**

C&W Site Redevelopment is well underway constructing a new acute care building. The majority of the new building function will be for the Children's Hospital. BC Women's will be getting new LDR/obstetrical OR space within the new acute care building as well as the new and very large NICU. The Demolition of the old Shaughnessy L Wing has been completed and the new Acute Care Centre is scheduled to be complete in 2017.

The department of Anesthesia at BCWH has purchased new epidural infusion pumps that allow for automated intermittent boluses and patient controlled epidural anesthesia. The new mode of epidural maintenance will be implemented in June 2015 and will soon replace continuous

epidural infusions. An audit will be conducted pre and post implementation to assess changes in patient satisfaction, analgesia, mobility and secondary outcomes such as instrumental delivery. This is a significant change in practice at BCWH.

**Staffing/Recruitment -** Dr David Lea and Dr. Simon Massey are now co-acting heads of BCWH Anesthesia.

## ROYAL COLUMBIAN & EAGLE RIDGE HOSPITALS

***Royal Columbian Hospital***

As the tertiary care centre for the entire Fraser Health Authority, which serves over one-third of the population of BC, the Royal Columbian Hospital provides a wide spectrum of surgical services. In fact, the range of surgical services provided at RCH is unmatched by any other site in British Columbia. RCH is the highest volume cardiac center in BC and also sees the most high-level trauma--it is by far the busiest trauma neurosurgery center in BC and is one of the top three centers in Canada for trauma orthopedics. Year after year RCH continues to have one of the highest risk-adjusted performing NICU; it is the one of the few centers in BC that can handle high-risk OB cases that require ICU and/or cardiac care. Interestingly, over 60% of the cases performed at RCH are classified as urgent/emergent. Over the last decade, NSQIP data has consistently ranked RCH surgical patients as having the highest acuity amongst the hundreds of North American hospitals participating in the study; at the same time, RCH has managed to have exemplary results.

***Eagle Ridge Hospital***

The six operating rooms at ERH provide space for nearly 10000 surgical cases a year, the majority of which are Surgical Day Care cases. Most of the pediatric cases done by the Department are performed at ERH.

**VANCOUVER ISLAND HEALTH AUTHORITY**
**Sites:**
**Victoria General Hospital, Cowichan District Hospital**
**Royal Jubilee Hospital, Westcoast General Hospital**
**Saanich Peninsula Hospital, Nanaimo Regional Hospital**
**St Joseph's General Hospital, Campbell River Hospital**

The department successfully filled positions that were vacant and staffing levels have improved resulting in improved coverage of OR slates. Increased staffing levels have allowed the department to create more job share situations thus creating more flexibility in staffing at RJH and VGH.

The South Island (Royal Jubilee and Victoria General Hospital) Dept. of Anesthesia started an out of OR anesthesia position at RJH to manage pain patients, consults, support the OR and cover problems in PACU. To date the position has been well received by hospital staff and the days are very busy.

In 2016, Island Health will partner with a private surgical center to run 2 slates daily to address the increasing surgical wait lists in the South Island. As well, this will increase access for patients requiring in-patient care at RJH and VGH. Island Health has increased surgical ward capacity in preparation for more inpatient cases.

Island Health has embarked on an ambitious project to implement an island wide electronic health record (EHR) starting in Nanaimo.

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**University Hospital of Northern BC**
**(Prince George Regional General Hospital)**

The University Hospital of Northern BC is a 220 bed acute care facility and is the regional referral centre for Northern BC. Last year we performed approximately 8000 surgical procedures. The surgical specialties consist of general, vascular, obstetrics and gynaecology, orthopaedics, urology, plastics, otolaryngology, maxillo-facial, dental and ophthalmology. The Department of Anesthesia at UHNBC consists of 12 specialist anesthetists. Two share their time between anesthesia and critical care and one exclusively does chronic pain.

An anesthetic pre-assessment clinic is held twice a week, staffed by department members in rotation. Northern Health covers a large geographical area and, as the regional centre for the north we have patients travelling large distances to us.

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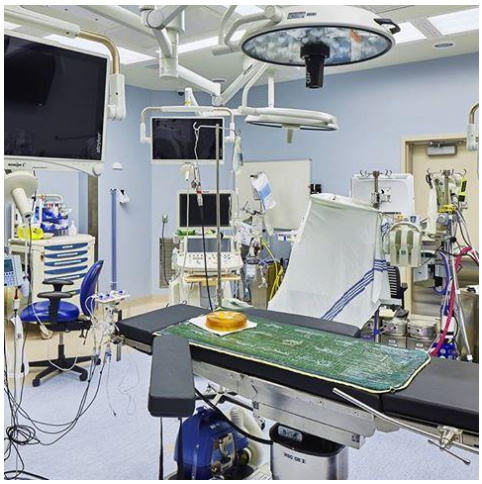
**KELOWNA GENERAL HOSPITAL**
**VERNON JUBILEE HOSPITAL**

***INTERIOR HEART & SURGICAL CENTRE* AT KELOWNA GENERAL HOSPITAL OPENED ITS DOORS TO PATIENTS ON SEPTEMBER 28, 2015**

The $381 million Interior Heart and Surgical Centre (IHSC) Project is an important part of building patient care in the Interior – including new patient care towers at Kelowna General Hospital and Vernon Jubilee Hospital and the development of UBC's Southern Medical Program

The new operating rooms are larger than the old ones, with most of the equipment hang from robotic arms, freeing up floor space.

The Hybrid OR, which opened in October 2015, will allow for diagnostic imaging during surgery, with 3-D images accessed in real time.3



The IHSC's state of the art surgical unit, combined with the cardiac revascularization program, will save lives by providing timely, life-saving therapies and surgeries to residents of the Southern Interior who previously would have had to be transported to the coast.

*Article in Global News aired on Sept. 28, 2015*

# Pharmacology and Therapeutics

## *PHARMACOLOGY*

***Dr. Catherine Pang BSc PhD***
***Associate Head***

As part of the Department of Anesthesiology, Pharmacology & Therapeutics (APT), we are committed to excellence in Pharmacology and Anesthesiology education and research through creativity and dedication. Our present research strength is in areas of neural, cardiovascular, respiratory, ion channels, and clinical pharmacology as well as drug development. We have strong collaborations within the Department in Anesthesiology, Pharmacology and the Therapeutics Initiative as well as outside of the Department.

In addition to research efforts, we have maintained our excellence in teaching at the undergraduate, graduate and postgraduate levels in both pharmacology and therapeutics. The department has been offering degree programs in undergraduate and graduate pharmacology. The PCTH 514 seminar series, led by Bernie MacLeod, continue to provide opportunities for our students to share their research interests and accomplishments; and the Department Seminar Series, organized by Harley Kurata, continue to provide an opportunity for faculty and students to be exposed to other related research areas from within and outside the university.

**Faculty**

Dr. Harley Kurata resigned from his position as Associate Professor effective July 2015, and was appointed as Affiliate Associate Professor in the Department to allow him to continue supervising graduate students and research collaborations with members of APT.

Dr. Mahyar Etminan, Assistant Professor, Department of Pediatrics, Division of Translational Therapeutics, was appointed as an Associate Member of the Department. He has been teaching PCTH 400 for many years as well as serving on our graduate student committee. He currently has an academic appointment with the Department of Ophthalmology.

Dr. Jessica Kalra, Staff Scientist (Department of Experimental Therapeutics, BC Cancer Research Center) and Instructor (Department of Biology and Health Sciences, Langara College) was appointed as Adjunct Professor for a 3-year term. She supervised the research of one of our Honors B.Sc. students and is interested in giving lectures in pharmacogenetics.

Dr. Samuel Goodchild was appointed as Adjunct Professor. He was a post-doctoral fellow of Dr. David Fedida, and is currently a Research Scientist at Xenon Pharmaceuticals Ltd. He previously taught PCTH 404/PHYL 526 and mentored both PhD and undergraduate students in our Department. He is interested in teaching in both our undergraduate and graduate programs and research collaborations with our Departmental members.

Dr. Andrew Peter Hegle was appointed as Adjunct Professor. He is the Co-founder of Canalytic Laboratories and a previous Postdoctoral fellow of Dr. Eric Accili in the Department of Cellular & Physiological Sciences. He received PhD in Molecular, Cellular & Developmental Biology in the University of Michigan, where his research focused on the oncogenic properties of the EAG potassium channel. He is presently working with Dr. Ricardo Riveria on the safety pharmacology of natural health products in Canada, and will be involved in teaching our undergraduate and graduate students.

**Medical Undergraduate Teaching (2015-16)**

The past year has been a busy and exciting time for pharmacology education as intense planning and preparation led to the successful launch of the renewed undergraduate medical program in August 2015. Pharmacology is designated as a 'Pharmacotherapy Theme' in the renewed curriculum, and is represented by departmental Theme Co-Leads Drs. Stan Bardal and Jennifer Shabbits.

Pharmacology-driven educational activities and assessable learning objectives were incorporated into nearly every week of the finalized year 1 schedule. It will be similarly represented in the year 2 syllabus, which is still in development. We have contributed pharmacology content to several new Case Based Learning (CBL) cases, and are working collaboratively to include pharmacology in multi-disciplinary clinical reasoning sessions. We have secured a pharmacology-focussed week in the second term of year 1 and a new CBL case on Adverse Drug Reactions has recently been written for that week.

The clinical experiences in years 3 and 4 continue to focus on clinical rotations where pharmacology teaching is integrated into the clinical setting. Pharmacology is included in some academic half-day teaching, as well as the Preparation for Medical Practice (PMP) course, which includes ~15 hours of pharmacology instruction in areas such as medication reconciliation, psychopharmacology, prescription writing and adverse drug reactions.

While the renewed curriculum provides many opportunities for pharmacology education, it is not without its challenges. Securing limited and highly sought-after curricular time is the most significant and ongoing challenge in years 1 and 2. However, persistence and a willingness to collaborate with other theme groups (patient safety, evidence based medicine, addictions, palliative care, etc.) has allowed for pharmacology content to be integrated into numerous teaching and learning activities. This raises the need for greater involvement of department members to deliver these sessions. Once the years 1 and 2 course syllabi are finalized there will be a concerted effort to allocate teaching sessions to appropriate faculty members.

The next phase of curriculum development will be the integration of the 'themes' into the renewed year 3 and 4 experiences. The input and expertise of our clinical faculty will be critical for ensuring that the time allocated to the Pharmacotherapy theme is used in the most effective way.

**Graduate Program (2015-16)**

We have a total of 28 graduate students in the department (20 PhD and 8 MSc). In 2015-16, 5 new students joined (3 MSc and 2 PhD), and 3 students graduated with a degree (2 MSc and 1 PhD). Graduate students have 29 publications. A total of 13 scholarship awards (1 CIHR-PhD, 2-CIHR-MSc, 1 CIHR-MD/PhD, 1 Brain Canada Mental Health Training award, 5 4-YF, 3 Saudi Arabia

Govt. scholarships) are received and 10 GSI awards given. Our students attended 23 conferences and received 6 conference travel awards to present their work while 10 were recognized with awards. One PhD who graduated in 2015, is working as a post-doctoral fellow in Australia and one MSc graduate is in the UBC medical school. Overall, the number of graduate students is similar to that in last year. The number of publications and conference awards, however, significantly increased in 2015-16.

**Vancouver Summer Program**

The Vancouver Summer Program (VSP) is a campus-wide outreach that allows students from top tier universities in Southeast Asia to study at UBC for four weeks during the summer. Pharmacology offered one of seven two-course packages - "Pharmacology of Everyday Life" and "Systems pharmacology" – consisting of 81 hours of lectures, small-group workshops and tutorial sessions. In total, 19 students enrolled in our program from universities in China, Hong Kong and Taiwan. Student enrollment in the pharmacology summer program decreased in 2015 relative to 2014 due to increased offerings of packages from the Faculty of Medicine (from 1 in 2014 to 7 in 2015).

Dr. Andrew Horne, our VSP Director, coordinated and oversaw both pharmacology courses. Classes were taught by a mix of faculty members and graduate students (see list below). All graduate students were invited to participate, and those who volunteered were individually trained by Dr. Andrew Horne prior to teaching. There has been positive feedbacks from participants of both programs.

Victoria Baronas
Jason Cui
Tim Fung
Dr. Saeid Golbidi
Pouria Jalily Hasani
Dr. Andrew Horne
Dr. Cleo Leung
Dr. Joanne Leung
Dr. Catherine Pang
Dr. Ricardo Rivera
Dr. Jennifer Shabbits
Alice Wang
Dr. Roger Wong

**Undergraduate Pharmacology**

For 2015-16, 23 students were admitted into the 3rd year BSc Pharmacology program. The academic standings of the students remain strong, with 15 Sciences Scholars (with >90% academic standing in year 2) and the remaining 8 with >85% average. There were 18 students enrolled in the 4th year BSc Pharmacology program, and 20 students registered in PCTH 400.

The following are elective pharmacology courses offered to students from other programs:

PCTH 201: 56 students from the Faculty of Science and Faculty of Arts have registered.

PCTH 305 (taught concurrently with PCTH 300): 10 science students have registered.

PCTH 325: 177 science undergraduate students and graduate students have registered.

In 2014-5, one B.Sc. Pharmacology student and in 2015-6 two BSc Pharmacology students were awarded a Wesbrook Scholarship (see list below). Each year, a total of 20 Westbrook scholarships are awarded to senior UBC undergraduate students from various faculties with outstanding academic performance, leadership, and involvement in student and community activities.

**Tony Zheng Yu Zhao** (3rd year class) was selected as a winner of the Premier Undergraduate and Wesbrook Scholar Award in 2014-5.

**Farnaz Javadian** (3rd year class) was awarded both the Wesbrook and HSBC Emerging Leader Scholarship in 2015-6.

**Cody Lo** (4th year class) was awarded the Wesbrook Scholar Award and Carl Bradford Robertson Premier scholarship in 2015-6.

Stephanie Sellers in PhD program and Emmanuel Osei,in dual PhD program
taken during the Annual Research Day

# *THERAPEUTICS INITIATIVE*

**Dr. James Wright MD PhD FRCPC**
**Co-Managing Director**

**Dr. Ken Bassett, MD MA PhD**
**Co-Managing Director**

The Therapeutics Initiative (TI) was established in 1994 by the Department of Pharmacology and Therapeutics in cooperation with the Department of Family Practice at The University of British Columbia with its mission to provide physicians and pharmacists with up-to-date, evidence-based, practical information on prescription drug therapy. To reduce bias as much as possible, the TI is an independent organization, separate from government, pharmaceutical industry and other vested interest groups. We strongly believe in the need for independent assessments of evidence on drug therapy to balance the drug industry sponsored information sources.

Over the years the TI has substantially enhanced its ability to assess the clinical evidence presented in published articles, meta-analyses by the Cochrane Collaboration and scientific material presented by the pharmaceutical industry. In pace with the extensive assessment of clinical evidence, the TI has developed effective ways of knowledge translation and dissemination of this evidence to all active players involved in drug therapy: physicians, pharmacists, nurses and policy-makers (Ministry of Health) and is committed to analyzing its own impact.

# EDUCATION

## *POST-GRADUATE MEDICAL EDUCATION PROGRAM*
## *ANESTHESIA RESIDENCY*

**Matthew Klas MD FRCPC**
**Program Director**
**(see further details in Appendices)**

## *POST-GRADUATE MEDICAL EDUCATION PROGRAM*
## *FAMILY PRACTICE ANESTHESIA*

**James Kim MD FRCPC**
**Program Director**

2015 was a very busy year for the UBC FPA program. June saw the successful graduation of Dr. Kevin Woodstra, who returned to Smithers, BC. Dr. Derek Sargent entered the program in July. Through the continued support of REAP, the residents attended an innovative conference/simulation training in Ontario at the Northern Ontario Medical School Department of Anesthesia. This FPA 'Bootcamp' is a week in duration and comprised many hours of simulation sessions and lectures. It is anticipated that all new residents will participate in this program. In November, the UBC FPA Refresher Course was a huge success with over 65 attendees and a dozen staff presenters/workshop leaders. This course will become an annual event which will hopefully grow beyond BC attendees.

A large portion of administrative time was devoted to the interim program review which was successfully completed in the fall. The program received full accreditation and will be up for review in another 4 years time.

The UBC FPA Residency Training Committee:
Dr. Jim Kim, Program Director
Dr. John Veall (LGH)
Dr. Ron Ree (SPH)
Dr. Mitch Giffin (VGH)
Dr. Mike Traynor (BCCH)
Dr. Mike Wong (BCWH)
Dr. Kathleen Dalinghaus (Whitehorse)
Dr. Travis Flath (Whitehorse, CCFP)

## *MEDICAL UNDERGRADUATE PROGRAM*

**Oliver Applegarth BSc MD MEd FRCPC**
**Program Director**

This will be my last report as I step down from the directorship in June 2016. Dr. Brad Merriman will take over as the new Program Director.

It takes a lot of commitment on the part of British Columbia's anesthesiologists to ensure that all our medical students receive the high caliber of training that they do. The medical school is large, and distributed province-wide. There is the "classic" mode of delivery, and the longitudinal mode. Even with these potential challenges, feedback from students remains strong and the curriculum is well appreciated. Thanks to everyone for their ongoing dedication. In the first two years of the medical school we continue to have committed practitioners who dedicate a lot of their time to PBL. Once again, we receive very strong feedback due to these individuals. The students truly appreciate PBL teaching that comes from experienced clinicians who can inject practicality to the discussions.

The main challenge within the whole medical school over the last two years has been the move to "curriculum renewal". This represents the biggest shift in medical education at UBC since the introduction of problem-based learning in 1997. The basis for curriculum renewal is easy enough to attempt to digest. It is a move away from isolated learning and a dis-connected curriculum. It is a move towards learning in groups (academic learning communities), longitudinal knowledge acquisition, the use of a spiral curriculum (re-exploring concepts over and over as knowledge/experience increases) and evaluation based on exit-competencies (what students can do, on top of what they know). If my description of curriculum renewal leaves you wondering how it can be implemented in real terms, with limited resources, you are not alone. It is still not clear what the curriculum will look like "in the trenches", and this has lead to the delay of the rollout while kinks are being sorted out. 2015 mark the start of the third and fourth year program that will be affected in 2017. We are committed to quality anesthesia education for our students and will continue to advocate for that no matter what curriculum renewal asks of us.

The fourth year program remains solid due to the fine efforts of Dr. James Price. Special accolades must go to both Dr. Price (for delivering a wonderful and effective lecture/mock-code) and Dr. Peter Choi (for lectures in epidemiology) to the fourth year students during this year's preparation for Medical Practice course.

Capacity in the 4$^{th}$ year system is always a problem, but those students that we do see get a wonderful experience and emerge with a strong foundation in our specialty. We have been very fortunate over the years to welcome many of these strong students into our residency program. This speaks well for the future of our specialty, which is one of the key reasons that we must continue to advocate for the strong undergraduate program we are all building.

## *CONTINUING PROFESSIONAL DEVELOPMENT & VISITING PROFESSOR PROGRAM*

**Dr. Stephan Malherbe, MBChB, FCA(SA), FRCPC**
**Program Director**

CPD within the Department of Anesthesiology Pharmacology and Therapeutics includes our Visiting Professor Program and the Whistler Anesthesiology Summit (WAS). The Okanagan Anesthesiology Conference and Pediatric Anesthesia/GPA conference are also opportunities for CPD within the department and will be described elsewhere.

Dr. Jean Templeton Hugill Memorial Lecture

The next Dr. Jean Templeton Hugill Visiting Professor Lecture is scheduled on April 27, 2016
Dr. James C. Eisenach has been invited speaker.

Visiting Professor Program

The goal of the Visiting Professor program is to provide anesthesiologists from around the province stimulating and thought provoking speakers throughout the academic year. Each regional hospital (Vancouver General Hospital, St. Paul's Hospital, Royal Columbian Hospital, BC Children's Hospital, BC Women's Hospital) selects a speaker which best reflects that hospital's interests at that particular time.

Our visiting professor committee consist of: Dr(s). Stephan Malherbe (BCCH), Alyssa Hodgson (RCH), Giselle Villar (BCWH), Cynthia Yarnold (SPH) and Stuart Herd (VGH).

Our speakers this academic year included:

Dr. Janice Chisholm, Dalhousie University
Dr. Robert Arntfield, Western University
Dr Lisa Leffert, Harvard University
Dr. Kirk Lalwani, Oregon Health and Science University

We continue to video-conference the visiting professor lecture series with multiple sites now having access to our speakers in real time. Sites involved via video-conference link include Lions Gate, Nanaimo, Port Alberni, Prince George, Nanaimo, Vernon and Victoria. Feedback from the program has been very positive. Our video library of speakers continues to grow and is available on our website below.

http://apt.med.ubc.ca/anesthesiology/video-lectures/

The UBC department website is linked to the Canadian Anesthesiology Society Continuing Professional Development website so that interested anesthesiologists can access our departmental website and visiting professor videos.

We also thank Winnie Yung for her ongoing work and assistance in organizing the program.

Whistler Anesthesiology Summit (WAS)

The WAS held its fifth annual conference in Whistler on February 26 - March 1, 2015. The conference host hotel will be the Westin Whistler Resort. A variety of local and international speakers will be in attendance. Our out of town guest speakers this year include: Dr(s) Michael Mythien, Robert Stoelting, Robert Chen, Michael Murphy, Duminda Wijeysundera and Andre Denault. This year we are offering a hands-on airway and pulmonary/cardiac ultrasound workshop for attendees.

UBC CPD

The CPD Advisory Committee meets 2-3 times/ year. Dr. Brenna Lynn oversees CPD, as the associate dean of Continuing Professional Development.

Department members can view the CPD website http://www.cpd.med.ubc.ca for information about upcoming UBC sponsored conferences and CPD events for several medical specialties throughout the province.

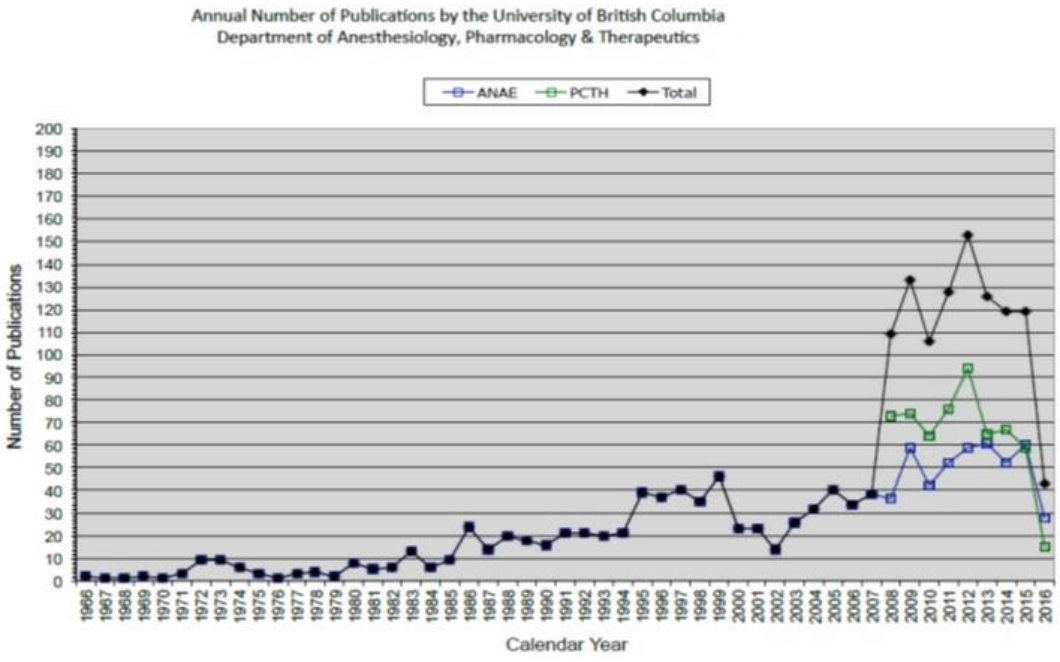
# RESEARCH

Research programs in our department focus on the physiology and pharmacology of the cardiovascular, respiratory, and central nervous systems; outcomes research in cardiothoracic anesthesia, critical care, neuroanesthesia, obstetric anesthesia, pediatric anesthesia, perioperative medicine, and regional anesthesia; patient safety and quality improvement; clinical monitoring; medical education and simulation; and therapeutics, evidence-based prescribing practice, and pharmacoepidemiology. With the strengths of three related but different sections in our department, our diversity enables us to build partnerships between the sections, which allow us to pursue investigations from the bench to the bedside to the population. Furthermore, our department has a long-standing tradition of collaboration with other groups within the UBC Faculty of Medicine (Critical Care, Neurology, Population and Public Health, Psychiatry) and other UBC faculties (Electrical and Computer Engineering). As you glance at our publications, you will see that research in the Department of Anesthesiology, Pharmacology, and Therapeutics is more than just drugs and putting people to sleep!

Peter Choi
Clinical Research Director (Anesthesiology)

**Peer Reviewed Publication Summary:**

1. Journals Articles refereed: 99
2. Journal Articles non-refereed: 1
3. Books: 1
4. Book chapters: 5
5. Editorials: 3
6. Commentaries and letters: 15



# ***GLOBAL OUTREACH***

Many department members are engaged global outreach activities. Specific missions in 2014 were:

1. India – Kaka-ba Hospital
2. Uganda – Makerere University/Mulago Hospital
3. Guatemala - Health for Humanity Surgical Mission

Thanks to all faculty, clinical fellows and residents who organized and participated in such important outreach activities.

**India – Kaka-Ba Hospital in Gujarat, India**
Dr. Carolyne Montgomery on a project with Operation Rainbow Canada. She was joined by BCCH clinical fellows, Dr. Liz Allison and Dr. Gayatri Gopalakrishnan

**UGANDA**
**Makerere University/Mulago Hospital**

Dr. Eleanor Reimer using the Phone Oximeter on a patient

Dr. Eleanor Reimer and BCCH Clinical Fellow Dr. Lindsay Rawlings in the operating room at Mulago Hospital

Makerere University Anesthesia Residents and medical students working with international volunteers

**Drs. Bob Purdy & Jim Prentice with Volunteer Teams in Guatemala – Health for Humanity Surgical Mission**

# APPENDICES

**ACADEMIC STAFF LISTING**
**(JANUARY – DECEMBER 2015)**

**Vancouver-Fraser Medical Program**

**BC CHILDREN'S HOSPITAL**
**Norbert Froese (Head)**
ANSERMINO, Mark
BAILEY, Katherine
BARKER, Michael
BROEMLING, Natasha
BROWN, Zoe
CASSIDY, Myles
CHEN, James
CHIN, Christopher
CSANYI-FRITZ, Yvonne
GORESKY, Gerald
KAHWAJI, Raymond
LAUDER, Gillian
LEE, Richard
MALHERBE, Stephan
MONTGOMERY, Carolyne
MORRISON, Andrew
PURDY, Bob
REICHERT, Clayton
REIMER, Eleanor
SCHEEPERS, Louis
TRAYNOR, Mike
WHYTE, Simon

**BC WOMEN'S HOSPITAL**
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BRIGHT, Susan
BROWN, James
CHOW, Frances
GUNKA, Vit
KILPATRICK, Nevin
KLIFFER, Paul
KRONITZ, Naomi
MASSEY, Simon
MONEY, Phyllis
PRESTON, Roanne
SAHOTA, Paul
VILLAR, Giselle
WONG, Michael

**ST. PAUL'S HOSPITAL**
**MOORE, Randy (Head)**
ABBOTT, Bill
BACH, Paul
BELL, Scott
BEREZOWSKYJ, Jennifer (DSSL)
BOSMA, T. Laine
BOWERING, John
COLE, Colm
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DEL VICARIO, Joe
DOYLE, Aeron
DUMITRU, Ioana
ELLIOTT, Mark (MSJ)
HEAD, Stephen
HELLIWELL, James
KLAS, Matt
KLIMEK, Alex
LEE, Bobby
MCDONALD, Ken
McDONALD, William
MONTEMURRO, Trina
OSBORN, Jill
PETRAR, Steven
PHILLIPS, William
PRABHAKAR, Christopher
PRASLOSKI, Bruce
PRENTICE, Jim
REE, Ron
RUPESINGHE, Lalitha
SCHWARZ, Stephan
SETTON, Debbie
SIROUNIS, Demetrios
WARRINER, Brian
WONG, Clinton
WOODHOUSE, Dorothy
YARNOLD, Cynthia

**RICHMOND GENERAL HOSPITAL**
TANG, Samuel (Head)
DONG, Glenn
DRAPER, Paul
HUBER, Chris
LEE, Laurence (on leave)
LIM, Hooi Ben
LISTER, David
NAVSARIKAR, Anup
VAN WEST, Cornel

**LIONS GATE HOSPITAL**

**McCARTER, BRYON (Head)**

AHMADI, Hazhir
CHATTERSON, Kelly
FINGLAND, Robert
HEWGILL, Randy (DSSL)
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McALPINE, John
McDIARMID, Adam Pope
MORRISON, Clare
PANTEL, Richard
RIPLEY, Teresa
ROOS, Martin
SENFT, Riley
THOBANI, Shafik
VRANA, Andrea
VEALL, John (DSSL)
VRANA, Andrea

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ATHERSTONE, Juliet
AU, Calvin
BITTER-SUERMANN, Bjorn
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CHOI, Peter
DHALIWAL, Baljinder
DOLMAN, John
DURKIN, Chris
FLEXMAN, Alana
FINLAYSON, Gordon
FITZMAURICE, Brett
FROEHLICH, Kevin
GIFFIN, Mitch
GRANT, Raymer
GRIESDALE, Donald E.G.
HARPER, Jon
HECHT, Patrick
HENDERSON, Cyndi
HERD, Stuart
HUGHES, Bevan
HUTTUNEN, Henrik
ISAC, George
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McEWEN, Jonathan
McGINN, Peter
McLEAN, Sean
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MOULT, Michael
NEGRAEFF, Michael
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PENG, Yvonne
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RANDALL, Tom
RIES, Craig
SAWKA, Andrew
SCHISLER, Travis
SUNG, Henry
SWART, Pieter
TANG, Raymond
TRUDEAU, Jacqueline
THÖLIN, Mats
VAGHADIA, Himat
WALKER, Jamie
WATERS, Terry
WEIDEMAN, Theo
WILSON, Jason
YU, Patrick

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**EAGLE RIDGE HOSPITAL**
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THORNELOE, Barry
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TWEEDLE, Shelley
VONGUYEN, Lan
WARNICK, Brady

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FRIESEN, Marvin
GRACIAS, Gavin
LAU, Bertrand
LAU, Jeffrey
RUNZER, Timothy
YU, Andrew

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DANELICE, Michele
DANDINA, Sujinth
DICKSON, Timothy
FINDLAY-SHIRRAS, Nigel
GAJECKI, Peter
IYER, Mahalaxmi
JOINER, Ross
KARWA, Laila
KELLY, Pat
KETABI, Salma
KINDOPP, Shawn
LING, Rassamee
LAU, Brenda
MacINNES, Aaron
McNEELY, David
MODI, Eesh
NAYA, Neil
TWIST, David
VESELY, Alexander (DSSL)

**DELTA HOSPITAL**
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JONES, Dean

**LANGLEY MEMORIAL HOSPITAL**
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WU, Stephen C K

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BREDEN, Michael
SULEMAN, Arif

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LAVIN, Patrick
LOKE, Julian
PALMER, Christopher

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RIENDL, John
SELTENRICH, Michael
VAN OOSTROM, Trevor
WONG, Karen

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COOK, Andrew
Holmes, Stuart

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**ROYAL JUBILEE HOSPITAL**
**SAANICH PENINSULA HOSPITAL**

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AVENANT, Christiaan
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CATON, Brent
CHAN, Peter (Gus)
CHANA, Karam Singh
COURTICE, Ian
DALLEN, Larry
DAVIS, William
DUNCAN, Peter
EFFA, Evan
ENRIGHT, Angela
FENJE, Nicholas
FERREIRA, Susan
GARDINER, Richard
HERRMANN, Trevor (DSSL)
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KAZEMI, Pooya
KINAHAN, Mike
KING, Wei-Shuen
LEACOCK, Susan
LEE, Logan
LOUGHEED, Sean
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MURPHY, Terence (Chief)
MURRAY, Maureen (Chief)
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PATTEE, Carol
PETTAPIECE, Kenneth
POPOVA, Kalina
PORAYKO, Lorne
QUON, Leo
RELF, Tim
ROBERTSON, William
SAMPSON, Jeffrey
SEROWKA, Paul
SHAW, Lorne
STEVENSON, Kim
SVORKDAL, Nelson
SYLWESTROWICZ, Anna
TAGGESELL, Richard
TOWNSEND, Gary
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VINCENT, Daniel
VUKSIC, Stanko
WATERS, Sara
WEBSTER, Anne
WOLLACH, Jeffrey
WOOD, Gordon
ZOLPYS, Lauren

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DHADLY, Pal
DAVOUDIAN, Pejman
GEORGYEV, Petar
MEHMOOD, Shehzad
RICHARDSON, Marshall

**TERRACE/MILLS MEMORIAL HOSPITAL**
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Gunter, Heinz
HADID, David
KOWE, Olajide

**SOUTHERN MEDICAL PROGRAM**

**KELOWNA GENERAL HOSPITAL-**
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BECK, Vance
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DE SOUZA, Gregory
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**VERNON JUBILEE HOSPITAL**
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EICH, Eric
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TSANG, John
Intensive Care Unit
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DONEN, Neil
STEWARD, David
PACEY, John

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Whitehorse

GODLEY, Mark Brian
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RENWICK, Jamie
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*Clinical Professor*
CA Stephenson MD FRCPC
*Clinical Associate Professor*
MC Sutter BSc MD PhD
*Professor Emeritus*
JE Swenerton MD FRCPC
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KW Turnbull BASc MD FRCPC
*Clinical Professor*
C van Breemen DVM PhD
*Professor*
RA Wall AB PhD
*Associate Professor*

MJA Walker BSc PhD
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DHW Wong MB BS FRCPC
*Clinical Professor*

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CCY Pang BSc PhD
*Professor and Associate Head*
AM Barr BA PhD
*Associate Professor*
PN Bernatchez BSc MSc PhD
*Associate Professor*
SSR Bhagavatula MSc PhD
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SL Borgland BSc MSc PhD
*Adjunct Professor*
CR Dormuth MA SM ScD
*Assistant Professor*
D Fedida PhD MB ChB
*Professor*
A Horne PhD
*Instructor*
D Knight, PhD
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H Kurata BS MSc PhD
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I Laher BSc MSc PhD
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ANESTHESIOLOGY

# *ANESTHESIOLOGY SITE CHIEF REPORTS*

**VANCOUVER ACUTE (VGH AND UBCH)**

**Hamed Umedaly MD FRCPC**
**Head – Department of Anesthesiology and Perioperative Care**

In 2013 the department initiated and invested in a 5 year (2013-2018) strategic planning mission to further develop our vision and strategic priorities with the support of an organizational psychologist Dr Jennifer Newman. The rich input from the department continued in 2015, and has provided the executive with focus areas to further and sustainably develop the departments clinical, academic, and leadership missions.

In 2016 the department is planning to institute a Perioperative Anesthesia Intervention Service (PAIS) to enhance the utilization of plexus and neuraxial regional anesthesia, as well as the placement of invasive vascular access in the PACU with full Anesthesia Assistant and RN support and monitoring capability. This parallel processing will further enhance teaching opportunities and efficiency. The department is also reaching out to areas outside of the operating rooms where procedural sedation occurs, in order to improve care and rescue capability through education and team-building simulations.

Academic activity has been well resourced, and the strong commitment of the newly formed academic group has culminated in a highly productive publication output of superb quality, consisting of both peer reviewed publications and book chapters. A significant proportion of these publications were collaborative
The anesthesia equipment and technology development continued with completion of updating the anesthesia workstation fleet, as well as enhanced monitoring capability for assessing and guiding fluid replacement and cerebral function. Collaboration was enhanced by joint education and visiting professors with the surgical teams, focusing on enhanced recovery after surgery.

A novel in situ simulation session was planned and executed collaboratively by anesthesiology, surgery and nursing with visiting professors from Harvard University and the University of Colorado. The plan is for this to be a regular team-building event involving residents and fellows.

The plans to enhance the scope and complexity of work at the UBCH site continued, with the support of a high acuity unit staffed by Intensivists as well as a dedicated Perioperative Anesthesiologist providing perioperative resuscitation and pain management. The criteria for patients suitable for UBCH were adjusted accordingly.

We are fortunate to recruit exceptional talent in 2015, with the recruitment of Drs Patrick Hecht and Jason Wilson for 2015, who are committed to subspecialty fellowship training. Dr Steven Lee completed a regional fellowship at U of T Sunnybrook and joined our department. After a initial Canada-wide and subsequently international search, we were fortunate to recruit long term locums: Dr Tony Badh and consultant anesthesiologist from Manchester, UK with substantial military trauma and simulation leadership and experience, Dr Katherine Dawson who completed a regional fellowship at VA after a staff consultant position in Waikato Hospital New Zealand and Dr Silke Brinkmann-Gray, a consultant anesthesiologist from Perth Australia who has brought leadership and educational capabilities in Simulation as well as research and clinical expertise in

regional anesthesia. Further, we are delighted to have Drs Sandy Kisilevsky, Graham Noble, Jei Park, Alex Wong and Donald Young, accept our offers to join our department in 2016.
The long careers and dedication to leadership, clinical anesthesia, research and education of Drs Anthony Boulton, Mats Tholin and Adrian White were celebrated in 2015.

Our department's expertise and leadership in pre- and postoperative care, perioperative pain management and critical care will be leveraged towards the goals of enhanced education, leadership, quality improvement and safety. With the leadership in Perioperative Care by Dr Froehlich, the clinicians have enhanced their engagement in the preoperative urgent consultation, optimization and resuscitation for emergent and urgent surgical inpatients.Leadership in developing a robust training program for Anesthesia Clinical Assistants (ACA) is evolving to include ACA's as a key part of the Anesthesia Care Team (ACT).

**Quality Assurance and Patient Safety (Head Dr Kelly Mayson**)

Review of Critical Incidents continues to be major Quality Assurance (QA) focus, with a group of reviewers—Drs Stuart Herd, Mitch Giffin, Kevin Froehlich, Jon Harper and Kelly Mayson, are responsible for chart review, presentation of the cases to the department and recommendation for quality improvement strategies. Dr Oliver Applegarth presented Grand Rounds on the format of critical incident reviews and potential ways of improving this process.

Two SQAN Surgical Quality Action Network Summer student awards were received by the department in 2015. The first was received by Kelly Mayson and assigned to James Arnold for the project *Implementation of Enhanced Recovery Program for Radical Cystectomy—review of optimal pain and fluid management.* The second was received by Andrea Brovender and assigned to Jordan Querido for the project *Unanticipated admission to an ICU within 72 hours of elective surgery—patterns of deterioration and the effect of a dedicated perioperative anesthesiologist.*

**NSQIP**

Twenty percent of cases at VH and UBC are retrospectively reviewed to assess for 30 day morbidity and mortality. QA initiatives have been started in areas where VH has been noted to be on outlier.
Enhanced Recovery After Surgery Program
Colorectal surgical cases were identified through NSQIP as having an increased incidence of complications and longer length of stay. An ERAS program was initiated with a two-phase implementation starting in the spring of 2013, and then full implementation of the entire pathway in November 2013. Vancouver Hospital ERAS program has joined the BC ERAS Collaborative, as well as the NSQIP ERIN (ERAS in NSQIP) Collaborative in the fall of 2014. We continue to track adherence to ERAS components as well as length of stay, re-admission rates and 30 day outcomes

on 100% of our elective colorectal cases. Specific intraoperative components that anesthesia plays an active role in are as follows: maintenance of normothermia —94.5 %, administration of antibiotics in a timely manner—85.1%, adequate postoperative nausea and vomiting (PONV) prophylaxis— 85.1%, %, use of multimodal analgesia— 80.1%, and using a monitor for the purposes of goal directed therapy 50.8%. Review of 270 cases post implementation has demonstrated a reduction in NSQIP defined morbidity from 32.3% to 21.9%, all surgical site infections from 18.2% to 13.7%, and UTI's from 5.1% to 0.7%.

Guidelines were developed through the BC ERAS Collaborative on Goal-directed Fluid Therapy, lead Dr Kelly Mayson, and Multimodal Analgesia, leads Jill Osborne (St Paul's Hospital), and Mark Masterson (Kelowna General) and Kelly Mayson. In addition, through the BC collaborative the members of the VH Department of Anesthesia (Mayson, Meikle) have participated in the learning collaborative to aid in the spread of ERAS to other hospitals through the province.

An ERAS program for radical cystectomies was launched in October 2014. Review of 88 cases post implementation up to October 2015, has also shown a significant reduction in NSQIP defined morbidity from 31% to 19.3%, UTI rates 10% to 1.2%, and transfusion rates 43.3% to 27.7%.

**Perioperative Myocardial Morbidity and Mortality**

All cases of presumed perioperative MI identified through the NSQIP database are retrospectively reviewed yearly. The focus was to review whether the patients had been seen in ACC, and if they had sufficient investigations, been medically optimized, and been given appropriate medication instructions. The intraoperative management as well as postoperative management and treatment were reviewed, and assessed for demand ischemia events in the perioperative period. To date, 75 cases have been reviewed from 2012-2014. Although our VGH observed/expected ratio (risk-adjusted) has been >1.0, review of the charts found that only 73.3% of the cases had a confirmed diagnosis of perioperative MI. These cases experience ECG and/or troponin increase secondary to PE, sepsis, or a pre-operative MI. This highlights the need for Surgical Clinical Reviewers for NSQIP to confirm the diagnosis of MI with a physician. 39% of postoperative MIs occurred within 72 hours of surgery.

Identifying high risk patients in the Anesthesia Consult Clinic (ACC), and the need for follow up in the perioperative period with serial troponins should be considered. The Gupta and ACS-NSQIP risk calculator were retrospectively used on all these cases and both risk calculators, and they identified 62% of these patients as having moderate-high cardiac risk. The use of these risk calculators is currently under-utilized.

**Patient Opioid Education**

Ray Tang recently completed a study to examine to determine the effect of opioid information pamphlet on opioid disposal rates, weaning, and storage. 226 THR/TKR pts recruited at UBCH, 106 pre-pamphlet (81% response rate) and 120 post-pamphlet (72% response rate). The study found that 48.8% (42/86) of control and 52.3% (45/86) study subjects weaned off opioids at 4 weeks.

The pamphlet increased opioid return rates from 4.8% (2/42) to 26.7% (12/45) (p=0.005). Thus, a proposal was set to RSEC to improve written and verbal information on opioids to patients

**Education**

The Quality Assurance team organized and presented the Junior Anesthesia Resident Lecture entitled Quality Assurance in Anesthesia. Critical incidents rounds are held for the Department approximately five to six times per year. Nursing In-Services are also provided on areas of crisis managements/codes, diabetic management, prevention of hypothermia, and ERAS initiatives. Troponins should be considered in these cases. However, there remains a problem on how to

manage high-risk patients with troponins rise in surgical services that do not have high acuity units, and that are not admitted to the Coronary Care Unit.

**Future Directions**

The department is keen to work with the hospital IT department throughout the implementation of AIMS and CST/enterprise systems to allow ongoing data collection of information specifically of interest to the perioperative care of patients. Unfortunately the attempted launch of CST has resulted in no progress in this area with the designation of an AIMS as "out of scope" which has hampered key aspects of quality improvement opportunities. Acquisition of an AIM system would: allows for decision support alerts, to track process measures and link to patient outcomes. Further it would give our department the ability to "benchmark" and compare to other centers by submitting data to NACOR and critical incidents, and near misses events to be captured and sent also into a registry

## Division of Neuroanesthesia (Head Dr Cynthia Henderson)

*(please refer to full report under UBC Division Reports)*

## Division of Regional Anesthesia (Head Dr Ray Tang)

*(please refer to full report under UBC Division Reports)*

## Division of Anesthesia for Spine Surgery (Head Dr Jonathan McEwen)

**Overview**

Members of Vancouver Acute's Division of Anesthesia for Spine Surgery are active in teaching, research, and clinical care both inside and outside the operating room. Contact with an anesthesiologist spans the time from preoperative assessment and optimization in the anesthesia consult clinic or emergency department, care in the OR, postoperative critical care in the intensive post anesthesia care unit, and postoperative pain management on the ward.

**Clinical Practice**

During the calendar year 2015, the division of anesthesia for spine surgery provided expert subspecialty perioperative care for the spine program's 922 admissions. More than half of these admissions represented urgent or emergent problems, with the balance deemed elective.

A breakdown of some representative diagnoses is as follows:

Trauma: 230 patients

Oncology: 104 patients

Degenerative: 312 patients

Deformity correction: 132 patients

(Source: Leilani Reichl, Research Assistant, VA Spine Research).

**Research**

Dr Alana Flexman has been a particularly active member of the division from a research perspective.

Some of her current projects include:

1. Frailty and Postoperative Outcomes in Patients Undergoing Surgery for Degenerative Spine Disease. Co-investigators: Dr John Street, Dr Raphaele Charest-Morin, Mr. Taren Roughead, Dr Christopher Ryerson.

2. Does Sarcopenia as Assessed by the Normalized Total Psoas Area Predict Early Outcomes In Elderly Patients Undergoing Elective Surgery For Degenerative Spine Disease? Co-investigators: Dr John Street, Dr Raphaele Charest-Morin, Juliet Batke, Honglin Zang, Leilani Reichl, Taren Roughead.

3. Optimization and outcomes of patients who decline blood transfusion during complex spine surgery: a retrospective cohort study Co-investigators: Dr Sandy Kisilevsky, Dr Kristine Roland, Dr Liam Stobart.

**New Initiatives**

The implementation of a preoperative safety checklist has been a major focus in all perioperative programs. The spine program has taken this a step further with discussions held among representatives from all facets of perioperative care (surgeons, anesthesiologists, critical care physicians, OR nurses, ward nurses, pharmacists, and allied health providers) to consider a structured approach to critical intraoperative decision points. This approach is felt to potentially have its greatest impact on the multi-day surgeries which are somewhat unique to Vancouver Acute's program.

## Cardiac Surgery Intensive Care Unit: (Medical Director Dr Rael Klein)

**Members**

In 2015 there were 7 Associate Directors of the Cardiac Surgery Intensive Care: Dr Rael Klein (Administrative lead and QA), Dr Hamed Umedaly, Dr Igor Brodkin (IT lead), Dr Paul Kapnoudhis, Dr Juliette Atherstone (QA lead), Dr Bevan Hughes, Dr Calvin Au and Dr John Harper. The Associate Directors each had between 7-8 weeks attending in the Cardiac Surgery Intensive Care Unit.

**Clinical Practice**

Seven Hundred and Seventy patients were cared for in the Cardiac Surgery Intensive Care Unit in 2015. These patients underwent Coronary Artery Bypass Surgery, Valve Replacement or Major Aortic Reconstruction or a combination procedure. Twenty three patients underwent thoracic endovascular stents and were recovered in the unit. Many patients were recovered with left ventricular assist devices and no patients required ECMO support during 2015. Twenty three patients required Renal Replacement therapy during the year and a number were transitioned to intermittent hemodialysis. Protocol for spinal cord protection and monitoring is adhered to for most descending thoracic aortic procedures. A number of patients requiring cardio-pulmonary bypass for resection of invasive cancer were also recovered in the unit.

**Education**

Residents and fellows and medical students were exposed to the management of cardiac surgical patients during the early post-operative period. The focus of this rotation is the management of hemodynamic instability including arrhythmia management, acute resuscitation of the bleeding patient focusing on coagulopathy management. Students are also instructed on post-operative ventilation strategies and weaning. There is also significant exposure to patients with existing or acquired renal dysfunction requiring renal replacement therapy. Residents and fellows were instructed on nutritional support and feeding strategies. Residents and fellows were exposed to the management and utility of sub arachnoid drains in the patients having descending thoracic aortic procedures as well as having exposure to the use of cerebral oximetry in the post cardiac surgical patient. Students were encouraged to spend time in the operating room during their rotations to provide insight into the continuum of care of this patient population.

During the year two ICU fellows, three cardiology residents, two cardiac anesthesia residents, one cardiac surgical resident and one cardiac anesthesia fellow rotated through the unit. They were expected to partake in formal morning rounds which included x-ray and lab review. Each patient was individually assessed by the resident and daily progress notes documented in the patients' charts. Line placement and replacement and thoracocenthesis are performed under the supervision of the attending in the unit.

The resident and fellows were also encouraged to partake in bedside echocardiographic assessment of the patients under the supervision of the attending CSICU Director and develop basic skills in trans-thoracic echocardiography. Informal bed side teaching sessions are held on a daily basis in the unit where relevant topics pertaining to post cardiac surgical management were covered. During the rotation review of complex echocardiographic and radiologic studies with cardiology and radiology was encouraged. Residents and fellows are encouraged to attend the weekly combined cardiology/ cardiac surgery rounds.

The CSICU rotation in the unit has consistently received a high rating from residents and fellows who rotate through.

**Research**

Two studies Commenced in 2015 and are ongoing:

1. The TRIC III trial is a multicenter international randomized control trial (Lead at Vancouver General, Dr Rael Klein). This trial is CIHR funded and is powered TO ASSESS safety of high versus low transfusion (current practice). Triggers for transfusion in Cardiac Surgical Patients both during Cardio-Pulmonary Bypass and postoperatively. The primary end point is composite score of any one of the following events occurring during the index hospitalization (from the start of surgery until hospital discharge or postoperative day 28, whichever comes first): (i) all-cause mortality; (ii) myocardial infarction; (iii) new renal failure requiring dialysis; or (iv) New focal neurological deficit. We have enrolled 35 patients to date.

2. Direct Trial: Principal Investigators (Dr Rael Klein and Dr Janette Brohan). We hypothesized that the use of dexmedetomidine as a sedative agent immediately following cardiac surgery in elderly patients would result in improved quality of recovery and a reduced

incidence of delirium in the postoperative period, when compared to propofol. We were also interested as to whether there was an associated improvement in neurocognitive outcomes in this population. Patients are randomized to receive either dexmedetomidine or propofol infusions from sternal closure to weaning from ventilation. These patients will be followed for 6 months postoperatively.

**Quality Assurance**

Active participation continued in the National Surgical Quality Improvement Program (NSQIP) continued in 2015 with emphasis on surgical site infection and reducing ventilation times after cardiac surgery. We continued to achieve a greater than 50% success in extubation times of less than six hours during 2015.

**New Programs**

A review and update was held for all staff in the cardiac surgery intensive care of our Renal Replacement Program which continues to add significant benefit to certain patients during the perioperative period. Development of a database for the CSICU in currently in progress.

## Division of Cardiac Anesthesia (Head Dr Calvin Au)

**Members**

There are currently 16 members in the Division of Cardiac Anesthesia. All members have been trained and certified in the Exam of Special Competence in Advanced Perioperative Transesophageal Echocardiography.

Members have additional subspecialty training in cardiac on top of the regular 5 year anesthesia residency. Our most recent recruit to this division is Dr Chris Durkin who trained at the Alfred Hospital in Melbourne, Australia.

The two future members, Dr Travis Schisler and Dr Sean McLean, are currently conducting fellowships in Cardiothoracic Anesthesia at the Universities of Pittsburg and Washington respectively.

We are training a fellow, Dr Jan Brohan from Ireland. Our former fellows have all met with great success and all have passed their Special Competency exams in Advanced Perioperative Echocardiography.

**Clinical Practice**

Cardiac Anesthesiology and Surgery have evolved into many different and specialized areas.

At Vancouver Acute, we care for patients requiring:

- Robotic Surgery
- Minimally Invasive Valve Repair/Replacement
- Major Aortic Reconstruction
- Thoracic Aortic Endovascular Repair
- Coronary Revascularization
- Valve Replacement and Repair including multi-valve procedures

Division members also provide a full-time presence in the Cardiac Catheterization Lab where such varied cases such as ICD implantation, Arrhythmia Mapping for and therapeutic ablative procedures as well, Patent Foramen Ovale (PFO) Closure, Left Atrial Appendage Closure, and Transcatheter Aortic Valve Replacement (TAVR).

Cardiac caseload continues to climb mirroring the aging demographic and the proven staying success of surgical intervention. Cardiac anesthesiology continues to make a strong contribution to the successful long-term outcome of these critically ill patients.

We have developed protocols to ensure that cardioversions run smoothly and are recovered safely.

Because of our deep involvement, we assist in the development in TAVR protocols including conscious sedation which are then proctored at centres that onboarding TAVR. .

**Education**

As in years past, the division maintains its status as one of the highest-ranked educators across the entire Faculty of Medicine. We continue to train fellows who take their newfound expertise across the globe.

In addition to the day-to-day training of students, residents, and fellows, members of our division have been invited as guest speakers/presenters at many meetings and conferences, some at the national level.

We actively participate in City Wide Cardiac Rounds where interesting cases and topics are discussed and ideas can be cross-fertilized from across the three local cardiac centres.
Also, we have echocardiography rounds to provide a showcase for interesting images recorded through the week.

**Research**

We are currently involved in a randomized, multi-centre blood conservation trial (TRICC Trial). This major initiative will hopefully provide some much-needed answers regarding transfusion triggers and to reduce exposure for our patients. We undertook the Blood Conservation in Cardiac Surgery Using a Novel Transfusion Algorithm (Multicenter Clinical Trial) TACS/ ROTEM which influenced the operationalizing of ROTEM and platelet works assays to guide transfusion practice in trauma, critical care, lung and liver transplant, and cardiac surgery. We are also engaged in the DIRECT Study which is looking at delirium rates in the post-operative period as they pertain to the usage of Propofol vs. Dexmedetomidine.

**Quality Assurance**

There is full participation in Morbidity and Mortality rounds both within the Department of Anesthesiology and the larger Cardiac Sciences group. The division is fully engaged in the National Surgical Quality Improvement Program (NSQIP) where cardiac patients “flow through” the operating room and into the Cardiac Surgery Intensive Care Unit for ongoing care. Within NSQIP, there have been targeted areas and goals for all operative cardiac patients including reduction in wound infection rate, reduction in post-operative pneumonia, and reduction in urinary catheter related infection. There have been measured successes in all of these areas.

## Division of Thoracic Anesthesia (Head Dr Jens Lohser)

*(please refer to full report under UBC Division Reports)*

## The Anesthesia Consult Clinic/Pre Admission Clinic (Medical Director Dr Andrew Meikle)

### Clinical Practice

The Pre-Admission Clinic processes the elective surgical procedures at Vancouver Acute, dealing with a caseload of 16,000 patients per year. The ability to provide timely Anesthesia consultations has traditionally been limited by Anesthesia staffing levels.

### Novel Management

The IT division has written ORMIS code and new ORMIS fields to provide monthly updates on the percentage of OR Booking packages received within five days of the scheduled surgery, tracks the number of OR Booking packages requiring Anesthesia consultation, and tracks the percentage of in town patients who are seen in Preadmission at least five days prior to surgery. This enhanced waitlist data allows a more rational resource deployment of both physician and nursing time within the Preadmission clinic.

Perioperative Surgical Services has formally agreed to tie Preadmission clinic staffing resources to meet patient demands. As a result the Anesthesia staffing was increased from three to four Anesthesiologists per day over four months and dealt with the entire OR Booking backlog. For the first time in VGH, the department of Anesthesia was able to see at least 90% of in-town surgical patients at least five days preoperatively. This enhanced lead time allows a much greater ability to retrieve relevant data, obtain investigations, obtain relevant preoperative consultations and change the order of surgical cases on the day of surgery. The OR Booking waitlist is now being tracked and should a backlog recur additional Anesthesiology resources will be deployed.

The physical plant of OR Booking and Preadmission has undergone a $540 000 upgrade. This physical plant upgrade has streamlined the flow of OR Booking packages into Preadmission. This streamlining has changed both nursing and clerical work flow, and reduced the number of physical places an OR Booking package can reside from 17 to 4. This has decreased clerical time in handling OR Booking packages, and dramatically decreased the incidence of lost or misfiled OR Booking packages. The physical plant upgrade has also provided better air flow, lighting, noise reduction, and lounge space for the staff within Preadmission.

To facilitate research in the perioperative period all research studies recruiting patients in Preadmission will now be approved by the Preadmission Quality & Safety Committee. A research cork board has been installed near the staff lounge displaying information on all ongoing studies to keep the Preadmission staff abreast of active research projects.

The retinal surgeons perform work at both Mount St. Joseph's Hospital and VGH. Traditionally they have submitted OR Booking packages to both hospitals due to uncertainty regarding each hospitals respective waitlist. This duplicate submission process caused a subsequent 50% withdrawal rate of retinal VGH OR booking packages which caused work both for their MOA's and VGH OR Booking. To minimize this waste a reciprocal agreement was established with Mount St. Joseph's to honour each others' booking packages. This has stopped duplicate OR Booking package submission.

The general surgeons have changed their pre-operative antibiotic regimen for bowel resection surgery to a compounded oral neomycin preparation taken the night prior to surgery. Many pharmacies refuse to compound at all and other pharmacies have excessive compounding fees. Preadmission has obtaining necessary approvals to dispense medications. Preadmission now currently dispenses free of charge oral neomycin, and is working towards dispensing nicotine replacement therapy to smokers.

Patients appreciate receiving relevant educational material regarding their upcoming surgical experience. Preadmission now e-mails patients customized pre-operative medication advice, generic "Preparing for Surgery" pamphlets and surgical procedure specific information. This provides a low cost and robust delivery method of educational content for the hospital.

**Education**

From an anesthetic perspective, a plethora of clinical issues, practice guidelines, surgical requirements and subspecialty anesthesia requirements make each day in the Anesthesia Consultation Clinic (ACC) a challenging assignment with excellent teaching opportunities. We are able to accommodate regular rotations of medical students, residents and fellows through the Pre-Admission Clinic. This provides invaluable exposure and rare opportunities for our future colleagues to focus and develop their skills in perioperative assessment, optimization and management.

**Quality Improvement**

Preoperative instructions for patients and fasting guidelines had been previously changed to promote pre-operative carbohydrate loading on the day of surgery. Subsequently, a one month audit of diabetic patients on insulin has shown an unacceptable glucose level at the time of admission to VGH on the day of surgery. Thus the carbohydrate guidelines have been modified to exclude diabetic patients on insulin from carbohydrate loading on the night before and morning of surgery.

Diabetic patients not on insulin have had their admission time to PCC changed to the same time as their non-diabetic counter parts. This saves the patient time and the PCC expensive nursing resources. This program will be expanded in the next year to include those diabetic patients on insulin with a newly developed preprinted order set to facilitate the perioperative management of hypoglycemic medications and glucose.

Post-operative audits have shown that in 20% of surgical cases, the surgically ordered subcutaneous heparin was either not administered or not charted during the preoperative and intraoperative period. Thus a new policy has been implemented to enhance heparin administration and charting both preoperative and intraoperative. Ongoing audits will track compliance.

**Challenges**

OR Booking will only accept OR Booking packages by paper submission or fax. The referring staff surgeons who overwhelmingly have EMR's, are left having to print out and submit a paper OR Booking package. This is a source of frustration, and work load for the surgical offices. The paper based system also means that Preadmission handles 16 000 discrete paper OR Booking packages and subsequent files additional paper containing diagnostic investigations, medical consultations, and data retrieved from outside sources. In this paper based filing process errors can and do occur.

These filing errors have led to unnecessary investigations and delays of surgery. Third party software vendors will be explored which allow electronic receipt of OR Booking packages and a robust filing system for additional data obtained during the Preadmission process.
The surgeons are expected to submit relevant preoperative orders within the OR Booking package. The problem arises is that some surgeons are submitting older versions of preprinted orders with their OR Booking package. The preprinted orders are located within VCH's firewall, the P&T committee does not distribute updated PPO's to the surgeons, and the hospital does not have any automatic expiry policy for PPO's and thus OR Booking is obliged to accept all physician orders. This problem will be escalated to the Perioperative Quality and Safety Group.

Preadmission has traditionally had the lowest level of employee engagement of any unit within Vancouver Acute. Preadmission has traditionally been a "duty to accommodate" unit and approximately 80% of its staff carry this designation. The manager of Preadmission has successfully filled a HR bullying claim against one of the senior nurses, and the hospital administration has been engaged in trying to both assess and modify the staff working conditions. Unfortunately the VA Gallup Employee Engagement survey will not occur this year due to concerns with the electronic data entering the US and the new Patriot Act. Thus objective recent data regarding Preadmission employee engagement is harder to obtain.

## Perioperative Blood Management Program (Head Dr Terry Waters)

**Clinical Practice**
VA has an active Perioperative Blood Management Program (PBMP) (formerly the Blood Utilization Program). The program is run by a group of anesthesiologists (Drs Atherstone, Froehlich, Kapnoudhis, Trudeau and Waters) and dedicated nurses based in the Pre-Admission Clinic, with contribution from Dr Roland of the Transfusion Service. Shelley Feenstra, the Transfusion Clinician has been a major contributor to the development of this program. Patients at risk of requiring a blood transfusion are referred to the program based on specific referral criteria (i.e. preoperative anemia and high risk surgery). In addition, patients who refuse blood product transfusion are assessed and a treatment plan made to allow safe management of major surgery without the need for blood products.

Preoperative management strategies include oral / IV iron, erythropoietin and, rarely, autologous donation. Intraoperative strategies include cell salvage, antifibrinolytics and acute normovolemic hemodilution. The program also ensures that patients with bleeding disorders are being optimally managed. We have recently developed a program database, which is helping us to better predict which patients will benefit from different types of therapy. By reducing transfusion, the program reduces transfusion related morbidity, mortality and cost along with decreased length of hospital stay.

## Liver Transplantation and Hepatobiliary anesthesia (Program Head Dr Terry Waters)

**Clinical Practice**
Anesthesia for liver transplantation and elective hepatobiliary surgery is provided by the hepatobiliary group, a group of nine anesthesiologists. VA has a world class liver transplant program, with 90 transplants, including 3 living donors and 3 combined liver/kidney transplants being done in 2015. The hepatobiliary group takes call for and manages these difficult cases, most

of which occur after-hours. The hospital has recently purchased two ROTEM devices to be used mainly for cardiac surgery, trauma and liver transplantation. ROTEM is a near point-of-care group of tests to measure whole blood clotting which more accurately assesses the need for transfusion than traditional clotting tests. It is anticipated that this will lead to lower transfusion rates and improved outcomes.

## The Perioperative Anesthesia Service (Head Dr Kevin Froehlich)

**Clinical Practice**

Since the inception of the perioperative anesthesia role in April 2013, the mandate has been to improve the care of surgical inpatients. The service is involved in the care of all patients in the PACU with a particular focus on the patients being cared for in the Intensive PACU. Pre-operatively, this service ensures timely anesthesia consultation and consultation follow- up when required. The perioperative anesthesiologist (POA) also acts as the departmental representation for complex patient care conferences; interdisciplinary conferences to establish a plan to best care for complex patients presenting for surgery. Other clinical responsibilities include difficult airway management outside of the OR, and attendance at trauma codes to facilitate a timely transfer to the or for complex trauma victims.

**Education**

Again in 2015, we have experienced only a small fraction in the number of resident assignments to the Perioperative Anesthesia Service. We feel the POA position has been beneficial to residency education in that there is a specific focus on perioperative issues that are not as heavily emphasized when the residents are working in the OR. In the POA role, residents are afforded ample time to see and review complex inpatient consultations. There is considerable emphasis on dealing with both common and complex issues in the PACU. We have made excellent strides in establishing a Perioperative Anesthesia fellowship. We hope to have our first fellow commence in 2017. Work needs to be done to further solidify the structure of the fellowship. Much interest has come from Australia and New Zealand anesthesia trainees. Dr Froehlich was the keynote speaker at the 2015 Australia and New Zealand Anaesthesia Continuing Education Coordinating Committee Perioperative Medicine Special Interest Group Meeting in Australia. There, he presented the evolution of the intensive PACU at VGH and the development of the perioperative anesthesia service.

**Research & Quality Assurance**

Dr Brovender has initiated a retrospective review looking at patterns of deterioration and the effect of having a dedicated perioperative anesthesiologist on unanticipated admission to an ICU within 24 hours of elective surgery.

**New Programs**

Members have been encouraged to continue to foster their bedside point-of-care ultrasonographic evaluations. The majority of the group has taken initiative and completed a comprehensive course in bedside ultrasonography. In 2016-17 we hope to designate one POA

member as the lead in this area. We need to establish a system whereby we can provide CME in this area, credential members, have a platform whereby save our exams to be reviewed, and develop a standard worksheet to document the findings of our exams on patients who require an evaluation in our PACU.

## The Post Anesthetic Care Unit (Medical Director Dr Kevin Froehlich)

### Clinical Practice

The 29-bed VGH PACU cares for 50-60 patients on an average OR day. The ability to care for complex post-operative patients for up to 48 hours is what sets this unit apart from most conventional PACUs in the country. Patients who require intubation beyond the OR, brief mechanical ventilation or on-going vasopressor support are cared for in the 7 bed 'intensive' PACU (IPACU). The IPACU requires expertise beyond conventional PACU care from both our physicians and nursing staff. Because of this, we have developed a system whereby these patients are managed by an anesthesiologist who is free of OR duties and is able to immediately attend to any issues in the PACU from 0700-2100.

### Education

Having a large PACU with a broad case base, an IPACU that acts like a short post-operative ICU and a dedicated day-evening anesthesiologist to manage this area is an excellent environment for resident and fellow education. Trainees are encouraged to immerse themselves in the care of their post-operative patients. Advanced rescue analgesia, hemodynamic assessment and treatment (including point-of-care ultrasound), titration of mechanical ventilation, and difficult extubation are some of the more advanced PACU care skills can be accessed by the anesthesia trainees. Anesthesia residents get some exposure to the PACU when they are on-call and when they are scheduled to work alongside the Perioperative Anesthesiologist. There is a plan to offer perioperative anesthesia fellowship for 2017. Bedside echocardiography is now routine and a plan to further develop this program will commence later in 2016.

### Research & Quality Assurance

Numerous quality assurance endeavors have been undertaken in the PACU over the past year. Dr Swart continues to be a national leader looking at the complex interrelationship between post-operative patients with an underlying diagnosis of sleep disordered breathing. Dr Brovender has untaken a quality assurance research project investigating the frequency, and reasoning for transferring post-operative patients from the UBC PACU, HAU, and ward to the VGH PACU. Departmental critical incident rounds have uncovered a few areas for patient care in the PACU to improve. We have improved the physician availability to deal with PACU issues by having the Perioperative Anesthesia Interventional Service (PAIS) anesthesiologist care for patients in the PACU from 0700-1300. We are in the process of working with our ICU colleagues to better care for patients who are post-operative from c-spine surgery for either a traumatic etiology or from pre-existing pathology.

### Challenges

Despite having excellent leadership, the main concern in the PACU is nursing satisfaction and retention. We value our highly trained PACU nursing colleagues and recognize their contribution to the care of our complex post-operative patients. The department has been working closely alongside nursing leadership to help mitigate this issue and to develop a solution to this multi-factorial problem.

## The Perioperative Pain Service (POPS) (co-directors Drs Raymond Tang and Kevin Froehlich)

### Clinical Practice

On average, the perioperative pain service is involved with 80 patients a week with either a PCA, or an epidural, paravertebral or perineural catheter. In addition, POPS is involved in providing sedation and analgesia to patients in the Burns/Plastics/Trauma Unit undergoing skin debridement and dressing changes.

### Education

Residents of all training levels are routinely scheduled to VGH POPS during their core rotation. The directors targeted several groups and carried out formal teaching sessions over the course of 2015. Presentations on perioperative pain management were given to the surgical residents during their orientation to residency. Multiple small, interactive presentations were given to the VGH PACU nurses on appropriate opioid analgesia use in the PACU. The POPS nurse clinicians carried out multiple educational sessions for the ward nurses.

### Research

In 2015, the directors of the POPS along with UBC anesthesia resident, Dr Peter Rose completed a research project to examine the utility of an information pamphlet created to provide patients with information regarding opioid analgesics, to assist patients in tapering off of opioids at home, and how to properly dispose of unused opioid medications. Our target patient population is primary total hip and knee joint arthroplasty patients. The study yielded interesting results and was published in the Canadian Journal of Anesthesia. DR Rose presented the research findings at the UBC APT annual research day as well as at the 2016 Whistler Anesthesiology Summit where he won first place in the resident research competition. His presentation on the merits of the pamphlet to the Lions Gate Hospital Medical Staff has resulted in the adoption of the pamphlet into clinical practice.

The directors of the POPS and clinical anesthesia fellow DR Genevieve Lowe have a study underway with members of the urology department to compare the utility of rectus sheath analgesia to epidural analgesia for patients undergoing radical cystectomy. The study is well underway with hopes to reach target enrollment in 2017.

### New Programs

In 2014 the POPS added the role of the perioperative pain nurse brought a monumental change to the structure and function of the perioperative pain service to assist the POPS anesthesiologist in the conduct of rounding, act as a liaison with the PACU and ward nurses and assist in educational and administrative endeavors of the perioperative pain service. In 2015, we were able to solidify these term positions into permanent positions. Jennifer Sakai and Amy Lau, our POPS nurse clinicians, have been instrumental in the patient care, administrative and educational endeavors of the service.

In 2015, the POPS directors worked alongside anesthesia departmental leadership, members of the Chronic Pain and Addiction Service (CPAS) and Dr Michael Negraeff to develop a vision for a Transitional Pain Service at VGH. This clinic would be designed to prevent post-operative chronic pain and opioid dependence; two very concerning societal issues. It is anticipated that there will be on-going discussion around the possibility of this clinic well into 2016.

**Challenges**
The POPS leadership was again faced with a shortage of proprietary syringes for our PCA pumps in 2015. This obstacle, which happened in 2013 as well, required multiple meeting to plan and implement an effective solution to a significant problem. With a collaboration between leaders in pharmacy, biomedical engineering, nursing and hospital administration we were able to navigate the through the issue without compromising patient care. We will be working with hospital administration and regional leadership in 2016 to devise a plan to replace our current PCA pumps to a company that does not require proprietary syringes to function.

## Fellowship Education Program (Co-directors Dr Pamela Lennox and Dr John Dolman)

**Overview**
This year continued to be a successful one for our several Fellows in various endeavours. Our program continues to fund five positions, three General Clinical positions, one Cardiac Anesthesia position, and one Neuroanesthesia position. In addition, we accepted a candidate funded through the British Royal Navy, for a trauma anesthesia Fellowship. We continue to receive applications from all over the globe, although surprisingly few from Canada, and none from the US.
Fellows who completed their year with us in June 2015 were:

Dr Kathryn Dawson, General Clinical anesthesia; she had interests in regional, vascular and hepatobiliary anesthesia, and completed projects in regional anesthesia. We were fortunate to have her continue on in our Department in a locum position subsequent to her fellowship.

Dr Sam Grummitt, General Clinical anesthesia; he had interests in major cases in many areas of anesthesia, as well as in echocardiography, and became very skillful at both TTE and TEE. He also spent some unanticipated enrichment in our Anesthesia Consult Clinic following a mountain bike accident resulting in a fracture in his intubating arm! He has returned to
Christ Church, New Zealand, and hopes to be involved in advancing echocardiography in his Department. He passed the Basic Perioperative Echocardiography exam of the NBE.

Dr Kelly Spencer, Cardiac anesthesia; she returned to Melbourne, Australia, passed the Advanced Perioperative Echocardiography exam of the NBE, and is applying for TEE certification. Her husband simultaneously completed an echocardiography Fellowship in the Cardiology Department, and accordingly had some interaction with members of our Cardiac
anesthesia division.

Fellows who completed their year in December 2015 include:

Dr Dan Hartwell, General Clinical anesthesia. He only spent 6 months with us, but had a keen interest in Simulation and spent some productive time in the CESCEI simulator as well as teaching airway skills. He has since returned to consultant role Christ Church.
Dr Darreul Sewell, Neuroanesthesia; he came to us from the National Hospital for Neurology and Neurosurgery in London, and managed to secure a consultant's post there following his Fellowship with us.

Dr Bentley Waller RN, General Clinical anesthesia; he came to us from London, having spent some time in Kandahar. He had a special interest in trauma case management, and, as he was externally funded, was able to spend some time out of the OR, including our VGH Trauma

Service and EHS Flight Ambulances. He has returned to London for completion of his training, and continued service with the Royal Navy.

New Fellows who joined us in July 2015 include:
Drs Janette Brohan, Cardiac anesthesia, from Ireland, Genevieve Lowe, General Clinical anesthesia, from Glasgow, and Enda Shanahan, General Clinical anesthesia, also from Ireland.

All of these Fellows add immensely to our Department's clinical and academic activity, and are invaluable in allowing Department members to pursue academic and administrative activities outside of the operating rooms. Our program appreciates the dedicated administrative support of Joanna Kulis, Harjeet Randhawa, and Katharine Garcia.

## Resident Education Program (Co-Directors Dr Juliet Atherstone and Chris Durkin)

**Overview**
The Vancouver Acute Department of Anesthesiology and Perioperative Care continues to contribute to multiple areas of residency education. We provide General and Subspecialty Anesthesia education and rotations in Thoracic anesthesia, Neuroanesthesia, Cardiac anesthesia and CSICU, Vascular anesthesia as well as Regional anesthesia. In addition, as the role of the anesthesiologist expands beyond the operating room we provide resident exposure to the Perioperative Pain Service, Anesthesia Consult Clinic and Perioperative Anesthesiology in our busy Intensive Postanesthesia Care Unit.

The department hosts multiple UBC Residency Program Academic Days throughout the year, which are full days of learning, providing lectures and problem based learning supervision for residents. Additionally, members of our department participate in the second year resident introductory lecture and simulator series. Residents attend our weekly VA Department of Anesthesia Ground Rounds when at academic day at VGH. To provide further case based learning, we have initiated interesting case rounds that occur twice a month for residents on rotation.
Residents rotating through their Transfusion Medicine Rotation at VGH participate in our daily Blood Utilization Meetings and learn about perioperative blood conservation.
Anesthesia Residents on call at Vancouver Acute carry the hospital airway pager and have become valuable members of the Code Blue Team as an airway and resource person. This has vastly improved their exposure to emergency airway management and improved patient care by having an airway expert available.

After years of extensive contribution Dr Finlayson has stepped down as site coordinator and Dr Durkin now joins Dr Atherstone as the VGH Site Coordinators for the UBC Department of Anesthesiology Residency program. Together, they are responsible for overseeing scheduling of all residents (internal and external to our program), evaluations of residents (both online and end of rotation feedbacks), communicating with the VA Department of Anesthesiology and Perioperative Care resident issues during department meetings, being advocates for the residents, ensuring that resident concerns are dealt with appropriately as well as organizing appropriate speakers and supervisors for resident academic days hosted at VGH.

Members of our department, including the site coordinators, are members of the Residency Training Committee and also sit on the Anesthesia Residency Selection Committee.
Multiple members of our department provide support and education for the fifth year residents preparing for Royal College Examinations by participating in their annual Seminar Series. During

these sessions, staff provide expertise and formalized oral exam practice sessions. In addition, members of the department participate in the twice-yearly Department of Anesthesia Oral Examinations as examiners, as well as provide multiple fifth year residents oral exam practice sessions outside of work hours.

The UBC Anesthesia Journal Club occurs every month of the academic year for residents and staff, during which residents analyze important papers and learn critical thinking and evaluation of research methods. Members of the department participate in hosting these events and supervising residents in their analyses.

**Research**

Numerous research projects are undertaken by residents under supervision of the staff anesthesiologists at Vancouver Acute Department of Anesthesiology and Perioperative Care. Dr Alana Flexman is the VGH Director of Research and is always available to assist and encourage residents in these endeavours.

## VGH Anesthesia Research Program (Co-Directors Drs Don Griesdale and Alana Flexman)

**Overview**

The Department of Anesthesiology and Perioperative Care continued to be productive in 2015. Dr Alana Flexman and Dr Don Griesdale continued as co-directors with Dr David Parsons as Research Manager. In 2015 we continued to employ a research assistant (Ms. Ruth Argue, RN) full time until September 2015 when Ruth returned back to her home (Ireland). We then hired a new research assistant, Ms. Rebecca Grey, who has been a valuable member of our research team and is an essential member of the group on multiple projects. In addition, Dr Umedaly and the research group have established a relationship with the VCH Foundation in which both the Department and the Foundation with each contribute $75 000 to support research endeavors in the Department. The group is very fortunate to have this increased funding which will continue to facilitate research activities in the Department.

The Department continues to increase in research productivity. A list of active (filed) research projects is provided at the end of this document as well as a list of publications in 2015. The Department and research group welcomed Dr Jacqueline Trudeau to a staff position. Dr Trudeau brings a strong research background with a PhD in immunology and plans to pursue clinical research related to blood transfusion/conservation following completion of a fellowship. The research focus of the department continued in the areas of regional anesthesia and pain medicine (Regional Anesthesia Research Team (RART) and Pain management, Drs Tang, Sawka, Vaghadia, Froehlich, Lee), neuroanesthesia (Drs Flexman, Griesdale), cardiac anesthesia (Drs Waters, Brodkin, Ansley, Klein, Brodkin), technology (Dr Swart, Brodkin), thoracic anesthesia (Drs Lohser, Durkin) and quality assurance/process improvement (Drs Mayson, Brovender).

Department members continued to collaborate on research with other specialties and areas, including urology, spine surgery, neurosurgery, computer science and engineering. Department members were active in supervising research projects with medical students, residents and fellows. The Department is involved in multi-center trials; Dr Rael Klein continued to be the lead site investigator for the Transfusion Requirements in Cardiac Surgery (TRICS) Trial and Dr Pieter Swart is the lead site investigator for a trial examining the Measurement of Adverse Respiratory Events By Capnography Among High-Risk Patients.

**Grant Funding**
Successful Merit Award recipients were Dr Raymond Tang and Dr Alana Flexman, each garnering $20,000 to support their research.

In addition to the Merit Awards, Research Infrastructure Awards were again offered in 2015 to support the operational costs of small projects in the department (total $20,000). Four projects were funded by the internal Infrastructure Awards program. Drs JacquelineTrudeau and Terry Waters were awarded $10,600 for the project entitled *Implementation of a Perioperative Blood Management Program Database.* Dr Pieter Swart received $6,675 for his project *Adverse Respiratory Events in The Recovery Room.* Drs Kelly Mayson, Kevin Froehlich and Raymond Tang received $5000 in funding to study *Compliance with ERAS components in colorectal surgery and radial cystectomies.* Lastly, Dr Travis Schisler received financial support (~$1,900) for three abstract presentations at the 2015 SCA Conference.

Dr Alana Flexman and Taren Roughead were successful in obtaining a UBC Summer Studentship for research ($3,200). Dr Kelly Mayson and Dr Andrea Brovender obtained funding for students for the summer from the Surgical Quality Action Network ($3,500 each). Dr Jacqueline Trudeau was successful in obtaining peer-reviewed funding from Canadian Blood services ($15,000).

**Conferences**
Don Griesdale did another excellent job of organizing and leading the UBC Department of Anesthesiology, Pharmacology and Therapeutics Annual Research Day. Several members of the department participated in this event as abstract, poster and presentation judges.
Members of the department participated in several conferences in 2015 as invited speakers and to present their research, including the Canadian Anesthesiologists' Society Annual Meeting, the Society for Neuroscience in Anesthesia and Critical Care, the American Society of Anesthesiologists Annual Meeting and the Whistler Anesthesiology Summit.

**Other Activities**
Dr Peter Choi continues to serve as the Clinical Research Director for the UBC Department of Anesthesiology, Pharmacology and Therapeutics. The research group continues to promote the research successes of the department though regular emails and biannual research rounds to the department. The hallway cabinet continues to be updated with recent departmental publications. In addition, several members of the department have participated in rounds with other departments (e.g. surgery, critical care, trauma) to share their expertise and research activities.

**Future Directions**
The Research Group has several objectives for the upcoming year. We hope to 1) continue to increase our research infrastructure including additional personnel to allow consistent support and creation of a blood utilization/ROTEM database 2) establish a relationship with the VGH Foundation to support our research activities going forward; 3) Engage further with the VCH Research Institute to increase awareness of anesthesia research activities outside the Department. Finally, as the Department is actively recruiting new staff, the research group looks forward to engaging and supporting new staff in research activities.

**Active Projects 2015**
PI: Dr Igor Brodkin, Ms Priscilla Taipale (RN)
Title: Comparison of Analgesia Consumption after Mitral Valve Repair Surgery via Median Sternotomy vs Right Mini Thoracotomy Approaches.

PI: Dr Igor Brodkin, Ms. Priscilla Taipale (RN)
Title: Comparison of Analgesia Consumption after Mitral Valve Repair Surgery via Median Sternotomy vs Right Mini Thoracotomy Approaches.

PI: Dr Alana Flexman, Dr Darreul Sewell (Fellow)
Title: Status of Neuroanesthesia Fellowships in Canada

PI: Dr Alana Flexman, Taren Roughead (MSI), Dr Darreul Sewell (Fellow)
Title: Internet-based resources frequently provide inaccurate and out-of-date recommendations on preoperative fasting.

PI: Dr Alana Flexman, Dr Darreul Sewell (Fellow), Dr Adrian Gelb (UCSF), Dr LZ Meng (Yale)
Title: Anesthesiologists' Perception of Perioperative Stroke Risk in Non-Neurologic and Non-Cardiac Surgery

PI: Dr Alana Flexman, Dr Alexandra Kisilevsky (Resident)
Title: Preoperative Optimization and Outcomes in Patients who Refuse Transfusion During Spine Surgery

PI: Dr Alana Flexman, Dr Don Griesdale, Dr Peter Gooderham (neurosurgery), Dr Brian Toyota (neurosurgery)
Title: Effect of an Alveolar Recruitment Maneuver on Subdural Pressure, Brain Swelling and Cerebral Perfusion Pressure in Patients Undergoing Supratentorial Tumour Resection.

PI: Dr John Street (spine surgery); Dr Raphaele Charest-Morin (spine surgery), Dr Alana Flexman, Dr Tamir Ailon (spine surgery)
Title: Out-of-Hours Spine Surgery Associated with Increased Intraoperative Adverse Events? A Prospective Cohort Study

PI: Dr Alana Flexman, Dr John Street (spine surgery), Dr Raphaele Charest-Morin (spine surgery)
Title: Frailty and Sarcopenia in Elderly Patients Undergoing Elective Surgery for Degenerative Spine Disease

PI: Dr Rael Klein, Dr Jan Brohan (Fellow)
Title: TRICS-III: Transfusion Requirements in Cardiac Surgery (Multicenter Randomized Clinical Trial)

PI: Dr Kelly Mayson
Title: Comparison of Thoracic Epidurals and Rectus Sheath Catheters within in Radical Cystectomy ERAS Program

PI: Dr Kelly Mayson, Dr Alana Flexman, Dr Liam Stobart (Resident)
Title: Audit of Pain Management with the Implementation of a Colorectal ERAS Program

PI: Dr Kelly Mayson, Dr Neil Ramsay, Dr Alana Flexman, Dan Werry (MSI)
Title: Reduction in Postoperative Complications with Active Pre-Warming

PI: Dr Kelly Mayson, Dr Liam Stobart (resident), A. Bisallion, T Hong
Title: Compliance of Anesthetic Compliance of ERAS guidelines varies following Program Initiation & Enhanced Recovery After Surgery Shows High Patient Satisfaction

PI: Dr Kelly Mayson, Dr Andrea Brovender, Dr Katie Lavis (fellow), X. Hang (MSI), Ruth Argue (RN)
Title: Morbidity Rates for Adult Elective Surgery Using ISOS Methodolgy vs NSQIP Methodology at Vancouver Hospital. International Surgical Outcome Study—VGH results.

PI: Dr Andrea Brovender, Dr Jordan Querido (MSI), Dr Kelly Mayson, Dr Kevin Froehlich, Dr Donald Griesdale, Tracey Hong
TITLE: THE EFFECT OF THE PERIOPERATIVE ANESTHESIOLOGIST ON EARLY UNANTICIPATED ADMISSION TO THE ICU AFTER ELECTIVE SURGERY

PI: Dr Himat Vaghadia, Dr Enda Shanahan (Fellow)
Title: Nasal Intubation Using a Parker Flex-tip Endotracheal Tube with Posteriorly Facing Bevel Compared to a Nasal Rae Tube with left Facing Bevel: A Randomized Study

PI: Dr Raymond Tang, Dr Andrew Sawka, Dr Himat Vaghadia, Dr Genevieve Lowe (Fellow), Dr Martin Gleave (Urology)
Title: A randomized trial of epidural vs rectus sheath catheters for radical cystectomy

PI: Dr Raymond Tang, Dr Andrew Sawka, Dr Himat Vaghadia, Dr Genevieve Lowe (Fellow), Dr Nirooshan Rooban (fellow), Dr Martin Gleave (Urology)
Title: Cadaveric study of rectus sheath catheters

PI: Dr Raymond Tang, Dr Andrew Sawka, Dr Himat Vaghadia, Dr Stephen Lee, Dr Genevieve Lowe (Fellow), Dr Nirooshan Rooban (Fellow)
Title: Cadaveric study of suprascapular nerve block catheters

PI: Dr Raymond Tang, Dr Andrew Sawka, Dr Himat Vaghadia, Dr Ilana Sebbag (Fellow)
Title: Optimal patient positioning for lumbar epidural insertion in term pregnant patients using midline and paramedian ultrasonography

PI: Dr Raymond Tang, Dr Kevin Frohlich, Dr Peter Rose (resident), Jenni Sakai (RN), Ruth Argue (RN)
Title: Efficacy of an Educational Pamphlet on Opioid Tapering and Disposal after Primary Hip and Knee Arthroplasty

PI: Dr Raymond Tang, Dr Enda Shanahan (Fellow), UBC Engineering
Title: Development of an ulitrasound probe holder using a suction device

PI: Dr Raymond Tang, Dr Enda Shanahan (Fellow), UBC Computer Science
Title: Development of a difficult airway application

PI: Dr Terry Waters (multicenter trial)
Title: Blood Conservation in Cardiac Surgery Using a Novel Transfusion Algorithm (Multicenter Clinical Trial) TACS/ ROTEM

PI: Dr Donald Griesdale
Title: CerebraL AutoRegulatIon by Flow velocitY index in Hypoxemic Ischemic Brain Injury (CLARIFY – HIBI)

PI: Dr Donald Griesdale
Title: The effect of therapeutic hypertonic saline and hypernatremia on mortality in patients with severe traumatic brain injury

PI: Dr Donald Griesdale
Title: Cerebral Oximetry to assess CErebral autoregulaTion in Hypoxemic Ischemic Brain Injury (COnCEpT – HIBI)

PI: Dr Donald Griesdale
Title: The Rational Clinical Examination: Will this critically ill patient respond to a bolus of intravvenous fluids?: Meta-analysis

PI: Dr Pieter Swart (multicenter trial)
Title: The Measurement of Adverse Respiratory Events By Capnography Among High-Risk Among High Risk Patients In The Recovery Room And 24 Hours Post-Operatively

PI: Dr David Ansley
Title: Propofol cardioprotection for on-pump aortocoronary bypass surgery in patients with type 2 diabetes mellitus (PRO-TECT II): a phase 2 randomized-controlled trial

PI: Dr Jacqueline Trudeau, Dr Terry Waters, Dr Hamed Umedaly
Title: Implementation of a multi-disciplinary ROTEM program at Vancouver General Hospital.

PI: Dr Jacqueline Trudeau, Dr Terry Waters, Dr Hamed Umedaly
Title: Impact of ROTEM-guided transfusion protocols on patterns of blood product usage in high-risk cardiac surgery; Implications for the manufacturer.

PI: Dr Jacqueline Trudeau, Dr Terry Waters
Title: Implementation of a perioperative blood management program database.

PI: Dr Jacqueline Trudeau
Title: Determining optimal treatment to correct preoperative anemia and reduce perioperative allogeneic blood transfusions (ABT): a large, retrospective cohort study.

## Staff Division Memberships

**Cardiac Anesthesia**

Drs Au (Head), Atherstone, Brodkin, Dolman, Durkin, Finlayson, Fitzmaurice, Giffin, Harper, Herd, Hughes, Isac, Kapnoudhis, Lohser, Tholin, Umedaly, Waters

**Cardiac Surgery Intensive Care (CSICU)**

Drs Klein (Head), Atherstone, Au, Brodkin, Harper, Hughes, Kapnoudhis, Umedaly

**Neuroanesthesia**

Drs Henderson (Head), Applegarth, Dhaliwal, Flexman, Griesdale, Huttunen, Mayson, McEwen, Page, Ries

**Thoracic Anesthesia**

Drs Lohser (Head), Durkin, Finlayson, Fitzmaurice, Hughes, Kapnoudhis

**Lung Transplant Group**

Drs Lohser (Head), Finlayson, Fitzmaurice, Hughes, Kapnoudhis, Harper, Umedaly

**Spine Anesthesia**

Drs McEwen (head), Choi, Dhaliwal, Flexman, Giffin, Grant, Henderson, Huttunen, Lennox, Peng, White

**Regional Anesthesia**

Drs Tang (Head), Bitter-Suermann, Blachut, Brovender, Froehlich, Lee, Lennox, Peng, Ramsay, Yu

**Vascular Anesthesia**

Drs Bitter-Suermann (Head), Au, Applegarth, Osborne, Sawka, Swart, Tang, Vu, Weiderman

**Ambulatory Anesthesia**

Drs Lennox (Head), Grant, Mayson, Page , Tang, Vaghadia

**Liver Transplant**

Dr Waters (Head), Drs Bitter-Suermann, Boulton, Brodkin, Brovender, Dolman, Giffin, Isac, Klein, Osborne, Parsons, Randall, Sawka, Sung, Trudeau

**Intensive Care**

Drs Finlayson, Griesdale, Isac

**Trauma Group**

Drs Huttunen (Head), Applegarth, Choi, Dhaliwal, Meikle, Randall, Ramsay, Weiderman,

**Perioperative Anesthesiologists (POA)**

Drs Froehlich (Head) Bitter-Suermann, Brovender, Durkin, Hecht, Mayson, Mclean, Parsons, Peng, Price, Ramsay, Sawka, Schisler, Swart, Trudeau, Umedaly, Wilson

## Grants, Awards, Presentations and Publications

**Internal Grants**

Anesthesiologists' Perception of Perioperative Stroke Risk in Non-Neurologic and Non-Cardiac Surgery. UBC Summer Student Research Program. $3,200 – June to August 2015. PI Alana Flexman. MD Candidate Taren Roughead as CoI.

**External Grants**

EPVEnt-2-A: Phase II Trial Esophageal Pressure Guided Ventilation. National Institutes of Health. $950,000 - September 2012 to September 2015. PIs Stephen Loring & Daniel Talmor. Don Griesdale as CoI.

**Invited Presentations**

<u>Dr Kelly Mayson</u>

1. Postoperative Hypotension. ERAS BC Collaborative Learning Session 2, Vancouver. April 1, 2015.

2. Enhanced Recovery After Major Abdominal Surgery. NWAC —Networking World
3. Anesthesia Conference, Vancouver. April 30, 2015.
4. Enhanced Recovery After Major Abdominal Surgery VH's experience. Richmond Anesthesia Evening Rounds. June 18, 2015.
5. Audit of Multimodal Analgesia with the Implementation of a Colorectal ERAS program. ACS NSQIP Annual Meeting, Chicago. July, 2015.
6. Guidelines for Fluid management in ERAS program. ERAS BC Collaborative Learning Session 3, Vancouver. September 29, 2015.
7. Multimodal Analgesia for ERAS. McGill University SAGE/ERAS Society Canada ERAS Annual Meeting, Montreal. November, 2015.

Dr Alana Flexman

1. Perioperative Stroke: Prevention, Management and Current Controversies. UBC Refresher Course for General Practitioner Anesthetists, Vancouver. 2015. *Highest rated speaker.*
2. The Pregnant Patient Requiring Urgent Craniotomy for Tumor Resection. American Society of Anesthesiologists' Annual Meeting, San Diego. October, 2015.
3. Best Papers in Neuroanesthesia. Canadian Anesthesiologists' Society Annual Meeting, Ottawa. June, 2015.
4. Neuroanesthesia Research Update UBC Division of Neurosurgery Grand Rounds, Vancouver. 2015.

Dr Jens Lohser

1. Protective Lung Ventilation. Okanagan Anesthesia Conference, Silverstar, January 23rd 2015.
2. Thoracic Anesthesia for Thoracic Surgeons. Thoracic Surgery teaching rounds, Vancouver General Hospital, March 27th 2015.
3. Pro: Fluid restriction is necessary for lung isolation surgery. Thoracic Anesthesia Symposium, SCA Annual meeting, Washington, April 10th 2015.
4. Co-presenter Polyak P. Esophagectomy. Thoracic Anesthesia Symposium, SCA Annual Meeting, Washington, April 10th 2015.
5. Percutaneous Tracheostomy. General Surgery City Wide Rounds, University of British Columbia, October 2015.

Dr Ray Tang

1. Ultrasound guided regional workshop. Whistler Anesthesia Summit. Whistler, BC. Feb 25-28, 2016.
2. Tang R. Everything but the kitchen sink: use of local anesthetic adjuvants in regional anesthesia. Whistler Anesthesia Summit. Whistler, BC. Feb 26-Mar 1, 2015.
3. Tang R. Airway workshop- airway topicalization and blocks for awake fiberoptic intubation. Whistler Anesthesia Summit. Whistler, BC. Feb 26-Mar 1, 2015.
4. Ultrasound guided regional anesthesia workshop. Pediatric Anesthesia Refresher Course. Vancouver, BC. April 18, 2015.

5. Do we need to see the needle anymore? Novel needle visualization technology. Networking World Anesthesia Conference. Vancouver, BC. April 29-May 1, 2015.
6. Local Anesthetic Cocktails. Refresher Course for General Practitioner Anesthetists. Vancouver, BC. Nov 6-8, 2015.
7. Ultrasound guided regional workshop. Refresher Course for General Practitioner Anes. Vancouver, BC. Nov 6-8, 2015.

**Conference Proceedings**

Quality Forum Vancouver, February 2015

1. Lavis K, Huang X, Argue R, Flexman A, Mayson K. International Surgical Outcome Study—VGH results.
2. Stobart L, Hong T, Bisallion A, Mayson K. Patient Satisfaction in an Enhanced Recovery After Surgery Program.

Thoracic Anesthesia Symposium, Society of Cardiovascular Anesthesiologists, April 2015

1. Schisler T and Finlayson G. Lung Isolation For Hyperbaric Oxygen Therapy In A Patient With Cerebral Air Emboli and A Bronchogenic Cyst.
2. Schisler T, Yee J, Finlayson G. Peri-induction Transthoracic Echocardiography To Guide Anesthetic Management In A Patient With A Posterior Mediastinal Mass.

Canadian Anesthesiology Society Meeting, June 2015

1. Mayson K, Stobart L, Flexman A. Audit of Pain Management with the Implementation of a Colorectal ERAS Program. CASJ June 2015 Supplement: 85931
2. Ramsay N, Werry D, Flexman A, Mayson K. Reduction in Postoperative Complications with Active Pre-Warming. CASJ June 2015 Supplement: 86003

ACS NSQIP Annual Meeting, July 2015

1. Hong T, Mayson K, Warnock G, Panton N, Stobart L, Bisaillon A. How the implementation of an Enhanced Recovery After Surgery Protocol Can Improve Patient Outcomes.
2. Stobart L, Hong T, Bisallion A, Mayson K. Compliance of Anesthetic Compliance of ERAS guidelines varies following Program Initiation.
3. Mayson K, Stobart L, Flexman A. Audit of Multimodal Analgesia with the Implementation of a Colorectal ERAS Program.
4. Lavis K , Brovender A, Hang X, Mayson K. Morbidity Rates for Adult Elective Surgery Using ISOS Methodology vs NSQIP Methodology at Vancouver Hospital.
   Stobart L, Hong T, Bisallion A, Mayson K. Enhanced Recovery After Surgery Shows High Patient Satisfaction.

American Society of Anesthesiologists Annual Meeting, October 2015

1. C. D. Mazer, M.D., FRCPC, Rael Klein, M.D., Philip Jones, M.D., Blaine Kent, M.D., George Djaiani, M.D., Martin Holler, M.D., Martin Westphal, M.D. Effect of Perioperative Infusion of 6% Hydroxyethyl Starch 130/0.4 in an Isotonic Electrolyte Solution vs. 5% Human

Serum Albumin on Renal Function in a Randomized Controlled Trial in Adult Cardiac Surgery Patients.

Society for Neuroscience in Anesthesia and Critical Care Annual Meeting, October 2015

1. Flexman AM, Charest-Morin R, Stobart L, Street J, Ryerson CJ. Frailty and Postoperative Outcomes in Patients Undergoing Surgery for Degenerative Spine Disease.

**Manuscripts**

Meng L, Settecase F, Xiao J, Yu Z, Flexman AM, Higashida RT. Initial clinical experience with near-infrared spectroscopy in assessing cerebral tissue oxygen saturation in cerebral vasospasm before and after intra-arterial verapamil injection. J Clin Neurosci. 2016 Jan 4.

Mebel D, Akagami R, Flexman AM. Use of Tranexamic Acid Is Associated with Reduced Blood Product Transfusion in Complex Skull Base Neurosurgical Procedures: A Retrospective Cohort Study. Anesth Analg. 2015 Nov 9.

Flexman AM, Meng L, Gelb AW. Outcomes in neuroanesthesia: What matters most? Can J Anaesth. 2015 Oct 23.

Zakus P, Gelb AW, Flexman AM. A survey of mentorship among Canadian anesthesiology residents. Can J Anesth. 2015 Sep;62(9):972-8.

McIlroy DR, Lin E, Durkin C. Intraoperative transesophageal echocardiography: a critical appraisal of its current role in the assessment of diastolic dysfunction. J Cardiothorac Vasc Anesth 29(4): 1033-1043; 2015

Lohser J and Slinger P, Lung injury after one-lung ventilation: A review of the pathophysiologic mechanisms affecting the ventilated and the collapsed lung, Anesth Analg 2015, 121:2, 302-18, Review.

Lohser J, PRO: Restrictive Fluid Management Should Be Used in All Thoracic Surgical Patients, SCA Bulletin, 14(3), 2015.

## Member Roles

**University of British Columbia**

| | |
|---|---|
| Dr Oliver Applegarth | Director, UBC Anesthesia Medical Undergraduate Program<br>Co-chair, Procedural Skills Working Group, UBC Faculty of Medicine<br>Member, ACUDA<br>Reviewer, UBC Medical Journal |
| Dr Gord Finlayson | Anesthesia Resident Selection Committee<br>Residency Site Coordinator for VGH UBCH |
| Dr Alana Flexman | Treasurer, Section of Neuroanesthesia, Canadian Anesthesiologists' Society<br>Member, Scientific Affairs Committee, Canadian Anesthesiologists' Society<br>Peer reviewer, Canadian Journal of Anesthesia, Journal of Neurosurgical Anesthesiology<br>Organizing committee, Whistler Anesthesiology Summit (Abstracts |

| | |
|---|---|
| | Director of Faculty Development & Chair, |
| | UBC Faculty Development Retreat |
| | Co-Director, VA Research |
| | Director, UBC Journal Club |
| | Director, UBC Resident Mentorship Program |
| | Academic/Administrative Oversight Committee Chair |
| Dr Peter Choi | UBC Anesthesia Clinical Research Director Committee |
| | Member, UBC Research Ethics Board |
| | Member, UBC Therapeutics Initiative Scientific Inquiry and Education Committee |
| | Member, UBC Anesthesia Journal Club Committee |
| Hamed Umedaly | Faculty Executive Committee |
| | Clinical Promotions Committee |
| | Treasurer and Executive Member of the Board Medical Alumni Association UBC |
| Dr Donald Griesdale | Member, UBC Anesthesia Journal Club Committee |
| | Co-Chair: UBC Residents and Fellows Research Day Committee |
| Dr Cynthia Henderson | Head, Division of Neuroanesthesia |
| Dr Stuart Herd | Visiting Professors Committee |
| Dr James Price | Visiting Professors Committee |
| | Coordinator, UBC Anesthesia Undergraduate Program |
| | Chair, Continuing Medical Education Committee |
| Dr Jens Lohser | Head, Division of Thoracic Anesthesia |
| Dr Penny Osborne | Anesthesia Resident Selection Committee |
| Dr David Parsons | Clinical Faculty Implementation Committee |
| Dr Jon McEwen | Anesthesia Resident Selection Committee |
| **VGH/UBCH** | |
| Dr Juliet Atherstone | Member, PBMP, Head, Perioperative Echo Service |
| Dr Jon McEwen | Member, Pharmacy & Therapeutics Committee |
| | Medical Director Anesthesia Assistant Program |
| | Head, Division of Spine Anesthesia |
| Dr Michael Moult | Head, Anesthesia Technologies |
| Dr Calvin Au | Head, VA Division of Cardiac Anesthesia, |
| Dr Stuart Herd | Critical Incident Committee |
| Dr George Isac | Chair, Resuscitation Committee |
| | Chair, Organ Donation Committee |
| Dr Rael Klein | Chair, Executive Committee, Department of Anesthesia |
| | Asssociate Head VGH |
| | Medical Manager, CSICU |
| | Member, PMBP |
| | Member, Cardiac Surgery Advisory Committee |
| Dr Pamela Lennox | Head, Ambulatory and Short Stay Anesthesia |
| | Co-director, UBCH Operating Rooms |
| Dr Andrew Meikle | Member, Resuscitation Working Group |
| Dr Peter McGinn | Anesthesia Liaison Eye Care Centre |
| Dr Michael Negraeff | Member, VA Acute Pain Steering Committee |
| | Member, Medical Advisory Committee |
| | Member, Senior Leadership Team |

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|---|---|
| Dr Lynn Martin | Member, Resuscitation Committee |
| | Member, Credentials Committee |
| Dr Raymond Tang | Head, Section of Regional Anesthesia |
| | Associate Director, Perioperative Pain Service |
| Dr Hamed Umedaly | Head, Department of Anesthesiology and Perioperative Care |
| | Member, VA Executive Committee |
| | Member, Surgical Executive Committee |
| | Member, Medical Advisory Committee |
| | Member Steering Committee JPOR Rejuvenation |
| Dr Terry Waters | Chair,Blood Transfusion Service Committee |
| | Member, Blood Utilization Committee |
| | Head Liver Transplant and Hepatobiliary Program |
| | Member, Transfusion Medicine Fellowship Committee |
| **Vancouver Coastal Health** | |
| Dr Patrick O'Connor | Vice President, Medicine, Clinical Quality and Safety |
| | Chair, Quality of Care, VCH HAMAC |
| | Member, Credentials Committee, VCH HAMAC |
| | Member, VCH Senior Executive Team |
| | Chair, VCH Executive Medical Group |
| Dr Andrew Sawka | Medical Director Perioperative Services |
| Dr Terry Waters | Chair, Regional Blood Transfusion Committee |
| Dr Lynn Martin | VCH Credentials Committee |
| **VA Department of Anesthesia** | |
| Dr Calvin Au | Head, Division of Cardiac Anesthesia |
| | Associate Medical Director, CSICU |
| | Member, Staff Selection Committee |
| Dr Bjorn Bitter-Suermann | Head, Section of Vascular Anesthesia |
| Dr Igor Brodkin | Associate Medical Director, CSICU |
| | Staff Computing Resources |
| Dr Alana Flexman | Elected Member VA Anesthesia Executive |
| | Member selection committee |
| | Associate Director Research |
| Dr Mitch Giffin | Critical Incident Committee |
| | Director, Anesthesia Technology and Systems/Equipment |
| Dr Donald Griesdale | Director VA Department of Anesthesia Research |
| Dr Jon Harper | Grand Rounds Coordinator |
| | Critical Incident Committee |
| | Associate Medical Director, CSICU |
| | Member, Executive & Selection Committees |
| Dr Cynthia Henderson | Head, Division of Neuroanesthesia |
| | Head, ECT Anesthesia Interest Group, Vancouver Acute |
| Dr Stuart Herd | Associate Head UBCH |
| Dr Bevan Hughes | Associate Medical Director, CSICU |
| | Call schedule Author |
| Dr Henrik Huttunen | Vacation schedule Coordinator |
| Dr Paul Kapnoudhis | Associate Medical Director, CSICU |
| | Member, Staff Selection Committee |
| Dr Rael Klein | Medical Director, CSICU |

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|---|---|
| | Associate Head VGH |
| | Chair VA Department of Anesthesia Executive |
| | Member Staff Selection Committee |
| Dr Pamela Lennox | Member, Staff Selection Committee |
| | Head, Division of Ambulatory and Regional Anesthesia |
| Dr Jens Lohser | Head, Division of Thoracic Anesthesia |
| Dr Kelly Mayson | BCMA ERAS Working Group |
| | NSQIP Anesthesia Champion Vancouver Acute and UBC Hospital |
| | ERAS Anesthesia Lead Vancouver Acute |
| | VA-SQAC (Surgical Quality Action Committee) |
| Dr Peter McGinn | Anesthesia Allergy Clinic, Coordinator |
| Dr Andrew Sawka | Call Schedule Administrator |
| Dr Andrew Meikle | Medical manager Anesthesia Consult Clinic and |
| | VGH Perioperative Care Center |
| Dr Michael Moult | Co-Director, Anesthesia Technology and Systems/Equipment |
| | Critical Incident Committee |
| Dr David Parsons | VA Research Administrator |
| Dr Hamed Umedaly | Head Department of Anesthesiology and Perioperative Care. |
| | Associate Medical Director, CSICU |
| | Chair Staff Selection Committee |
| **Other** | |
| Dr David Ansley | CJA Guest Reviewer |
| Dr Calvin Au | CJA Guest Reviewer |
| Dr Igor Brodkin | CJA Guest Reviewer |
| Dr Peter Choi | Chair, ACUDA Research Committee |
| | CJA Consultant Epidemiologist and Reviewer |
| | Cochrane Anesthesia Review Group, Cdn Editor |
| | CAS Perioperative Medicine Executive Chair |
| Dr John Dolman | CJA Guest Reviewer |
| Dr Alana Flexman | Society for Neuroscience in Anesthesia and Critical Care Education Committee Member |
| | CJA Guest Reviewer |
| Dr Pamela Lennox | CJA Guest Reviewer |
| Dr David Malm | CJA Guest Reviewer |
| Dr Lynn Martin | CJA Guest Reviewer |
| Dr Kelly Mayson | CJA Guest Reviewer |
| Dr Peter McGinn | CJA Guest Reviewer |
| Dr Andrew Meikle | CJA Guest Reviewer |
| Dr Michael Negraeff | Chair, Pain BC Society |
| | Member, BC Provincial Pain Initiative Committee |
| Dr Patrick O'Connor | CJA Guest Reviewer |
| | Member, BC Quality Council Advisory Group (MoH) |
| | Member, Physicians Services Advisory Group (MoH) |
| Dr David Parsons | Member, Royal College Credentials Committee |
| Dr Andrew Sawka | CJA Chair, Section of Regional Anesthesia and Acute Pain Management |
| Dr Hamed Umedaly | CJA Guest Reviewer |
| Dr Himat Vaghadia | CJA Guest Reviewer |

**BRITISH COLUMBIA CHILDREN'S HOSPITAL**

**Norbert Froese, MD FRCPC**
**Head of Pediatric Anesthesia**

**PRELIMINARY ACUTE PAIN SERVICE REPORT for 2015**
*Gill Lauder, MB BCh, FRCA, FRCPC, CPE, Director, Acute Pain Service*

The Anesthesiology-based Acute Pain Service (APS) has now completed its 26th year of operation, caring for a number of patients and families admitted to BC Children's Hospital (BCCH) during 2015. The APS is currently active in the management of acute medical and postoperative pain.

The APS falls under the mandate of the Department of Anesthesia. The Medical Director for APS is Dr G. Lauder who has undertaken this role since July 2010. In 2015 there were two time periods when the APS director role was temporarily transferred; once from October 2014 till March 2015 to Dr Zoe Brown and the second occasion from November 2015 to February 2016 to Dr Stephan Malherbe. 18 Pediatric Anesthesiologists provide rotating clinical coverage 24 hours per day, 7 days per week. 1.0 FTE Nurse Clinician (Sarb Randhawa) and a 0.6 FTE Administrative Assistant (Erin Lowe). Nursing and administrative FTE's are shared with both the APS and the Complex Pain Service (CPS).

The paediatric experience of pain involves the interaction of physiological, psychological, behavioural, developmental and situational factors. Due to the diverse interplay of these factors there is substantial interindividual variability in pain perception for different children who have undergone the same surgical insult. In addition interindividual variability in response to medications due to pharmacogenetic, sex, cultural, cognitive and emotional factors means that the analgesic response to doses of analgesia medication are also not predictable. Hence, the nature of pain as a sensation and its overall significance to a child is unique. The resulting uncertainty in an individual child's pain perception and response to medications dictates that pain therapy is targeted according to ongoing individual assessment and response. Safe clinical practice requires an understanding of pain pathophysiology, different pain models, pain assessment in different aged children and the age related changes in the pharmacokinetics and pharmacodynamics of analgesics in infants and children. The APS service manages this complex situation by regular ongoing assessment with the use of good quality standard orders, standard drug concentrations, evidence based guidelines, and regularly updated nursing policies/procedures to support the needs of the children served.

**APS STATS FOR 2015: Pending**
Database statistics are not available at the present time until Decision Support Services (DSS) provide APS data. Patient data, outcomes and complications are collected via point-of-care hard copy service record, and transposed to a database by the nurse clinician to enable DSS to analyze, develop and produce the yearly summary. The data/details for 2013, 2014 and 2015 are still pending, principally due to lack of nursing time to input the data. Approximately 465 children were managed by the APS during 2015. The number of children served by the APS during 2015 represents a very small proportion of the children admitted to BCCH following surgery

(approximately 31%) and an extremely small proportion of all admissions to BCCH during 2015 (approximately 0.7%).

**APS CRITICAL INCIDENTS IN 2015: Pending**

A summary of the years self-report critical incidents through PSLS has been requested from the department of Quality and Safety. These data/details for 2015 are pending. Based on feedback at all four APS departmental meetings no significant critical events were reported

**APS SUCCESSES DURING 2015:**

External fixators & frame peri-operative analgesia guideline. A multi-modal pain pathway was created for this group of patients in collaboration with Dr Cooper (Orthopedics). Ongoing prospective audit will determine effectiveness and need for change.

**Education:**

APS staff were involved with many institutional and external educational pain management lectures and educational projects throughout 2015. The list of educational activities delivered by APS in 2015 include:

- Point of care teaching Medical students, Residents, Nurses in OR, on APS and in CPS clinic.
- Point of care teaching of children, parents and nurses on wards during APS rounds.
- APS Departmental Rounds; 4 during 2015.
- Pediatric Epidural Analgesia for Nurses; BCCH, Tri-annual sessions
- Pediatric Burn Pain Analgesia for Nurses; BCCH, Vancouver, Bi-annual sessions
- Pediatric Acute Pain Management for Oncology Fellows, BCCH, Annual
- Pediatric Pain Management for PICU Fellows; Annual
- Pain Management for Otolaryngology fellows/residents
- Review of Lidocaine infusions 18th March APS Meeting
- Presentation of Tonsillectomy Audit Data 24th June APS Meeting
- Review of Cannabis and the developing Brain 28th Oct APS Meeting

**Research:**

Research projects specifically designed to explore pediatric pain management issues have been initiated in 2015. See Pediatric Anesthesia Research Team (PART) report for details.

**Publications:**

Publications produced by the APS service specifically centred on pediatric pain management in 2015 are highlighted in the Pediatric Anesthesia Research Team (PART) report.

**ONGOING APS CHALLENGES**

**Audit.**

There is no electronic database to analyze quality control issues easily and in a timely manner. Meetings have occurred to remedy this situation with a small working group including Dr Lauder, Dr Goresky, Dr Ansermino, Dr Froese and the IT department; however, there are no resources currently available to finance any potential solutions.

No nursing resources are available to implement ongoing follow up of all patients leaving hospital after discharge from day surgery in this institution. Following on from the APS directed Tonsillectomy audit the SDU have implemented telephone follow up calls for this population of patients only.
There is no tracking of the quality of pain management for non-APS patients within the institution or after discharge.

**Personnel.**
Despite the 1.0 FTE, the nurse clinician role is restricted to 0730-1630 Tuesday to Friday. The nurse clinician has a significant and increasing clinical and administrative commitment to the complex pain service minimizing time for APS point of care management and teaching on the wards. There has been no change to the funding of APS since the inception of the service in 1999.

**Lack of nursing resources prevents:**

- Change of the present referral practice where only physicians can refer children to the APS. Denies and ignores expertise of other clinicians and family members.
- Enhanced point of care management and education
- Enhanced continuity of patient care.
- Expansion/adoption of more non-pharmacological techniques for individual patients.
- Development of other pain management education packets/guidelines
- Enhance collaboration with other areas in the institution such as NICU and ER
- Development of ongoing quality of care projects
- Enhanced integration with Quality and Risk
- Enhanced integration with Childlife
- Expansion of invasive techniques to other wards
- Nurse led research projects.
- Nursing involvement in Provincial and National Pain Education Meetings

**Psychology.**
Lack of an APS dedicated psychologist ignores the fact that pain perception is a complex biopsychosocial problem (mix of nocioceptive responses to the trauma of surgery and psychological components). In some APS patients postoperative pain control can be problematic, especially in children who are not opioid naïve, who have a history of chronic pain or who have an ongoing chronic disease process. Lack of trained psychological support causes persistence of psychological suffering and a maladaptive anxious response that worsens outcome.

**APS SUMMARY**
The 24/7 APS service continues to provide what is clinically perceived to be excellent care, without critical events, to the children admitted to the Acute Pain Service. However, without quality of care metrics it is difficult to substantiate this claim.
To move forward with evidence based innovative ways to improve pain for all children in a dedicated pediatric tertiary care institution requires much more dedicated administrative, allied health (e.g. psychology and child-life) and nursing resources than currently available.

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**QUALITY OF CARE**
*Dr. Simon D. Whyte*

Departmental quality of care (QoC) meetings took place on 9 occasions in 2014, with 8 staff members reviewing 14 cases. All meetings were quorate & all department members bar two attended 50% or more of the meetings, confirming the value of these rounds to department members. Members also continued to present audits and quality improvement initiatives, both in this forum & beyond.

**Practice & resource changes arising from audit presentations in 2014 (contributing department members):**

- Documentation of exact antibiotic administration time on anaesthesia record (SW)
- Group and anonymised individual feedback of temperature management in NSQIP patients (SW)
- Ongoing annual review of perioperative deaths (within 30 days) and possible employment of this reporting strategy to the hospital's Mortality Committee (for discussion in 2015) (RP/SW).

With regard to the department's role in QoC activities beyond anaesthesia services provision *per se*, Dr. S. Whyte continued in the roles of Co-Chair of the hospital's Child Health Safety & Quality of Care (CHSQoC) committee; department representative on the QoC committees of Surgical Suites, and Surgery & Neurosciences; and at the P-NSQIP forum. Surgical Suites Grand Rounds, incepted in 2011, increased to 6 meetings in 2014, with ongoing good attendance & feedback; I'm grateful to Nathan O'Hara, Bindy Sahota & Damian Duffy of OPSEI for ongoing co-ordinating & advertising activities, & for financial support. Dr. Reimer continued as Chair of the Site Wide Sedation Committee, which reports to CHSQoC. Drs. S. Whyte and A. Morrison represent anaesthesia on the Surgical Site Infection working group. In 2014 this group strived to improve infection control practices in the Surgical Suites, within the constraints of the physical plant, amongst other insuperable barriers. This has resulted in practice changes that do not always improve efficiency and flow in our work, and are not necessarily as evidence-based as many of us would wish for. I appreciate colleagues' willingness to undertake & adapt to these changes.

This is my annual opportunity to thank everyone who contributes to & facilitates the quality assurance and quality improvement work of this department, whether by volunteering cases for discussion, contributing to the healthy debate that always accompanies case reviews, undertaking to implement actionable recommendations that arise from these reviews & from PSLS reports, or scheduling my time to undertake the QoC portfolio. I foresee 2015 being a year in which our clinical audit culture continues to develop & we start to consider the opportunities & challenges that the new hospital will bring. I hope we will continue to support each other in performing continuous quality improvement in the care we provide.

**BCCH and UBC Pediatric Anesthesiology Clinical Fellowship Program**
*Dr. K Bailey, Fellowship Director*

**Job Description and Fellowship Committee:**
The current Fellowship Committee members are: Drs. Froese (Chief), Ansermino (Research), Chin (Simulation, Cardiac), Lauder (APS), Traynor/Brown (Residency Training, Scheduler), Bailey (Fellowship Director) and one member-at-large, Dr. Cassidy. The Fellowship Director position was successfully transitioned over from Dr. Carolyne Montgomery to Dr. Katherine Bailey on July 1, 2015. The fellowship committee met twice in 2015, in January and September. The department secretary, Ms Denise Taylor is responsible for the management of the applications, and provides assistance with immigration, provincial licensing, and hospital and university privileges. In addition, she maintains the annual information package, updates the Web Site and manages the Fellows schedules with respect to vacations, conference leave and specialty rotations.

**Recruitment and Structure Update:** The 2014/2015 fellows Lindsay Rawling and Peter Harper successfully completed their fellowships in June 2015. Due to unforeseen personal circumstances in the first half of his fellowship, the focus of Peter's fellowship was mostly clinical during the last 6 months. The 2015/2016 fellows Liz Allison and James Gaynor started July 1st, 2015 and have both been doing an excellent job clinically as well as participating in research. There were no significant changes to the fellowship structure or call during the 2014/2015 academic year. A new one week rotation in regional anesthesia at St. Paul's Hospital will be introduced in January 2016 for the 2015/2016 fellows. There has also been discussion about limiting the amount of time spent in the cardiac OR outside of the cardiac rotation. This decision will be deferred to the 2016/2017 year. Anesthesia led Multi-disciplinary Anesthesia/Surgery Fellows Journal Club was successfully held for the first time in January 2015. Due to good attendance and staff physician support, this will be continued in 2016 with financial support. Additionally, the department successfully hosted our first international health fellow Dr. Mary Nabukenya, from Uganda, for 6 months.

**Clinical, Academic and Research:**
Dr. Rawling participated in the 2015 International Health Trip. Dr. Rawling and Dr. Harper submitted their case log-books, and case numbers/distribution are similar to previous years to date for the 2014/2015 Fellows. (300 plus cases at 6 months). The fellows also participated in APT research day.

The number of Simulation days for the Fellows has been continued at 10 sessions per year. Goals and Objectives are available for Simulation, Cardiac rotation (Chin, McMann), Neonatal anesthesia (Brown/Rawling), Spine Rotation (Morrison, Harper). Dr. Gaynor is currently working on G & O for the Regional Rotation. The program remains committed to trying to increase exposure to difficult airways, US guided blocks and epidurals. The role of Fellows on the Trauma team was formalized with the mandatory use of the trauma pager when on call (Out-of-house). The implementation of

mandatory PALS and Trauma Team Training were proposed. Participation in the APS continues. The PICU rotation was attended by both 2015/2016 Fellows, with good reviews. The biggest scheduling challenge, which will be changed going forwards in 2016/2017, will be to allow one block between cardiac and PICU, in order to facilitate academic time for research (currently the rotations have been back to back, creating difficulty in getting projects up and started).

**Challenges and Changes:**

The biggest challenges for the fellowship program remain trying to:

1. **Optimize the balance between clinical and academic experiences:** The Fellowship Committee has been actively involved in informal discussions as to ways in which to modify the fellowship structure, including call, and a fellowship retreat is ideally planed for fall 2016. To date, we have been unable to find funding support for a 2-year fellowship model that combines a research year and a fellowship year, in order to better balance some of these concerns.

2. **Encourage application by well-qualified Canadian applicants:** Promotional activities have been done, the UBC, PART and BCCH anesthesia departmental website application forms and information have been updated. Contact information for the Fellowship Director has also been updated. Identification of residents within the UBC residency program with an interest in Pediatric Anesthesia has been encouraged, and their interests in Pediatric Anesthesia supported. Fellowship Directors from other programs across Canada have also been contacted to let them know about our renewed interest in accepting Canadian applicants.

3. **Standardize Fellowship Curriculum**. The new Fellowship Director (Bailey) participated in the National Curriculum Working group at the 2015 CPAS/CAS meeting in Ottawa. The objectives of this group were to create a national standardized Pediatric Anesthesia Fellowship Curriculum, and to establish a set of guidelines as the Royal College of Physicians and Surgeons of Canada moves towards Entrustable Professional Activities and a Competency Based Training model. To date, no national curriculum has been established. The BCCH Fellowship has continually been moving towards a more CBME evaluation process, and to move the evaluation to an electronic format.

**Summary:**

The Fellowship program continues to undergo a transition period with a renewed focus on training Canadian clinicians, and an adjusted balance between clinical and academic commitments. The transition between Fellowship Directors has gone smoothly with the support of the department at large. The current 2015/2016 fellows have been easily meeting all clinical and academic expectations of the department. The next 2 years of fellowship positions have been filled by excellent well-qualified applicants.

**Cardiac Anesthesia**
*Dr. Clayton C. Reichert, Head Cardiac Anesthesia*

The cardiac anesthesia team is lead by Dr. Clayton Reichert. Other team members are Chris Chin, Norbert Froese and Louis Scheepers.

**Residency Program**
*Dr. Michael Traynor, Residency Coordinator*

Dr. Michael Traynor served as BCCH residency coordinator for 2015

**BCCH Pediatric Anesthesia Simulation Report 2015**
*Dr. Chris Chin, Simulation Lead*
Pediatric Anesthesia Simulation is continuing to build on the success of the Anesthesia Residents simulation training program. While the Managing Emergencies in Pediatric Anesthesia and the Pediatric Airway Management courses are now well established, additional simulation training initiatives continue to be developed. Many of these involve training for and/or with other specialties.

<u>Pediatric Anesthesia Residents training:</u>
Competency based Pediatric Anesthesia Simulation training for UBC Anesthesia Residents has been running regularly since 2013.
Since July 2014 Anesthesia Residents are scheduled to attend the MEPA course just prior to starting their BCCH Pediatric Anesthesia module and this has been appreciated by the residents. Feedback for the Pediatric Anesthesia courses continues to be excellent (see 2015 feedback summaries below).
One feedback comment in conjunction with several other quality improvement discussions has culminated in the production of a BCCH Pedicrisis Guideline booklet which is now available in all BCCH Anesthesia areas. This guideline is sent out to the Anesthesia Residents prior to their attending the simulation sessions.
In addition to the simulation courses mentioned above, Pediatric Anesthesia at BCCH has also developed and rolled out a 1 day PALS Provider course for Anesthetists and Skilled Practitioners. The aim (successfully achieved) has been to ensure that Anesthesia Residents have the opportunity to attend a PALS provider course prior to starting their Pediatric Anesthesia training module.

<u>UBC Anesthesia Simulation</u>
In addition to Pediatric Anesthesia simulation training, BCCH Anesthesia Simulation provides support to many UBC Anesthesia Simulation initiatives:

- Peri Operative Emergency Medicine (POEM) Course: BCCH Anesthesia provides Faculty support with BCCH Pediatric Anesthesia Staff and Fellows teaching on this course.
- Royal College of Physicians and Surgeons of Canada Simulation: BCCH Anesthesia provides Faculty for the teaching and assessment of the Anesthesia Resident Simulation scenarios that are currently being rolled out on a national basis.
- UBC Medical Student Summer Program: BCCH Simulation developed and taught an Introduction to Pediatric Anesthesia module for Medical Students using part task skill trainers in the BCCH Simulation Centre.

Multidisciplinary training

Pediatric anesthesia simulation has also been involved in teaching and training for other specialties:

- There have been airway training workshops and simulations run for the Pediatric Emergency department and feedback for these has been excellent. Pediatric anesthesia simulation has also contributed a Surgical Airway Workshop to the recently BCCH Emergency Department initiative to develop a Pediatric Advanced Trauma Simulation course. The inaugural course took place in Nov 2015.
- We contributed and advised on the development of a "Procedural sedation and analgesia on the Clinical Teaching Unit" education package including 2 simulation scenarios. Our Pediatric Anesthesia Fellows helped to supervise the inaugural simulation sessions and a poster presentation on this new initiative was recently presented at the 2016 International Pediatric Simulation Society Meeting.
- In 2015 we also collaborated with Pediatric Cardiology and have instituted regular in-situ Cardiac Cath Lab simulation sessions. These are scheduled monthly and feedback so far has been great (see attached feedback summary).
- At our 2015 Pediatric Anesthesia Conference, Pediatric Anesthesia Simulation ran a very successful Pediatric Anesthesia Emergencies Simulation workshop. Feedback was excellent and we have been invited to run a 1 day workshop for the Anesthesia Department in Prince George. As a satellite day (to the conference) we also ran a successful 1 day PALS Provider Course for GP Anesthetists and we repeated this 1 day PALS Provider course in November 2015 (in conjunction with the annual BC GP Anesthetist conference).

**Global Outreach**

*Dr. Bob Purdy, Departmental Global Health Lead*

*Multiple department members participated in global outreach initiatives in 2015*

The following volunteer medical missions were undertaken by department Anesthesiologists. The goals of these missions were to provide surgical care for Pediatric patients from remote under serviced areas of these countries. Patients who would otherwise be unable to access care most often because of poverty.

Secondary goals included teaching and training of local health care providers.

October 2015 Uganda: Dr. E. Reimer, Dr. L. Rawlings Fellow

November 2015 India, Operation Rainbow Canada: Dr. C Montgomery, Trevor Coelho, Anesthesia Assistant, Dr. E Allison Fellow

November 2015 Guatemala, Health for Humanity Surgical Mission: Dr. R. Purdy

**Pediatric Anesthesia Spine Team.**

*Dr. Andrew B. Morrison, Spine Team Coordinator*

The Pediatric Anesthesia Spine Team was formed five years ago with the intention of providing a specialized, consistent and coordinated approach to the provision of anesthesia for our scoliosis patients.

Scoliosis patients comprise of three groups based upon aetiology: congenital, neuromuscular, and idiopathic. They encompass a broad range of age groups from toddler to adult, occasionally with

complex medical conditions. Our small expert group of anaesthetists is able to focus on the individual requirements of each patient while delivering a high level of care specific to the requirements of scoliosis surgery.

Ongoing experience with the model of smaller team spinal surgery anesthesia delivery have confirmed our impression that communication, understanding and interaction between care providers in the operating room are improved with the result of improved patient care.
2015 saw a change in the management of red cell scavenging in spine surgery. The cell saver had previously been operated exclusively by our perfusion department. In 2015 our anesthesia assistants were trained in cell saver operations and now share this role with BCCH perfusionists.

The team comprises seven members drawn from the Department of Paediatric Anaesthesia with rotation into and out of the team approximately every six months. Current members of the spine team are Andrew Morrison, Gillian Lauder, Simon Whyte, Yvonne Csanyi-Frtiz, Myles Cassidy, and Zoe Brown and Michael Barker. As part of the larger Paediatric Spine Team we are actively involved in ongoing multidisciplinary education sessions to maintain, advance and promote understanding of the challenges these patients face.

# BC Children's Hospital RESEARCH TEAM (PART) Newsletter

Our research unit encompasses two well-established and dynamic research groups; the Pediatric Anesthesia Research Team (PART – http://part.cfri.ca) and the Electrical & Computer Engineering in Medicine group (ECEM – http://ecem.ece.ubc.ca). The team is based at CFRI's Oak Street campus. PART's researchers include anesthesiologists, research staff, multidisciplinary trainees (medical, graduate, and undergraduate students), engineers, psychologists, surgeons, and nurses. Our trans-disciplinary team collaborates on projects that cover a wide scope of pediatric-focused research, including but not limited to basic science, clinical trials, and population and global health research.

## IN THE NEWS:

Knowledge translation is an important component of any successful research project. We are happy to report that several of our initiatives and inventions received media attention this year.

Mark Ansermino, Guy Dumont and Richard Merchant were interviewed by CTV news, about the iControl project, and its relevance to the future of anesthesia.
*Right: Richard Merchant and Sonia Brodie pose with iControl, at Royal Columbian Hospital*

The Washington Post wrote an article about the role iControl could play in the future of anesthesiology. Forbes followed up on the Washington Post article and discussed the legal and ethical considerations governments will need to consider with automated anesthesia.

The Vancouver Sun reported on how UBC faculties are seeking innovative approaches to personalized medicine. The story listed the example of collaboration between Mark Ansermino (Faculty of Medicine) and Guy Dumont (Faculty of Applied Sciences) working together to create the Phone Oximeter.

## HIGHLIGHTS

The Pediatric Anesthesia Research Team (PART), with the participation of all members of the Department of Pediatric Anesthesia and collaborators from many other Departments, has created an environment where research can flourish. We maintain our close links with Electrical and Computer Engineering at UBC, the Centre for International Child Heath, the Office of Pediatric Surgical Evaluation and Innovation (OPSEI), and are active members of the new *Healthy Starts* and *Evidence to Innovation* research themes at the Child & Family Research Institute (CFRI).

Two PART postdoctoral fellows have recently secured exciting new roles as Assistant Professors. Matthias Görges was appointed to the UBC Department of Anesthesiology, Pharmacology & Therapeutics, and has also taken on the role of co-leader of CFRI's Clinical and Community Data Analytics and Information Group. Ainara Garde was appointed to the Department of Biomedical Signals and Systems at the University of Twente in the Netherlands. We are very sad to have her leave us but look forward to future ongoing collaborations. Matthias and Ainara have each contributed so much to the breadth and excellence of our team. We wish them all the best as they move forward in their careers!

The team has continued to grow in ability and effectiveness. We have taken on a number of new challenges both with industry and with local, national and international partners. The impact of our training and research has been demonstrated by the success of our funding efforts, the real world uptake of our research and the ongoing success of our previous team members.

### RESEARCH OUTPUT

This year, the Department published, or has in press, 22 peer reviewed manuscripts. We presented 34 abstracts at local, national, or international meetings.

### COLLABORATIONS

Our research collaborations have continued to grow both within UBC with other local, national and international academic and industry partners. We continue to collaborate on the PIERS on the move project, have strengthened ties with the Department of Anesthesia at Royal Columbian Hospital and have fostered new relationships in sleep apnea research.

### GRANT APPLICATIONS

Our team submitted many grant proposals in 2015! Drs Whyte, Brown, Lauder, Ansermino, Garde and Görges submitted applications as principal investigators, and Drs Rawling, Allison, and van Heusden submitted applications as co-investigators. New funds awarded in 2015 from grant agencies totalled $872,156, with another $5M under review. We secured awards from the UBC Faculty of Medicine (Lauder & Emmott); the CFRI (Whyte & Allison); the Alva Foundation (Ansermino & Garde); Grand Challenges Canada (Ansermino & Dumont) and CIHR (Ansermino & Dumont).

## THE TEAM

As with each year, the Pediatric Anesthesia Research Team welcomed some new members and said goodbye to many wonderful individuals. We are grateful to each for contributing to our team's success!

- We sent off **Lindsay Rawling** and **Peter Harper** to pursue new adventures, and welcomed **Elizabeth Allison** and **James Gaynor** as they complete their Clinical Fellowships with the Department of Pediatric Anesthesia.
  *Right: Peter Harper, Lindsay Rawling, & Carolyne Montgomery at the 2015 Fellows' dinner.*
- **Mohamed Elgendi** joined the team as a postdoctoral fellow for the duration of 2015, contributing to the pulse oximetry component of the CLIP trials being conducted in Pakistan and Nigeria. He has since gone on to pursue another Postdoctoral Fellowship at the CFRI.
- **Nancy Christopher**, a Registered Nurse who has been volunteering with PART since 2014, started as part-time research assistant in March 2015. Her nursing expertise has been a great help to the DoIWheeze, RRa and Child Life projects.
- **Edda Karlsdóttir**, a medical graduate from Iceland, joined the team as a visiting scientist for the spring and summer, working on the Anesthesia in Neonates project with Gill Lauder and Matthias Görges.
- **Manil Chowdhury**, who was running the KidsCan youth advisory committee, funded by the Peter Wall Institute for Advanced studies and the Michael Smith Foundation for Health Research, left the team in 2015, coinciding with wrap up of the project.
- **Peter Chen**, a Software Developer with PART/ECEM since 2013, left to pursue an exciting industry position in Seattle, WA. We wish him all the best!
- **Roslyn Massey**, an engineering undergraduate student from Queen's University, joined us in the summer to work with Chris Petersen on the EEG simulator project.
- **Mazy Abulnaga**, a long-time student of the ECEM research group, commenced a Work Learn position in 2015, focusing on signal processing within the DoIWheeze study.
- **Amos van Dijck**, a Master's student enrolled at Aberystwyth University in Wales, joined us for the summer, working on the CardioQ-RP study with Zoë Brown and Matthias Görges.
- **Wesley Chu**, a recent UBC grad, joined the team in September as a volunteer and has been working on the Screen-My-Sleep and POPAPT projects.

## AWARDS AND ACHIEVEMENTS

The PART continued its success at various local, national and international venues:

The team won two awards at the APAGBI annual meeting in Aberdeen in May 2015. Winner of the ***1st prize for free papers (oral presentation)*** went to **Joy Dawes** (presenter), **E Cooke**, R Jimenez-Mendez, **K Brand**, **P Winton, G Lauder**, B Carleton, G Koren, K Aleska, M Rieder, **C Montgomery** for '*Pharmacokinetics of single dose oral morphine in healthy children following surgery*'. The award for ***Best Poster Presentation*** went to **Heng Gan**, **W Karlen**, **D Dunsmuir**, **G Zhou**, **M Chiu**, **G Dumont**, **M Ansermino** for '*Comparison of the performance of a mobile phone respiratory rate counter with the WHO ARI Timer*'.

**Ainara Garde** received the 2015 CFRI Outstanding Achievement by a Postdoctoral Fellow Award, given each year to a fellow, who has demonstrated outstanding achievement in research aimed at improving the health and wellbeing of children and/or families. **Ainara** also received the ***2015 Young Investigator Award in Respiratory Sleep Medicine***, from the World Association of Sleep Medicine in February 2015, a travel award that allowed her to attend the 6th World Congress on Sleep Medicine in Seoul, Korea.

*Right: Fellow Ainara and Fernando at the 2015 Fellows Dinner*

The team's **RRate app** received a ***2015 Connected to the Community Award*** for its use of wireless technology to improve the lives of Canadians. This award is an opportunity for the Canadian Wireless Telecommunications Association to pay tribute to outstanding organizations in recognition of their partnerships with Canada's wireless industry. The award ceremony was held in Vancouver on April 16, 2015. *Left to right: CWTA President Bernard Lord; PART Software Developer Dustin Dunsmuir, Prof Guy Dumont, and George Heyman, MLA for Vancouver-Fairview. Photo credits: CWTA*

Director of Technology Development, **Chris Petersen**, received the ***2015 STA Fresenius Research Grant Award*** for his work on *Anesthesia EEG simulator for depth of hypnosis index validation*. Doctoral candidate **Parastoo Dehkordi** was awarded a ***MITACS Accelerate Fellowship*** with co-funding from LGTmedical to work on *Sleep apnea screening algorithms for pulse oximetry utilizing analog sensors on a mobile device*. Finally, **Anthony Emmott**, PART undergraduate student trainee and now UBC medical student, was awarded a ***UBC Faculty of Medicine Summer Studentship*** for his work with **Gill Lauder** on the *Post-discharge audit of pain in children undergoing tonsillectomy and/or adenoidectomy*.

## COLLABORATIONS

Our research collaborations continued to grow in 2015, both within UBC with other local, national and international academic and industry partners. Our collaborators in 2015 included:

Onsite at the Children's and Women's Health Centre of BC

- **Cherry Mammen** of **Nephrology** and **Firoz Miyanji** of **Orthopaedics** have worked on a project led by Zoë Brown and Matthias Görges to develop and test a goal-directed fluid therapy approach in spine patients.
- **Theresa Newlove** of **Psychology** has been working with Chris Petersen to develop a prototype mobile app designed to support belly-breathing to reduce pain and anxiety experienced by children during routine medical procedures such as blood draws and wound cleaning.
- **David Wensley** and **Heather Beals** of **Respiratory Medicine** and **Neil Chadha** of **Pediatric Otolaryngology-Head and Neck Surgery**, have been collaborating on a study co-led by Ainara Garde and Mark Ansermino on the efficacy of the Phone Oximeter for parent-led, overnight, at-home assessment of obstructive sleep apnea severity in children. **Patsy Regan** in the ENT clinic has greatly supported PART with the Sleep Apnea: Pulse Oximetry Pre- and Post- Tonsillectomy.
- **Shu Sanatani** and **Elizabeth Sherwin** of **Cardiology** are collaborators on a project led by Simon Whyte and Liz Allison on the effects of dexmedetomidine on myocardial repolarization, blood glucose and potassium concentrations in children.
- **Terri Sun**, a UBC Anesthesia resident, has joined Mark Ansermino, Gill Lauder, Nick West and Dustin Dunsmuir in developing the next iteration of Panda, our mobile app designed to support post-operative pain management at home.
- From the BC Children's nursing teams: **Jennifer Koch** assisted with our evaluation of the respiratory acoustic monitor (RRa) on the post-surgical ward; **Julie Bedford** has been collaborating with Simon Whyte and Matthias Görges in various NSQIP/quality improvement initiatives; **Trish Page** has continued to support PART endeavours in the surgical day care unit this year, in particular with the Child Life study and the audit of post-discharge pain following tonsillectomy procedures.

Around the Lower Mainland

- **Richard Merchant** and the Anesthesia Department at the Royal Columbian Hospital worked with PART on the Pre-Operative Warming Study (POWS) and the iControl-RP (Closed-loop control of remifentanil and propofol) study, both of which were completed this year.
- **Sukh Brar** of the Anesthesia Department at Royal Columbia Hospital was supported by Nick West, Erin Cooke and Nasim Lowlaavar in collecting data at RCH for the Canada-wide Transfusion Algorithm Cardiac Study.
- **Donald Griesdale**, intensive care physician and anesthesiologist at Vancouver General Hospital helped lead our Continuous Sedation Monitoring Study in the VGH Intensive Care Unit.

- **Fernanda Almeida** of **UBC Oral Health Sciences**, began a new collaboration with PART co-led by Ainara Garde to study use of mobile phone-based pulse oximetry to assess sleep disordered breathing severity in adults at home.
- **Matthew Yedlin** of **UBC Electrical and Computer Engineering** continued collaborating with our team on a project led by Guy Dumont to extend the capabilities of mobile phone-based pulse oximetry.
- **Ian Mitchell** of **UBC Computer Science**, is part of team led by Guy Dumont that is working towards certifiably safe closed-loop control for anesthesia.

Within Canada

- **Paul McBeth** of **Critical Care Medicine, University of Calgary**, supported our work on the Continuous Sedation Monitoring Study at VGH.
- We have once again had the opportunity to work with **Carl von Baeyer** of the Departments of Psychology and Pediatrics, **University of Saskatchewan**, and the Faculty of Medicine, **University of Manitoba**, on a study evaluating novel tools for self-reported pain scores in preschool-aged children.

International and Global Health Partners

- We advised on protocol development and provided the technology infrastructure to allow **Dr Tiina Jaaniste** and her team at the **Sydney Children's Hospital** in Australia to evaluate pain scoring tools for younger children in their emergency department.
- Our team worked closely on several global health projects proposals with our long time collaborators **William Macharia and Bob Armstrong (Aga Khan University) along with Tex Kissoon (BC Children's Hospital).**
- **Andrew Macnab**, and **Babak Shadgan** of the **UBC Bladder Care Centre** are lending their NIRS expertise to a team led by Mark Ansermino to research and prototype a NIRS-based device to assess tissue oxygen saturation in children with malnutrition and pneumonia in low-resource settings.
- Our team continues to collaborate with **Peter von Dadelszen's** UBC research team, including work on PIERS (Pre-eclampsia Integrated Estimate of RiSk) on the move – development and evaluation of a mobile clinical decision aid for use in women with a hypertensive disorder of pregnancy

Industrial

- We continue to work closely with **NeuroWave Systems Inc.**, Cleveland, Ohio, to evaluate EEG monitoring during anesthesia and its role in supporting closed-loop control of anesthetic drugs.
- We began a three year NSERC Collaborative Research and Development project with our spin-off company **LGTmedical** to study ways of extending the capabilities of mobile device based pulse oximetry
- We have continued to collaborate with **Medtronic** to examine patient monitoring technology.

## FUNDING

The PART currently employs 11 research staff and more than 12 trainees. As in previous years, the lack of long-term, secure funding to maintain the key administrative and infrastructure support is a risk to the team's viability.

In 2015 the team submitted a total of 37 applications, including: 20 operating and/or equipment grant proposals (4 successful and 5 pending); 14 studentship, fellowship, and/or salary award applications (5 successful and 3 pending); and 3 honour award applications (1 successful and 1 pending).

Funds requested in 2015 totalled $31,683,474, including several large-scale global health initiatives. Funds requested for local projects totalled $6,528,452. Of the 37 applications and proposals submitted, 10 were successful, 21 were unsuccessful, and 6 are pending, giving us a success rate thus far of 32%.

Some notable successes include:

- Seed funding the from the CFRI Evidence to Innovation research theme group to begin Dr Simon Whyte's study on the effects of Dexmedetomidine on myocardial repolarization, blood glucose and potassium concentrations in children.
- An industry-partnered Collaborative Research and Development grant from NSERC and LGTmedical, to extend the technical capabilities of the Pulse Oximeter and create a neonatal/pediatric sensor.
- An operating grant from the Alva Foundation to evaluate using the Phone Oximeter to assess obstructive sleep apnea in children from the comfort of their own beds.
- A Proof of Principle Phase 1 grant from CIHR to formalize and extend the current iControl safety system to facilitate regulatory approval for our closed-loop, dual-drug, total intravenous anesthesia control system.
- An Explorations grant from Grand Challenges to collect initial data towards creating a non-invasive diagnostic and treatment monitoring device that uses near-infrared spectroscopy device to assess muscle oxygen saturation in children with malnutrition and pneumonia in low-resource settings.

We were also one of 7 finalists from 386 applicants for the Caplow Children's Prize. Now in its third year, this annual, global competition funds the best and most effective child survival project proposing to save the greatest number of children's lives.

We have many applications pending for exciting projects that we hope to report to have begun by next year! We encourage all those in the Anesthesia Department at BC Children's Hospital to consult with our full-time Grants Facilitator, Mika Johnson, when considering a new project or funding opportunity.

## COMMUNITY ACTIVITIES

### The Sensor Project

The first fundraiser for the Sensor Project was held on May 28, 2015, raising more than $13,000 for a life-saving initiative in the developing world led by UBC clinicians and scientists. Visit the www.thesensorproject.org to read more and donate.

*Right: Mark Ansermino demonstrates the sensor to Mossadiq Umedaly and Mary Nabukenya*

### UBC Faculty & Staff Sports Day

The *PARTy Animals* made a return appearance at the annual UBC Faculty & Staff Sports Day. This event is for all UBC staff, faculty and graduate students. It's a great way to get physically active and a good opportunity to do team building through physical and intellectual challenges.

*Left: Dustin, Nancy, Mika, Anthony, Sonia and Manil… PARTy-crocs?*

### ChildRun

Team members of all ages completed the 5 km course around the hospital neighbourhood. The ChildRun supports oncology research at BC Children's Hospital, and the PART has been an annual participant for more than 10 years. The run raised $1 Million for research.

*PART-Time runners at the 2015 Child Run*

**BRITISH COLUMBIA WOMEN'S HOSPITAL & HEALTH CENTRE**

**David Lea MD FRCPC**
**Acting Head – Department of Anesthesia**

**Staffing/Recruitment**

We are continuing to do the work of 16-17 FTE with 13.5 FTE due to lack of a contract. The departments "out of office hours" burden of work sits at 43%.

The department has continued to advocate to the Ministry of Health and the PHSA to increase funding to allow further recruitment and provision to have 2 in house anesthesiologists 24/7 for patient safety. Currently only one in house anesthesiologist is available in weekday evenings and throughout the weekend days.

**Anesthesia Assistant**

BCWH has hired a new part time Anesthesia Assistant and has gained a 0.5 FTE. This has increased coverage for anesthesia assistants from 0700 to 1930 seven days a week.

**Clinical Fellowship Program**

The clinical research fellowship training at BC Women's is sought after nationally and internationally. Given the high delivery rate at about 7 000 babies per year we have capacity for three clinical-research fellows in the department. Historically, our fellows have been mainly from UK, Australia, and New Zealand. However we also trained fellows from United Arab Emirates, Mexico and Brazil. The fellowship program allows for 40% research protected time. Each fellow is expected to complete a clinical research study during the fellowship year and is expected to submit research abstracts to SOAP and the CAS for presentation. Fellows are expected to work as junior staff after the initial month, and to date our fellows have all proven themselves capable and all find the experience of having to organize activities in our busy LDR and OR very useful for their future careers. Fellows are scheduled into internal medicine, hematology and high risk ultrasound clinics as part of their rota in order to expose them to the work of our colleagues in obstetrical and maternal-fetal medicine. In addition, they take a clinical epidemiology course at UBC and are invited to be part of monthly cardiac obstetrical rounds hosted by Dr. Marla Keiss at SPH.

**Education:**

The department continues to be involved in resident and medical student education. We had a successful Obstetric Academic Days in 2015. Although many departmental members participated, Dr. Villar is to be congratulated for organizing this important month of activity. We continue to have weekly Thursday morning resident seminars which are mandatory for residents and involve case-based discussion on pre-assigned topics each week, facilitated by a staff person or fellow.

We continue to work on how to incorporate the new practice of pre-puncture US before epidural and spinal placement, without undermining the importance for residents to be able to develop the

"feel" of epidural placement. Drs. Gunka and Massey are actively involved in developing a prototype US probe that can provide real-time imaging during neuraxial procedures, which is the next step in the evolution of teaching how to perform neuraxial techniques safely to learners.

Recently the department has purchased a trans-thoracic echocardiogram probe and hope to incorporate this as part of the training program once staff have sufficient experience.

Monthly Interdisciplinary rounds with Obstetrics, Family Practice, Midwifery and Nursing continue to explore controversial topics of interest to all departments with various departmental members presenting. The department continues to reach out to the community by providing expertise and consultation in the area of obstetric anesthesia. The OB Div News written monthly by Dr. Joanne Douglas continues to reach out to a broad international audience of anesthesia providers.

**Research:**

We continue our active research program with the assistance of our invaluable research assistant Alison Dube. We typically have 3-4 research projects active at any given time. Dr. Gunka has been the research/fellow director since 2012. Dr. Simon Massey has been participating in research projects and mentoring of fellows.

**Quality Improvement**

Department members actively participate in hospital quality activities including the Best Practice Committee, Quality Surveillance and Analysis Committee and the Patient Safety Committee. Peer Review is now part of our required work with each member undergoing an indepth assessment every 3 years. We have chosen to include procedural observation as well as chart audit as part of the department's process.

BC Women's continues to use "imPROVE" – a LEAN strategy of continuous quality improvement for improving efficiency without compromising quality of care. Site redevelopment is now using a LEAN strategy – Integrated Facilities Design, to create the high level spaces in the new critical care building.
The Department holds Morbidity and Mortality rounds once a month – difficult cases are discussed, as well as items such as airway protocols which have arisen from a case.

Current Audits:

1. Anesthetic complications (ongoing annual review)
2. Mobility with Labour Epidurals pre and post automated intermittent bolus

**The Future**

We continue to be challenged by our clinical workload given the high proportion of after-hours work and ageing workforce. Over the next 2 years I expect 2 staff to retire. The hope for a contract from PHSA that provides for appropriate coverage on evenings and weekends remains a hope.

The new acute care building expansion of the C&W site offers the opportunity to expand the Gynecology Daycare Surgical Program from 1 OR to 5 ORs. We look forward to this opportunity to have more regular daytime work hours. There is also a new HDU unit on the horizon which will have four beds. However, the new building and renovation to the existing building will not be completed until 2018-19.

**Committee Memberships:**

**University:**

| | |
|---|---|
| Dr. Paul Kliffer: | College of Physicians and Surgeons Committee for developing privileging guidelines |
| | UBC Anesthesia Simulator Group |
| | R5 Seminar Series |
| Dr. Roanne Preston: | FOM Department Head |
| | Faculty Executive |
| | FOM Finance Committee |
| | FOM MSS Subcommittee #4 chair |
| | Residency Training Committee |
| | CaRMS selection committee |
| | Journal Club Organizing Committee |
| | R5 Seminar series |
| | PEPUA Program Director |
| Dr Vit Gunka | CaRMS selection committee UBC promotions committee |
| Dr Mike Wong | UBC Residency Training Committee |
| | UBC GP Anesthesia Residency Training Committee |
| Dr James Brown | University Faculty Executive |
| | Clinical Faculty Affairs Committee |
| Dr. Naomi Kronitz: | Member, Residency selection committee |
| Dr. Paul Sahota: | Undergraduate Site Coordinator |
| | R5 Seminar Series |
| Dr. Giselle Villar: | Site Resident Coordinator |
| | Residency Training Committee |
| | R5 Seminar Series |

**Hospital:**

| | |
|---|---|
| Dr. Roanne Preston: | CST project department representative |
| Dr. Paul Sahota: | CST project department representative |
| Dr. Joanne Douglas: | Case Review committee |
| | Advisory Board Women's Health Research Initiative |
| Dr. Vit Gunka: | Fellowship program director |
| Dr Mike Wong : | BCWH Site Redevelopment |
| | High Acuity Unit Model of Care |
| | Department Head Search Committee |
| Dr James Brown: | Modified Early Obstetric Warning Score (High Acuity Unit Project) |
| Dr. David Lea: | member, C&W Code Blue Committee |
| | co-chair BC Women's Code Blue Committee |
| | member, RT Advisory Committee |
| Dr. Phyllis Money: | member, C&W Code Blue Committee |
| | member, RT Advisory Committee |
| | member, BCW Multidisciplinary Rounds Organizing Committee |

| | |
|---|---|
| Dr. Giselle Villar: | member, Acute Perinatal Best Practice Committee |
| Dr. Simon Massey: | member, DVT/PE working group |
| Dr Paul Sahota | Obstetrics and Gynecology Department Head Search Committee |

**Departmental:**

| | |
|---|---|
| Dr. Susan Bright | member, Department of Anesthesia QA committee<br>Omni business manager |
| Dr. David Lea: | Department of Anesthesia Equipment Manager<br>Member, Departmental QA Committee |
| Dr. Naomi Kronitz: | Omni Negotiator and Co-lead |
| Dr Paul Kliffer | Omni Negotiator and Co-lead<br>Residents OB Simulation |
| Dr. Vit Gunka: | Research and Fellowship Director |
| Dr. Phyllis Money: | Medical Information Technology Liaison |
| Dr. Simon Massey: | Departmental M+M rounds coordinator |
| Dr James Brown | Residents OB Simulation |

**Outreach Activities:**

| | |
|---|---|
| Dr James Brown: | Internal Journal of Obstetric Anesthesia Peer Reviewer<br>Lead Obstetric Editor Anesthesia Tutorial of the Week (ATOTW) |
| Dr. Joanne Douglas: | North American Editor International Journal of Obstetric Anesthesia (IJOA)<br>Reviewer: CJA, RAPM, Anesthesia and Analgesia, PSI<br>Associate Editor: Regional Anesthesia and Pain Medicine<br>Member CEPD committee CAS<br>Member SOGC VTE in pregnancy Guideline Committee |
| Dr. Roanne Preston: | Guest reviewer CJA, IJOA, EJA, JOGC, JClin Anesthesia<br>Vice-President ACUDA and Chair Management Committee ACUDA |
| Dr. Paul Sahota: | PHSA rep for BCAS |

**Grants:**

1. CIHR/PSI Grant 2014-2017 $399,000 for SQOR: Surgical Quality Outcomes Report. PI Roanne Preston. Co-PIs Malcolm Maclure, Colin Dormuth, Gary Redekop

**Special Highlights (Honours)**

1. Order of Canada – Dr. Joanne Douglas

**Service to the community**:

| | |
|---|---|
| Roanne Preston: | Co-chair Organizing Committee for Cycle for Sight Westcoast for the Foundation for Fighting Blindness. |
| Dr. Su Bright: | Marriage Officer for the Baha'i community of Abbotsford<br>- teach Baha'i children's classes, Junior youth classes, facilitate Ruhi study circles for adults on an interfaith committee for Abbotsford Bridges of Faith |

1. **Cardiac Anesthesia:**

Dr. Bobby Lee is the Head of the UBC Division of Cardiac Anesthesia and directs the Cardiac Anesthesia program at St. Paul's Hospital. The Cardiac Anesthesia Fellowship program continues to attract good interest under the lead of Dr. Kevin Rondi, the Cardiac Fellowship lead. 2015 has seen the ongoing development of a research program in percutaneous endovascular aortic valves, and trans-apical aortic valves, where Anesthesia has participated both in the combined interventional and cardiac OR and post-operative care. There continues to be a number of research initiatives in the planning phase in Cardiac Anesthesia. Cardiac transplantations and heart failure devices continue to evolve and increase.

In the past fiscal year there were 801 Open Heart Procedures with 20 Cardiac Transplants, 189 percutaneous valves and 19 VADs. The Trans-esophageal Echocardiography group comprises 7 anesthesiologists who cover a call group in conjunction with Cardiology. This multi-disciplinary approach to Trans-Esophageal Echo has proven to be useful. TEE rounds have become increasingly popular with Surgeons and Cardiologists joining Anesthesia for these. Anesthesiologists continue to play a crucial role within the Cardiology/Cardiac surgery combination of care.

Anesthesia involvement with Electrophysiology procedures has resulted in 295 Cardiac Defibrillators, 365 Pacemakers and 905 Electrophysiology procedures. As well Laser Lead Extraction continues to increase.

2. **Division of Acute and Interventional Pain Management:**

Dr. Bill McDonald retired as Division Head this year and Dr. Jill Osborn has taken over. Dr. Colm Cole, Dr. Clinton Wong, Dr. Alan Berkman, and Dr. Brenda Lau continue to work on staff. The Acute Pain service portion of this division treated over 1000 inpatients with PCA, regional and epidural analgesia in the last year. Increasing use of various nerve catheters continues to grow.

The chronic pain diagnosis and management portion of this division had over 425 fluoro assisted and over 1500 non-fluoro injections in the last year. Increasing numbers of Spinal Cord Stimulators are being inserted in conjunction with Neurosurgery, and 416 intrathecal pumps. Neuromodulation is becoming a growth industry. This is the only multidisciplinary chronic pain clinic in the province, and provides services with outreach to many areas outside the lower mainland. Given its unique and well-planned efficiency this is hoped to be used as a model for the evolution of various chronic pain programs in the province

**3) Regional Anesthesia:**

Our regional anesthesia program remains the busiest in the Province, with more that 2500 nerve blocks performed in 2015. In addition, we are extremely active in resident and fellow medical education, community anesthesiologist education, and research.

Main OR block room:

2015 was a very active year for the regional anesthesiologists at Providence Healthcare.

Our main OR block room completed a total of 1893 blocks. These blocks consisted of a variety of upper and lower limb single shot and continuous catheter techniques. Our regional anesthesiology group has grown to include 11 regional anesthesiologists, all of whom who have advanced skills as well as a special interest in regional anesthesia. In addition to our existing busy clinical practice in the main OR block room, we have expanded our services to now include a telephone follow-up call to all out-patients on post-operative day one following their regional block. We feel that this service not only improves patient care and communication, but can also support quality assurance and research initiatives.

Surgical Procedure Rooms:

Our surgical procedure rooms also had a busy year in 2015, during which 780 cases were completed. Our scope of work has also expanded in the SPRs to include tumescent anesthesia for radiofrequency ablation of varicose veins. To achieve this, our regional anesthesia group has collaborated with the vascular surgery department to provide a high efficiency swing room model of care for radio-frequency ablation of varicose veins. The anesthetic care involves using our existing expertise in ultrasound guided regional anaesthesia to deposit a high volume, low concentration tumescent local anaesthetic buffer around the pathologic vein, thereby protecting the patient from painful stimuli and shielding their healthy tissues from collateral injury as the vein is ablated with a radio-frequency ablation catheter. Since patients receive only mild sedation they are routinely discharged within 10 minutes of completion of the procedure. The collaborative project has allowed a previously non-MSP funded surgical procedure to be available to patients under the general medical care system.

In addition to providing provincial leadership in the field of resident and fellow education in regional anesthesia, many of our members have made significant teaching contributions at the consultant level, both nationally and internationally in 2015. For example, our members have been appointed to be workshop teachers at a number of conferences, including the Networking World Anesthesia Conference, the Whistler Anesthesia Summit, and the Canadian Society Anesthesiologists.

Recognizing a desire for advanced regional anesthesia skills among community anesthesiologists, our group is in the process of developing short term educational opportunities (usually a few days), in which anesthesiologists from across BC may spend time in our Department to develop their regional anesthesia skills, and to learn some of the organizational aspects of running a block room. Similarly, in 2015 we also began to plan short term observership courses for emergency medicine fellows. We hope to expand these programs in the years ahead.

**3. Obstetrics:**

The department participates in the care of obstetrical patients. The number of obstetrical patients continues to be 1700 per year at St. Paul's with some increased pressure to monitor high risk pregnancies and pregnancies with coexisting cardiac disease. An epidural PCEA service has now been implemented. Anesthesia continues its involvement with the perinatal services committee.

**4. Pre-Admission Clinic:**

The Department continues to evolve a state of the art Pre-Admission Clinic. The latest initiatives include website development with patient education being a focus. A LEAN process has completely revamped this area leading to improvements in patient flow and care. Over 3000 anesthetic consults occurred in the last year.

**5. High Acuity Beds:**

The Development of four high acuity beds using a unique blend of medical-surgical nurses and Par nurses has been working well for the last 2 years. This helps address the need for some type of surgical step-down beds. Management by anesthesia should has allowed an increase in numbers of patients flowing through the PACU as well as an opportunity to improve patient care peri-operatively

**7. CSICU:**

The CSICU continues to evolve under a small subset of anesthesiologists including 2 with intensivist backgrounds. The increasing number of heart failure patients receiving surgical intervention continues to increase. This change in the demographics of the cardiac patients is a particular challenge given the workload in the CSICU. This is a fruitful area of research. The major research focus in the CSICU however continues to be that of delirium and to that end a significant research group has evolved. They are in the process of creating a retrospective data base that will hopefully inform future prospective trials.

**8. Fellowships:**

Dr. Steve Petrar is the Fellowship Director with Dr. Alex Klimek as the outgoing Regional Anesthesia Program Director. Dr. Kevin Rondi is the lead for Cardiac Anesthesia and Echocardiography Program directions. Our current Fellow in Regional Anesthesia, Dr. Nick Dennison will be with the department until August 2016. Incoming Fellows are as follows:

**Incoming Fellows:**
Jason Wilson Regional Anesthesia (July 2016 - July 2017)
Jean Raubenheimer Cardiac Anesthesia / Echo (July 2016 - July 2017)
Alex Kumar Regional Anesthesia (July 2017-July 2018)

Dr. Petrar continues to work on advertisement and outreach & applicant data, curriculum development and future outlook and areas to address to ensure a robust and continuing Fellowship program at St. Paul's Hospital.

**9. Research Activity:**

Dr. Stephan Schwarz as Research Director continues to bring a rigorous rational approach to the department. His association with our Pharmacology colleagues has resulted in cooperation and joint research interest. The department now has 2 graduate students in its employ as well as a cardiac anesthesia fellowship candidate. Dr. Schwarz also holds the prestigious title of the Dr. Jean Templeton Hugill Chair in Anesthesia.

The research of one of our members, Chris Prabhakar, has also been featured in the following video in "Anesthesiology News": http://www.anesthesiologynews.com/Multimedia/Article/05-16/Echogenic-Needles-Provide-Best-Needle-Visualization-at-Steeper-Angles-of-Insertion/36408

***Presentations:***

1. Jenkins M, Boyd JH, Lazosky L, **Sirounis D**: The cost of Varying Degrees of Renal Failure in a Quaternary Care University Hospital. *Society of Critical Care Medicine 2015 Congress*; Phoenix, AZ, USA; January 17–21, 2015.
2. Sunderland S, **Yarnold CH**, **Head SJ**, **Osborn JA**, **Schwarz SKW**: Regional vs general anesthesia and the incidence of unplanned physician visits for postoperative pain following wrist fracture surgery. *2015 UBC Whistler Anesthesia Summit*; Whistler, B.C.; February 26–March 1, 2015.
(Paper awarded First Price in the poster competition [Sarah Sunderland])
3. Tse L, **Bowering JB**, **Schwarz SKW**, **Moore RL**, Burns KD, Barr AM: Delirium outcomes in transcatheter aortic valve implantation. *2015 UBC Whistler Anesthesia Summit*; Whistler, B.C.; February 26–March 1, 2015.
4. **Bosma TL**, Yeong, SK: Peri-operative Emergency Management (POEM) interdisciplinary simulation course. *Trauma 2015 Annual Scientific Meeting & Conference* (Trauma Association of Canada); Calgary, AB; April 10–11, 2015.
5. **Prabhakar C**: Ultrasound-guided needle visualization using echogenic needles and beam-steer technology. *The Dalhousie University Department of Anesthesia, Pain Management, and Perioperative Medicine 2015 Research Day*; Halifax, NS; April 24, 2015.
6. Tse L, **Schwarz SKW**, **Bowering JB**, **Moore RL**, Barr AM: Influence of anesthesiologists on the incidence of delirium after cardiac surgery: A historical cohort study. Selected for oral presentation at the *Ninth Annual UBC Dept. of Anesthesiology, Pharmacology & Therapeutics Research Day*; Vancouver, B.C.; May 5, 2015.
7. Young DJ, **Head SJ, Schwarz SKW**: A retrospective quality assessment of the effects of peripheral nerve blockade on analgesic requirements following foot & ankle surgery at St. Paul's Hospital. *Ninth Annual UBC Dept. of Anesthesiology, Pharmacology & Therapeutics Research Day*; Vancouver, B.C.; May 5, 2015.

The research of one of our members, Chris Prabhakar, has also been featured in the following video in "Anesthesiology News": http://www.anesthesiologynews.com/Multimedia/Article/05-16/Echogenic-Needles-Provide-Best-Needle-Visualization-at-Steeper-Angles-of-Insertion/36408

## 10. Teaching

All members of the Department are actively involved in the teaching of medical students and residents. By necessity most of this takes place in the OR, however there are also many sessions outside of the OR especially for oral exam practices. This now involves third and fourth year students rotating through the department. Dr. John Bowering has finished his last year as Royal College Examiner. The anesthesia residents have uniformly found the teaching experience at St. Paul's Hospital valuable. Dr. Matt Klas continues as Program Director for the UBC Department of Anesthesia Residency Program and for Resident training at SPH. Various members participate in the residency selection process.

Members of the department are also involved in teaching residents from Medicine, Emergency Medicine, and Family Practice in addition to respiratory therapists and OR nursing students. Dr. Scott Bell and Dr. Kevin Rondi coordinate the Anesthesia CME Program given to GP Anesthetists each year.

## 11. Anesthesia Assistants

The Anesthesia Assistants at St. Paul's now consist of 9 members but there is a shortage with the new programs of regional anesthesia and perioperative medicine coming on line. Dr. Jim Prentice continues in his role as a liaison for the anesthesia assistants to try and recruit and retain the proper individuals.

## 12. Quality Assurance

Under Dr. Trina Montemurro:
Quality Assurance within the Department is increasing in both nature and scope to reflect the changes that the organization is going through and to support the initiatives of the BC Anesthetists' Society. Regular Quality Assurance meetings occur at least 4 times yearly, with review of critical incidents and morbidity led by Dr. Bobby Lee.

## 13. Simulation

The CodePINK simulation program is a multidisciplinary simulation curriculum that runs 6 times per year. Two scenarios take an Obstetrician, Anesthesiologist, Anesthesia Assistant, OR nurses, Maternity nurses and PAR nurses through a maternal fetal crisis from the ward through patient transport into OR and skin incision. Debriefing focuses on system issues as well as team communication, decision making and situational awareness. This program is run through funding from the St Paul's Hospital Foundation. Work has started to expand this type of multidisciplinary simulation at St. Paul's Hospital.

## Future Directions

The Department of Anesthesia at St. Paul's Hospital will continue to develop as one of the larger departments in Providence Health Care. This will certainly bring changes to the department both as a result of external pressures as well as internal changes within the organization. Expansion of the Cardiac Surgery Program into trans-apical values has resulted in an endovascular OR suite

where Trans-femoral aortic valves are also performed. This also supports vascular surgeries involved in endovascular stents. The CSICU continues to evolve under a small subset of departmental anesthesiologists. Future evolution of the surgical approach to heart failure as well as research initiatives in delirium promise to take it in new directions.

The Department continues to explore opportunities in alternative funding of anesthesia delivery. It views itself as a leader in innovative solutions and is attempting to work within the greater provincial funding to find new ways of allowing anesthesiologists to practice.

The Department therefore continues to recruit and energize its membership. Despite continuing changes the next year or two should show great evolution in our involvement with UBC, hospital and research.

Dr. Randy Moore's term as Department Head ended early 2016 and Dr. James Kim from Lions Gate Hospital has been hired as the new Department Head.

**COMMITTEE MEMBERSHIPS**

**UNIVERSITY**

| | |
|---|---|
| Dr. John Bowering | Research Committee<br>Residency Training Committee |
| Dr. Randell Moore | Clinical Promotions Committee, UBC<br>Executive Committee, UBC |
| Dr. Matthew Klas | UBC Resident Program Director<br>Resident Selection Committee<br>Residency Training Committee |
| Dr. Stephen Head | Director, UBC Regional Anesthesia |
| Dr. Laine Bosma | Director, UBC Simulation<br>Residency Site Supervisor |
| Dr. Cynthia Yarnold | Chair, UBC Anesthesiology Whistler Conference<br>Residency Site Supervisor |
| Dr. Trina Montemurro | Chair, Residency Selection Committee<br>Quality and Safety Member, St. Paul's |
| Dr. Brian Warriner | Professor and Past Head<br>UBC Department of Anesthesia |
| Dr. Ron Ree | Director R5 Seminar Series |
| Dr. Jennifer Berezowskyj | Medical Student Coordinator, SPH |

**HOSPITAL**

| | |
|---|---|
| Dr. Brian Warriner | Professor<br>UBC Department of Anesthesia |
| Dr. John Bowering | Director of Cardiac Anesthesia<br>Co-Director of CSICU |
| Dr. Randell Moore | Chair, Department of Anesthesia<br>Medical Advisory Committee<br>Surgical Areas Committee<br>Pharmacy and Therapeutics Committee |
| Dr. Ioana Dumitru | Transfusion Committee |
| Dr. Matt Klas | Echo Rounds Coordinator |
| Dr. William McDonald | Pain Advisory Committee<br>Subcommittee on Pain |
| Dr. Jim Prentice | Technical Officer<br>Coordinator, SPH/Cariboo College Anesthesia Assistants Program<br>Anesthesia Assistants Program |
| Dr. Jill Osborn | Acute Pain Division Head |
| Dr. Matthew Coley | Perinatal Care Committee |
| Dr. Stephan Schwarz | Research Director |

**OTHER**

| | |
|---|---|
| Dr. Randell Moore | BCMA Tariff Committee<br>Transfusion Medical Advisory Group (TMAG)<br>Provincial P & T Committee |
| Dr. S. Head | BCAS Exec Committee |
| Dr. T. Montemurro | BCAS Safety Committee |
| Dr. Brian Warriner | Reviewer, Canadian Journal of Anesthesia,<br>Canadian Hospital Accreditation |
| Dr. Clinton Wong | ACUDA |

**VANCOUVER ISLAND HEALTH AUTHORITY**

**<u>Tom Ruta,MD FRCPC</u>**
**Department Head and Medical Director for Vancouver Island Health Authority**

Site Chiefs

| | | |
|---|---|---|
| 1. | Royal Jubilee Hospital | Maureen Murray |
| 2. | Victoria General Hospital | Terry Murphy |
| 3. | Cowichan District Hospital | Ken Pettapiece |
| 4. | Nanaimo Regional Gen Hosp | Georgia Hirst |
| 5. | Westcoast General Hosp | Marek Rozwadowski |
| 6. | Campbell River Hospital | Chris Pollitt |
| 7. | St Joseph General Hospital | Alex Blais |

QA/QI Chair: Mike Atherstone
CME Coordinator: Shuen King

Island Health Anesthesia Team:
1. Evan Effa
2. Larry Dallen
3. Scott Nielsen
4. Chris Pollitt

Education Representative:
Trevor Herrmann
RJH: Paul Serowka
VGH: Kim Stevenson

Simulation:
1. Angela Enright
2. Mike Atherstone
3. Shuen King
4. Stan Vuksic

Pediatric Anesthesia
1. Callie Leiopoldt
2. Des Sweeney
3. Jacques Smit
4. Logan Lee

Cardiac Anesthesia
1. Brent Caton
2. Mike Kinahan
3. Paul Serowka
4. Craig Bosenberg
5. Mike Van Der Wal
6. George Carvalho
7. Richard Gardiner

New Members joining the South Island Dept

1. Sara Waters
2. Meghan O'Connell
3. Lauren Zolpys
4. Sean Lougheed

Education;

Third year medical students continue to participate in a 2 week anesthesia rotation at RJH and VGH. Dr Logan Lee was recognized for his outstanding contribution to teaching medical students.

Fourth and 5th year UBC residents regularly visit RJH to get experience in vascular and thoracic anesthesia. There have been many residents arriving from other anesthesia programs as well.

Looking to 2016:

All members of the Department will be able to participate in simulations.

Members of the Department will be able to participate in MOREOB.

Dr. Waters will help complete and coordinate implementation of anesthesia critical incident checklists for the south island.

The EHR will continue to be implemented island wide in late 2016 or early 2017.

**University Hospital of Northern BC**
**(Prince George Regional General Hospital)**

**Dr.Nazar Murad, MD**
**Head, Department of Anesthesia**

The Chronic Pain service is staffed by one anesthetist with dedicated clinic space, clerk and an RN. I am pleased to report that Northern Health has agreed to undertake a comprehensive assessment of the current provision of chronic pain services within NH and construct a coherent plan for the future.
Lat year we began implementation of Surginet AIMS. Unfortunately our older anesthesia delivery units would not transfer data to the AIMS reliably and we therefore have a partial implementation until all of pir equipment is replaced.

Dr. M. Jamil Akhtar has taken on the role of Discipline-Specific Site Leader (DSSL) . We teach 3rd year medical students from the NMP for their mandatory anesthesia rotation, as well as many 4th years for electives, both from within BC and from other provinces. UBC anesthesia residents join us for one month rotations. They have been of a high standard and the department members continue to appreciate their presence at our facility. We also participate in the training of family practice residents.

The Northern simulation centre at UHNBC has enabled us to utilise high fidelity simulation for teaching airway management to medical students and family practice residents. Construction of a new learning and development centre is underway. It will provide an improved facility for simulation as well as space for other educational activities.

**Department Members:**

| | | | |
|---|---|---|---|
| Jamil Akhtar | Pejman Davoudian | Richard Kraima | Lucy Pearmain |
| Jason Cronje | Pal Dhadly | Shehzad Mehmood | Marshall Richardson |
| Olu Bamgbade | Petar Georgyev | Nazar Murad | Leon Terblanche |

# ***DIVISION REPORTS***

## DIVISION OF CARDIAC ANESTHESIA

***Head, Bobby Lee MD FRCPC***

**Resident Training**

The UBC anesthesia residents complete a two month cardiac anesthesia rotation at SPH and/or VGH, where both sites offer the opportunity to gain experience in the surgical contexts of: CABG, valve repair/replacement, and transcatheter aortic valve implantation. VGH offers exposure to manage patients undergoing major thoracic aortic vascular surgery. In contrast, SPH offers the experience of caring for patients with cardiomyopathies who require ventricular assist devices and/or heart transplantation. With the advent of newer percutaneous cardiac procedures, SPH also offers exposure to managing patients undergoing transcatheter mitral valve replacements/MV rings, and percutaneous ASD closures.

**CSICU**

Penultimate and final year UBC anesthesia residents complete a 1 month rotation in the CSICU, either at VGH or SPH. Given the increasing complexity of cardiac surgery patients over the past 10 years, this has resulted in an excellent learning experience for residents in managing complex patients with a variety of mechanical assist devices such as ECMO as well as challenging medical conditions often seen in the ICU such as septic shock. On occasion at SPH, we have had ICU fellows also rotate through the CSICU, a positive development resulting in bi-directional flow of knowledge between the ICU and CSICU.

**TEE**

For those final year residents with an interest in TEE, a 1 month rotation has been established at SPH. There is also an opportunity at RCH for a 2 month rotation to be spent with cardiologists. Though the objectives of the rotation are for residents to be able to conduct a detailed exam of cardiac and valvular function independently, most realistically, residents become comfortable with the basic TEE exam within this 1 month period.

**Fellowship Training**

A 1 - 2 year cardiac anesthesia fellowship is offered at SPH and at VGH. I have found it challenging to be able to find funding in order to fund a combined cardiac anesthesia/TEE/CSICU fellowship program where the fellow would spend time training at all three Lower Mainland sites VGH, RCH, and SPH. I believe the fellowship could be stronger in the clinical material offered and would benefit from each hospital's strengths, i.e. VAD/transplant at SPH, thoracic aortic/arch repairs at VGH.

**New Cardiac Anesthesia Staff Update**

At VGH, Drs. Sean McLean and Travis Schisler have come on staff this past year to join the cardiac anesthesia team in the near future upon completion of their fellowships.

At RCH, their contingent of cardiac anesthesia staff continues to expand with the recent return of Dr. Laura Duggan from Duke and the anticipated return of Dr. Brady Warnick from Ottawa.

Though I am not aware of new staff at Victoria or Kelowna yet, I am aware that the cardiac anesthesia program at Victoria is currently searching to add one more person to their contingent.

**UBC CARDIAC ANESTHESIA JOURNAL CLUB**

Though it is a challenge with limited funding opportunities, in December of this past year, we were able to resurrect the UBC Cardiac Anesthesia Journal Club with the help of Baxter at Cioppino's. Our guest speaker was Dr. Abeed Jamal, Clinical Assistant Professor for the UBC Department of Medicine, Division of Nephrology. Two articles were reviewed and the evidence discussed regarding Balanced IV Solutions in cardiac surgical/critical care patients. Cardiac anesthesiologists from all 3 Lower Mainland sites (VGH, RCH, and SPH) were invited as well as cardiac surgeons and perfusionists in order to promote the interdisciplinary aspect of such discussions. Follow up with participants as well as Baxter indicated that the event was welcome and an event to look forward to in the future given the plan is to continue these events on an annual/semi-annual basis.

## DIVISION OF NEUROANESTHESIA

***Head, Cynthia Henderson MD FRCPC***

The Division of Neuroanesthesia has been active in providing education to the Residents and Fellows in the subspecialty of Neuroanesthesia, continuing medical education for staff members and expert clinical care for neurosurgical cases. Residents in their R4 year spent one month in Neuroanesthesia at Vancouver General Hospital gaining expertise in routine and unusual cases in Neurosurgery, Neuroradiology, and Major Spine Surgery. During their Neuroanesthesia rotation, each resident made a presentation of an interesting case or topic at Neuroanesthesia Rounds which are held monthly and attended by members of the Department of Anesthesia. Quarterly Combined Neuroanesthesia / Neurosurgery Rounds are held with the Division of Neurosurgery to discuss interesting and mutually relevant topics and critical incidents. The Division of Neuroanesthesia was delighted to have an excellent Neuroanesthesia Fellow, Dr. Darreul Sewell for a one year period from July 2014 to July 2015. He worked on a project entitled Perception of Perioperative Stroke Risk in Non-cardiac, Non-neurologic Surgery during his fellowship.

In 2015, there were five core members in the Division of Neuroanesthesia - Dr. Cynthia Henderson (head), Dr. Bali Dhaliwal, Dr. Alana Flexman, Dr. Henrik Huttunen and Dr. Jon McEwen. There were three non-core members in the Division of Neuroanesthesia – Dr. Oliver Applegarth, Dr. Kelly Mayson, and Dr. Yvonne Peng, which provided increased exposure and resulting expertise to other members of the Department of Anesthesia. The non-core appointments are two years in length and are re-evaluated biennially. Dr.'s Kelly Mayson and Cynthia Henderson were gowned on May 7, 2015 after being promoted to Clinical Professors in the Faculty of Medicine at the University of British Columbia.

The collection of relevant Neuroanesthesia articles and Neuroanesthesia Rounds distributed to residents and Fellows has been expanded and placed on the G-drive for staff access. Guidelines and summaries of Neuroanesthesia considerations for various cases are being developed for residents and staff anesthesiologists assigned to the Neurosurgical theatre.

The biennial Residents' Academic Days in Neuroanesthesia and Anesthesia for Spine Surgery were presented on November 18 and 25, 2015 and lectures were given and supervised by Dr.'s Angineh Gharapetian, Don Griesdale, Cynthia Henderson, Lynn Martin, Kelly Mayson, Jon McEwen and Yvonne Peng. Members of the Division of Neuroanesthesia were actively involved in the R5 Senior Anesthesiology Residents' Preparatory Course and the UBC Anesthesia Departmental Residents' Oral exams. Dr. Henrik Huttunen ran the Anesthesia Residents' Airway Workshop in November 2015.

Several members of the Division of Neuroanesthesia organized and supervised the lectures and meetings of the Neuroanesthesia Section at the Canadian Anesthesiologists' Society meeting in Ottawa, Ontario in June 2015. Members attended and Dr. Alana Flexman moderated posters and lectured at the Society for Neuroanesthesia and Critical Care and American Society of Anesthesiology meetings in San Diego in October 2015.

In 2014, Dr. McEwen started a campaign to communicate with ward nurses and ICU physicians about quality issues in the Operating Room affecting spine patients during their recovery. There is a plan to start a similar campaign in 2016 with respect to Neurosurgery.

**Invited Presentations**

**Kelly Mayson**:

1) ERAS BC Collaborative Learning Session 2, Vancouver April 1, 2015
   "Postoperative Hypotension"
2) NWAC —Networking World Anesthesia Conference Vancouver April 30th 2015
   "Enhanced Recovery After Major Abdominal Surgery"
3) Richmond Anesthesia Evening Rounds June 18th, 2015
   "Enhanced Recovery After Major Abdominal Surgery VH's experience"
4) ACS NSQIP Annual Meeting—Poster and podium presentation Chicago July 2015
   "Audit of Multimodal Analgesia with the Implementation of a Colorectal ERAS program"
5) ERAS BC Collaborative Learning Session 3, Vancouver September 29th.
   "Guidelines for Fluid management in ERAS program"
6) McGill University SAGE/ERAS Society Canada ERAS annual meeting, Nov 2015, Montreal
   "Multimodal Analgesia for ERAS"

**Alana Flexman**:

| | | |
|---|---|---|
| Perioperative Stroke: Prevention, Management and Current Controversies | UBC Refresher Course for General Practitioner Anesthetists<br>Vancouver, BC<br>*Note: Highest rated speaker* | 2015 |
| The Pregnant Patient Requiring Urgent Craniotomy for Tumor Resection | American Society of Anesthesiologists' Annual Meeting<br>San Diego, CA | 2015 |
| Best Papers in Neuroanesthesia | Canadian Anesthesiologists' Society Annual Meeting<br>Ottawa, ON | 2015 |
| Neuroanesthesia Research Update | UBC Division of Neurosurgery Grand Rounds<br>Vancouver, BC | 2015 |

Students Supervised

Alana Flexman:

| | | |
|---|---|---|
| $3200<br>Supervisor | University of British Columba,<br>Summer Student Research Program<br>Title: Anesthesiologists' Perception of Perioperative Stroke Risk in Non-Neurologic and Non-Cardiac Surgery<br>*Co-investigator: Mr. Taren Roughead (MD Candidate)* | 2015 |

**Posters / Abstracts**

**Kelly Mayson:**

1) Quality Forum Vancouver February 2015
   a) "International Surgical Outcome Study—VGH results"
      Lavis K, Huang X, Argue R, Flexman A, Mayson K
   b) "Patient Satisfaction in an Enhanced Recovery After Surgery Program"
      Stobart L, Hong T, Bisallion A, Mayson K

2) Canadian Anesthesiology Society Meeting
   a) "Audit of Pain Management with the Implementation of a Colorectal ERAS Program"
      Mayson K, Stobart L, Flexman A
      --CASJ June 2015 Supplement: 85931
   b) "Reduction in Postoperative Complications with Active Pre-Warming"
      Ramsay N, Werry D, Flexman A, Mayson K
      --CASJ June 2015 Supplement: 86003

3) ACS NSQIP Annual Meeting July 2015
   a) "How the implementation of an Enhanced Recovery After Surgery Protocol Can Improve Patient Outcomes".
      Hong T, Mayson K, Warnock G, Panton N, Stobart L, Bisaillon A
   b) "Compliance of Anesthetic Compliance of ERAS guidelines varies following Program Initiation"
      Stobart L, Hong T, Bisallion A, Mayson K
   c) " Audit of Multimodal Analgesia with the Implementation of a Colorectal ERAS Program".
      Mayson K, Stobart L, Flexman A
   d) "Morbidity Rates for Adult Elective Surgery Using ISOS Methodolgy vs NSQIP Methodology at Vancouver Hospital"
      Lavis K , Brovender A, Hang X, Mayson K
   e) "Enhanced Recovery After Surgery Shows High Patient Satisfaction"
      Stobart L, Hong T, Bisallion A, Mayson K

**Alana Flexman:**

**Flexman AM**, Charest-Morin R, Stobart L, Street J, Ryerson CJ. Frailty and Postoperative Outcomes in Patients Undergoing Surgery for Degenerative Spine Disease. Society for Neuroscience in Anesthesia and Critical Care Annual Meeting. San Diego, CA, USA; October 2015.

**Volunteer Activities**

**Alana Flexman:**
See "Projects and Activities"

**Cynthia Henderson:**
Past Chair of the Section of Neuroanesthesia, Canadian Anesthesiologists' Society

**Kelly Mayson:**
BC ERAS Collaborative Advisory Panel since July 2014

**Projects/Activites**

**Dr. Oliver Applegarth**
Undergraduate Program Director

- Development of an online competency-based curriculum
- Yr 3 committee, Yr 4 committee, Promotions committee
- Development of a new MCQ examination
- Bi-weekly simulation team training course for yr 3, CESEI, Spring/Summer 2011

Co-chair, Procedural Skills Working Group, UBC Faculty of Medicine

Member - ACUDA

Reviewer – UBC Medical Journal

**Dr. Alana Flexman**
Treasurer of the Section of Neuroanesthesia, Canadian Anesthesiologists' Society
Member, Scientific Affairs Committee, Canadian Anesthesiologists' Society.
Peer reviewer: Canadian Journal of Anesthesia, Journal of Neurosurgical Anesthesiology
Organizing committee: Whistler Anesthesiology Summit (Abstracts)
UBC Director of Faculty Development & Chair of Faculty Development Retreat
Research Co-Director
Director of UBC Journal Club
Director of UBC Resident Mentorship Program
Academic/Administrative Oversight Committee Chair

Active Research Projects:

- Predictors of Transfusion in Intracranial Aneurysm Surgery
  - *Co-Investigators: Dr. Ryan Truant, Dr.Peter Gooderham, Dr. Darreul Sewell*
- Accuracy and Reliability of Internet-Based Resources on Preoperative Fasting
  - *Co-Investigators: Mr. Taren Roughead, Dr. Darreul Sewell, Dr. Christopher Ryerson, Dr. Jolene Fisher*
- Anesthesiologists' Perception of Perioperative Stroke Risk in Non-Neurologic and Non-Cardiac Surgery
  - *Dr. Darreul Sewell, Dr. Adrian Gelb, Dr. LZ Meng*
- Use of postoperative continuous positive airway pressure in patients undergoing transsphenoidal pituitary surgery: a retrospective cohort study
  - *Co-Investigators: Dr. William Rieley, Dr. Ryojo Akagami, Dr. Peter Gooderham, Dr. Pieter Swart*

- Frailty and Sarcopenia in Elderly Patients Undergoing Elective Surgery for Degenerative Spine Disease
    - *Co-Investigators: Dr. John Street, Dr. Raphaele Charest-Morin*
- Effect of an alveolar recruitment maneuver on subdural pressure, brain swelling and cerebral perfusion pressure in patients undergoing supratentorial tumour resection
    - *Dr. Brian Toyota, Dr. Donald Griesdale, Dr. Peter Gooderham*
- The Incidence and Predictors of Frontal Cerebral Oxygenation Desaturation during Anesthesia Induction in Patients Undergoing Carotid Endarterectomy
    - *Co-Investigators: Dr. Raymond Tang, Dr. Adrian Gelb, Dr. LZ Meng, Dr. Peter Gooderham, Dr. Keith Baxter, Dr. Charles Dong*
- Is Out-of-Hours Spine Surgery Associated with Increased Intraoperative Adverse Events?A Prospective Cohort Study
    - *Co-Investigators: Dr. John Street, Dr. Raphaele Charest-Morin, Dr. Tamir Ailon*

**Dr. Cynthia Henderson**
Past Head, Section of Neuroanesthesia, Canadian Anesthesiologists' Society
Coordinator, Neuroanesthesia Section Lectures, Canadian Anesthesiologists' Society Annual Meeting, Ottawa Ontario
Head, ECT Anesthesia Interest Group, Vancouver Acute

**Dr. Kelly Mayson**
BCMA ERAS Working Group
NSQIP Anesthesia Champion Vancouver Acute and UBC Hospital
ERAS Anesthesia Lead Vancouver Acute
VA-SQAC (Surgical Quality Action Committee)

## DIVISION OF THORACIC ANESTHESIA
***Head, JENS LOHSER MD FRCPC***

***Hospital Sites***
Thoracic Surgery is being practiced at Kelowna General Hospital, Surrey Memorial Hospital, Victoria General Hospital and Vancouver General Hospital. Vancouver General Hospital is most closely associated with the university department of anesthesia and the main site of resident teaching in thoracic anesthesia. There is limited interaction between hospital sites, aside from occasional calls from outlying sites for advice with complex cases.

**Members**
The division of thoracic anesthesia at VGH is a subgroup of the division of cardiac anesthesia and all attending anesthesiologists practice both cardiac and thoracic anesthesia. Advanced training in thoracic or cardio-thoracic anesthesia is a mandatory component of membership in the division. At present the division is staffed by:

Dr Chris Durkin Dr Gord Finlayson Dr Brett Fitzmaurice Dr Bevan Hughes
Dr Paul Kapnoudhis Dr Jens Lohser

The division is expecting the imminent return of two individuals who joined the Vancouver Acute anesthesia department in the summer of 2015 and have been accepted into the thoracic division pending the conclusion of their respective fellowships. Dr Travis Schisler will return from a Cardiothoracic Fellowship at the University of Pittsburgh in June 2016, where has been actively involved in lung transplantation, lung support with extracorporeal membrane oxygenation (ECMO) and critical care support for cardiothoracic patients. Dr Sean McLean will return from a Cardiothoracic Fellowship at the University of Washington in August 2016, where he has been actively involved in lung transplantation and advanced minimally invasive thoracic and esophageal surgery.

Dr Gord Finlayson took a three-month sabbatical in 2015 and pursued an advanced clinical fellowship in ECMO care at the Royal Brompton Hospital in London, UK. ECMO is gaining increasing importance both in the intensive care treatment of respiratory failure pre/ post lung transplantation and as a perioperative management technique to supplant cardiopulmonary bypass in the management of lung transplantation as well as complicated airway or lung surgery. Drs Jon Harper and Hamed Umedaly are past members of the division who continue to participate in the perioperative care patients for lung transplantation.

Participation in lung transplantation and the associated call coverage is a mandatory component of membership in the division. Due to the highly specialized care, which entails aspects of thoracic and cardiac anesthesia, as well as transesophageal echocardiography, the division is made up entirely of members of the division of cardiac anesthesia. All members of the division of thoracic anesthesia carry a cross-appointment in the division of cardiac anesthesia.

**Clinical Practice**

Thoracic surgery at VGH performs the full complement of thoracic surgical procedures, including lung, esophageal and mediastinal surgery as well as lung transplantation. Annually, we perform about 600 lung resections, of which half are major lung resections (lobectomy, pneumonectomy). Over the last years we have seen a near complete transition to minimally invasive techniques as the primary approach to major lung resections. We care for roughly 30-40 mediastinal tumor resections and roughly 20 airway resection or stenting cases per annum. The number of esophageal resections has been stable around 50-70 per year. While the transhiatal approach has previously been the dominant surgical technique for esophageal resections, we have seen an increasing number of transthoracic approaches both via thoracotomy and thoracoscopy. There have been early attempts at establishing a Minimally Invasive Esophagectomy (MIE) program at VGH. The move towards MIE is likely to continue in the coming months and MIE will become a routine component of the surgical portfolio in the coming years.

The Department of Thoracic Surgery has experienced significant turnover with the retirements of longtime fixtures Drs Ken Evans and Richard Finley in 2014 and the subsequent hiring of Drs Basil Nasir and Anna McGuire. Dr Basil Nasir, completed his cardiothoracic surgical training at the Mayo Clinic in Rochester and advanced thoracic fellowship training in endoscopic surgery at the University of Montreal. Dr Anna McGuire completed her thoracic surgical training and an advanced minimally-invasive thoracic fellowship training at the University of Ottawa. There is an ongoing recruitment drive for a fourth member into the division of thoracic surgery. There are ongoing

discussions with regards to a possible integration in the surgical coverage between the Lower Mainland Surgical sites.

Vancouver General Hospital is the only site in British Columbia, which performs lung transplantations. The number of transplants is variable but has been steadily increasing over the last 5 years, due to surgical personnel changes and the increased availability of organs from Donations after Cardiac Death (DCD). As a result, we have performed between 25-30 lung transplants per year in the recent years and an all-time record of nearly 40 in the last year.
Discussions about the establishment of an ex-vivo lung perfusion program are ongoing. Ex-vivo lung perfusion is hoped to greatly benefit the safety of and the expansion of the lung transplantation program, but may also benefit other solid organ transplant programs.
Lung transplant anesthesiologists are a part of a multidisciplinary transplant program and participate in lung transplant rounds to discuss preoperative and postoperative issues.
Thoracic surgery at VGH previously acted as the first Canadian site for diaphragmatic pacemaker implantations for patients with severe neuromuscular disorders.

**Education**
Thoracic anesthesia is an advanced subspecialty within anesthesia. As such, the division does not routinely participate in the education of medical students.
All Anesthesia residents rotate through thoracic anesthesia at VGH during their senior years, and may receive additional exposure at other sites (Surrey Memorial Hospital, Kelowna General Hospital, Victoria General Hospital). As part of their VGH rotation, all residents receive pre-rotation suggestions regarding reading materials. Selected articles are available as PDF files on a resident-maintained website and on the departmental hard drive. All members of the division take an active role in resident education. Residents present thoracic rounds during their subspecialty rotation. The focus of the thoracic rounds is on interests common to residents and the remainder of the department, not necessarily subspecialty members. Residents are welcome to attend lung transplantations. However, due to the significant perioperative risks and time pressures, resident involvement is limited to primarily observation. Participation in lung transplants is therefore voluntary. Within the last two years we have sought the feedback of senior residents on their educational experience during the thoracic rotation. All residents ranked their rotation as one of the best educational experiences during their residency. The teaching was rated as very good to excellent.

A fellowship is currently not offered. This division previously hosted an international research fellow in 2010-2012 who actively participated in research in thoracic anesthesia. A clinical fellowship is not offered for logistical reasons, however a thoracic experience is provided to the department's cardiac anesthesia fellows.

The division of thoracic anesthesia is actively involved in the planning and running of the Thoracic Anesthesia Symposium, an internationally accredited meeting held alongside the annual Society of Cardiovascular Anesthesiologist meeting. Dr Lohser has been a member of the organizing committee for the symposium for the last two years, and has been part of the presenting faculty for the last five years. Drs Schisler and McLean have presented cases at the meeting in the last years and Dr Finlayson has been invited to present at next year's meeting.

**Research**
An in-vitro experiment was recently completed to elucidate the downstream effect of applying positive or negative pressure to lung isolation devices (Dr Lohser). The study has been presented

in abstract format at the Society of Cardiothoracic Anesthesiology meeting in New Orleans and we intend to submit it for publication.

**Quality Assurance**
The division fully supports and participates in departmental quality assurance initiatives, including morbidity and mortality rounds. The division meets regularly to discuss aspects of lung transplant care.

## DIVISION OF REGIONAL ANESTHESIA
***Head, Ray Tang, MD FRCPC***

**Volume and Case Types**
The volume of blocks have decreased owing to the fact that some services including plastics and orthopedics- athletics have moved many of their cases into private facilities. Regional is still performed in the remaining plastic surgery hand surgeries, select orthopedic surgeries, and vascular surgery.

**Novel Procedures, Approaches and Management**
The implementation of the perioperative anesthesia intervention service (PAIS) began in January 2016. The PAIS was only partially implemented because of a shortage of anesthesia assistants so that the first cases of the day were unable to go through the PAIS area. In addition, the functioning of the PAIS is also reliant on adequate staffing of nurses and anesthesiologists so PAIS is only running at about 50% capacity. The initial roll out focused on patients undergoing hepatobiliary and thoracic surgery but has since expanded to include all services. The majority of the patients are having their epidurals and arterial lines placed in the PAIS area to reduce overall OR time. Data will be tracked during this time and compared to controls when PAIS was not instituted. The endpoint will be to reduce the incidence and frequency of late running operating rooms.

**Education**
The residents continue to go through St. Paul's Hospital for their regional rotation. There is a yearly regional day for residents at the CESEI and last year's event was well received, particularly the workshop component organized by Dr Tang.

Ian Mowat and Kathryn Dawson both have completed their fellowships and both have finished a project with RART. Dr Mowat's study has been published in the British Journal of Anaesthesia. Genevieve Lowe and Nirooshan Rooban are the current fellows and both are involved in research projects.

**Research**
For completed projects, please see publication list. Currently, the Division of Regional Anesthesia has a number of projects ongoing and are collaborating with a number of other departments:

1. Spine positioning study in parturients with Drs Sawka, Tang, Vaghadia, Preston, Gunka, Sahota and Ilana Sebbag. The investigators have replicated the study looking at the effect of rotation on the lumbar spine in term parturients. A manuscript awaits decision from a journal for publication.
2. Porcine epidural study looking at the effect of bolus vs. infusion on spread has been completed with Dr Mowat with Drs Tang, Sawka, Vaghadia, Henderson, and Krebs. 20 epidural catheters were inserted into 7 pigs and the effect of bolus vs infusion was analyzed by necropsy immediately after injection. This study was published in the British Journal of Anesthesia.
3. A pre-marking study to look at whether marking patients by ultrasound in the PCC is beneficial prior to entry into the OR. This was a volunteer study where two individuals marked volunteers whilst blinded to each other's markings, and a third individual measuring the differences in the marks. This study was completed by Kathryn Dawson and Peter Rose and has been accepted as a letter for publication in the Canadian Journal of Anesthesia.
4. Drs Sawka and Tang are content supervisors for Biomedical Communication student Ashley Hui from the University of Toronto. Ashley is creating a virtual 3D model of the spine and with simulated needle insertion using LeapMotion technology.
5. Drs Sawka and Tang have sponsored an Engineering Physics project at UBC with Marc Lejay and Sagar Malhi. A prototype for a Bluetooth enabled syringe pump was created, which would enable a single user to perform ultrasound guided regional blocks.
6. Drs Shanahan and Tang have been involved in creating a transducer holder prototype using suction devices along with two UBC engineering students, Jonathan Moore and Dylan Neid. A working prototype has been created as a proof of concept.
7. Dr Genevieve Lowe and RART have been collaborating with Urology to do a non-inferiority study with rectus sheath catheters vs. epidurals in cystectomy patients. Over 20 patients have been recruited with an aim to recruit approximately 80 patients.
8. Dr Genevieve Lowe, RART and Urology have completed a cadaveric study looking at ultrasound guided and surgical placement of rectus sheath catheters and dye distribution. Dr Ed Chedgy will be presenting this at the Urology Annual Research Day.
9. Collaborating with Dr Ed Chedgy of Urology, we are pursuing a chart review with medical student Grace Chan to do a matched cohort retrospective review of cystectomy patients, examining whether female patients have more pain and need more analgesics relative to their male counterparts.
10. Drs Genevieve Lowe and Nirooshan Rooban have completed a cadaveric study to evaluate the feasibility of performing suprascapular nerve blocks in the anterior neck. It has been a negative study and will be written up as a case series.
11. Dr Nirooshan Rooban and RART, in collaboration with Ortho Recon, are currently designing and seeking ethics approval for a study comparing adductor canal single shot vs. single shot + iv dexamethasone vs. adductor canal catheters for pain management after total knee arthroplasty.

**Quality Improvement**
We are continuing to follow up with all the block patients through the block forms which is why it has been reinforced to all members that a form be filled out for all blocks.
**Challenges**
The PAIS is a project with ongoing issues. Because it is so dependent on several factors, often it is under utilized and the patient selection is limited based on external factors. Funding will be reviewed at 6 months time. The OR management is seems supportive of this model which is encouraging.

The number of regional blocks and rooms amenable to regional blocks has decreased and may affect the ability to offer formal regional fellowships, although we are able to offer great opportunities for research and publication.

**Events**
Resident regional day is on May 12 this year organized by Dr Head and will involve Drs Tang and Lee.

Because there are so few residents that come to VGH for their regional rotation, regional rounds have not been regularly taking place.

Our group has been well represented at meetings as noted below with posters and presentations. Dr Tang has been involved with the organization of the Whistler Anesthesia workshop and giving a talk this year and will continue to do so. Dr Tang will be giving a talk and helping with a workshop at the NWAC 2015 this year.

## DIVISION OF PAIN MANAGEMENT

***Head, Michael Negraeff MD FRCPC***

**Activities 2015-2016:**

1. The UBC Pain Medicine Residency program is officially underway and the first resident has been selected – Dr. Michael Butterfield, MD, FRCPC (psychiatry), from Dalhousie will be starting the two-year program in July 2016.

2. Northern Health Authority is committed to implementing the Northern Health Authority pain strategy and has created working groups to work on the four priority areas.

3. Dr. Negraeff, psychologist Wes Buch and physiotherapist Neil Pearson continued to do specialist group support through videoconference with a primary care group in Vanderhoof. Two more sessions were held in 2015. Northern Partners in Care has been supporting the work and several conference calls have been done to plan how to expand the work but not lose the specialist-generalist consultation and personal feeling of the work. Two communities were added to the group videoconference – Fraser Lake and Fort St. James. The feedback from the primary care teams, which include local multiple disciplines (physiotherapy, mental health, social work and occupational therapy), has been extremely positive. The pain experts also have felt they have learned from working with

each other and the primary care teams. One step being undertaken to expand the work is to find out if other pain expert physicians, psychologists, and physiotherapists will be willing the join and create new expert groups. So far the response has been positive and 2016-2017 will hopefully see expansion of this type of clinical support.

4. Discussions at VGH and VCH have continued to further the development of pain management services for the hospital and the health authority.

    a. Work continued on plans to establish a Transitional Pain Clinic (TPC) at VGH in the Diamond Pavilion. The goals of this clinic would be to identify patients at risk for developing a new chronic Post-Surgical Pain problem, and to identify patients at risk for prolonged high dose opioids after their discharge from surgery. The program would aim to see the patients directly or through telehealth within two to three weeks discharge. Activities would include education, medication suggestion/adjustment, psychotherapy and groups. The program would be short term with discharge within 3-6 months.

    b. While the TPC group worked, another opportunity arose through the VGH and UBC Hospital Foundation to support the work of developing a Pain Vision for the hospital and region. A consultant was hired to lead the work with funds raised by the Foundation from a person in the community. Michael Negraeff and Maria Hudspith, Executive Director of Pain BC, and Dr. Hamed Umedaly, Head, Department of Anesthesia and Perioperative Medicine at VGH, were the sponsors of the work. Over 30 key stakeholder interviews were conducted to gather opinion on the best model(s) to develop. Stakeholders included local, national and international clinicians and thought leaders. A possible model was then developed and presented to an advisory committee for further feedback. It's now at the stage of presenting it to VGH/VCH leaders for discussion and to hopefully get a green light to work on a plan to implement it. Capacity building through education, mentoring, and rapid consultation were seen as key to supporting the region. Capacity to do central triage for outpatients was also seen as important.

5. Dr. Gillian Lauder, BCCH Anesthesia and Pain Specialist reported:
    a. New website for web based early intervention program for youth with evolving chronic pain was launched https://www.mycarepath.ca. This is a collaboration with Pain BC and the Strategies and Innovation Office from BCCH. All patients on the waitlist are directed to the online intervention.
    b. There is renewed favorable discussion with BCCH in regular meetings to move forward with a provincial pediatric pain strategy with collaborative funding by a CHIPS proposal for BCCH Foundation.

6. Dr. Jacqui Hudson, Lions Gate Hospital reported:
    a. Continued work with leadership at LGH for more resources in terms of space and health care profession support.

    b. Coined ourselves the LGH Complex Pain Group, made up of Drs. Jacqui Hudson, Martin Roos, and James Saunders (plastics). They hope to make advances in the coming years towards a multidisciplinary clinic.

c. Dr Martin Roos continues to provide interventional pain services at LGH. In the spring of 2015, Dr Jacqueline Hudson took over Dr James Kim's chronic pain case load, and now also provides interventional pain services at LGH.

d. LGH also has Dr James Saunders, a recently hired plastic surgeon, who has an advanced fellowship in peripheral nerve entrapment and release. He has a particular interest in surgical intervention for amenable peripheral neuropathies.

e. Drs. Saunders and Hudson have initiated a City-wide Multidisciplinary Interventional Pain Journal Club, which is attempting to meet on a quarterly basis. The third Journal club will be in July 2016. All comers are welcome!

7. Dr. Karl Muendel, Nanaimo Regional General Hospital Anesthesia and Pain Specialist, reported that:
    a. Over the last year the clinic has gone through some changes. We, unfortunately, lost two incredible pain physicians from our team. Dr. Karl Muendel has been appointed as the director of the Nanaimo Pain Program and co-chief of pain for Island Health, taking over where Dr. Alan Berkman left off.
    b. With our fresh lean design, new temporary clinical nurse leader, well-trained nursing and rehab staff and the addition of two new physicians, we are on track and meeting the Canadian Anesthesia waitlist benchmarks.
    c. We now have three ACGME accredited pain fellowship graduates at our program.
        i. Dr. Michael Pariser, the first, two year Canadian pain fellowship graduate, has been with us for approximately six months now. We're happy to have him as a permanent part of our team.
        ii. Dr. Trevor Van Oostrom, graduated from The Cleveland Clinic pain fellowship and has recently become a permanent part of our team.
        iii. Together, with Dr. Karl Muendel, they all perform a wide array of chronic and cancer pain treatments.
    d. Other additions to our multidisciplinary team include,
        i. Dr. Lonn Myronuk, Psychiatry
        ii. Dr. John Hawkeswood, Physiatry
    e. We continue to have a busy Spinal Cord Stimulator and Intrathecal Pump/catheter program. In the past our physicians and nurses had travelled to Victoria with our patients to use their OR time. Now, for the first time, we have been receiving regular OR days for surgical cases this year. Our NRGH team collectively run 80% of the neuromodulation on the island, making this is an important milestone for us.
    f. Over 90% of the patients referred to our clinic receive chronic pain education and/or rehab services. Although we have a busy interventional component to our clinic, our primary focus is pain education and rehab to increase functionality.
    g. We regularly teach nursing students, OT students and have had several medical students, family practice and anesthesia residents rotate through the program. Our current multidisciplinary team is incredibly keen to teach the latest evidence based treatments regarding intervention, medical management and rehab.

8. Dr. William Davis, Royal Jubilee Hospital Pain Program Medical Director, Victoria, and Carla Service, Director reported:
    a. Completed the neuromodulation database research, which was presented at INS (June 2015) and NANS (Dec 2015) conferences (oral and poster presentations).

The team consisted of: Nouri Najjar, Dr. Berkman, C. Service, Dr. Buna (pharm), S. Schellinck (OT): "*Changes in Healthcare Expenditures and Self-Reported Functional Measures Following Spinal Cord Stimulation for Chronic Pain*"

b. Continue to meet all wait-time benchmarks for new consults (all patients seen <=6 months; semi-urgent cases seen <= 3months)
c. Now provide OT and PT UBC student education placements.
d. Linda Cundiff, OT/RJH Pain Program received UBC award for 2015 Practice Education Team Award, awarded by the UBC Health Awards Selection Committee

9. Dr. Dean Burrill, RCH, and Brenda Poulton, NP, reported the outpatient consultation and interventional pain program remains active at one day per week with himself and fellow anesthesiologist Dr. Tony Tran, and NP Brenda Poulton.

    a. Perioperative outreach anesthesiology and APS has provided improved continuity of service and access to regional anesthesia for post-operative and trauma patients working collaboratively with nurse practitioner. Additionally, have provided timely anesthetic inpatient surgical consults.

    b. Anesthesiology actively involved/leading within interdisciplinary teams with ERAS implementation at RCH, which includes aspects of post-operative pain management.

10. Dr. Jill Osborn and Dr. Clinton Wong from St. Paul's Hospital Division of Acute and Interventional Pain Management reported:

    a. Dr. William McDonald has retired and was recognized by the Canadian Medical Society for his many contributions. He continues to run monthly video pain rounds with the support of the Northwest Pain Foundation.

    b. Dr. Jill Osborn has taken over the Division head position of interventional pain.

    c. Dr. Alan Berkman has joined the team for interventional pain 2 days a week.

    d. Janice Muir, Clinical Nurse Specialist, retired after many years of dedicated service and was recognized by the Canadian Pain Society for her many contributions during her career.

    e. Each year organize and deliver two pain themed academic days for the residents, which is an increase from one day per year.

    f. Awards the Dr. Jone Chang Prize in Chronic Pain each year to the anesthesiology resident who excels in the study and practice of chronic pain management during the residency. In 2015, the award went to Dr. Miguel Hernandez.

    g. Psychiatry, psychology, physiotherapy and occupational therapy resources are also available to the team through interdepartmental referrals.

    h. Dr. Osborn is leading the effort to develop a fully interdisciplinary collocated pain management center at SPH. Efforts to collaborate for a region wide pain strategy for Vancouver Coastal Health continue between SPH and VGH.

11. Dr. Brenda Lau, community based Change Pain Clinic reported:

    a. CHANGEpain Clinic (CpC) (www.changepain.ca) is a community based chronic pain clinic in Vancouver that delivers layered multidimensional care, mostly funded by MSP, including:
        i. Procedures (IMS, Trigger Point Injections, Image guided interventional pain procedures, infusion therapy)
        ii. Behavioural group medical programs co-led by physicians and allied health providers.

    b. CpC's physicians include anesthesiologists, GPs, rheumatologists, radiologists and physiatrists.

    c. CpC's community setting delivered services to patients through 41,350 patient encounters between May 2013 and June 2016.

    d. CpC measures patient results over time using a series of 6 surveys listed below. Results for CpC patients demonstrate statistically significant improvements in all 6 outcome measures (n noted in brackets):
        i. Brief Pain Inventory - pain interference (n = 1036)
        ii. Numeric Rating Scale -pain severity (n = 1036)
        iii. PHQ9 – depression (n = 1023)
        iv. PSEQ - self-management confidence (n = 673
        v. PRSS – catastrophizing (n = 914) and coping (n = 862)
        vi. TSK - fear of movement (n = 867)

    e. Some key findings for patients seen between May 2013 and December 2015:

        i. 68% female/32% male
        ii. 88% patients between the ages of 20 and 69 years
        iii. 66% patients are in most disabled category based on Brief Pain Inventory (BPI 41 – 70)
        iv. All 6 measures showed a statistically significant improvement between the first and second survey points ($p<0.01$)

    f. CHANGEpain is continuing to collect data to enhance understanding of results in a community based setting.

12. The Okanagan Interventional Pain Clinic (OIPC) (www.okpainclinic.ca) in Kelowna was started by Dr. Paul Etheridge (GP Anesthesia) in 2012 after he returned from a 1 year pain fellowship at McGill. He collaborated with like-minded physicians in the Okanagan from Salmon Arm to Oliver and created a pain association in order to advance pain care in the region:
    a. Dr. Paul Etheridge and Dr. Pam Squire were appointed as the rural elective coordinators for the new Royal College Pain Residency Program at UBC.
    b. The OIPC in Kelowna has multiple physicians working on a full time and part time basis as part of a multi-disciplinary team, including 4 specialists (Anesthesiologist,

Physiatrist, Thoracic surgeon and Orthospine surgeon), 4 GP's with pain training (University of Alberta certificate in pain or Pain Fellowships), all of whom received in-house supervised interventional ultrasound training for a minimum of 12 months or had prior interventional training in fluoroscopy.

c. The OIPC has a staff physiotherapist who provides rehabilitation assistance following interventional and medical treatments.
d. The OIPC had 10,000 patient visits and 1800 new consults in 2015.
e. Dr. Bill Nelems and his partner provides group CBT and pain management classes quarterly, which is televised through tele-health to 3-4 satellite rural sites in the IH region (an estimated 600-800 patients and family members attend annually).
f. CME events are held at the OIPC for the Okanagan pain association members (15 members) in the Okanagan valley twice a year.
g. Dr. Etheridge (UBC), Dr. Bill Nelems (UBC) and Dr. Finlayson (McGill) continue to conduct multi-centered clinical trials and published yearly in Regional Anesthesia and Pain Medicine since 2012. Studies were focused on newer techniques in ultrasound guided pain procedures in the cervical spine. The research has led to validated techniques that are equivalent in accuracy to fluoroscopy but has improved safety for patients by decreasing the risk of intravascular needle placement.

13. A Pain Medicine Section has been successfully established for representation of the pain medicine physicians at the Doctors of BC. The work was spearheaded by Dr. Owen Williamson with great assistance from the Psychiatry Section (Dr. Steve Wiseman) and from Dr. Brenda Lau at Change Pain Clinic and SPH pain center, and also from the legal community to establish the incorporated not-for-profit structure of the organization. The first AGM was held in May 2016 at Change Pain Clinic. The official name is the Pain Medicine Physicians of BC Society (PMPoBC). Anyone wanting to join should contact Dr. Owen Williamson (chair) or Dr. Brenda Lau (secretary).

**Pain BC Society Activities of Potential Relevance to APT Department Members**:

1. Pain BC renewed its strategic plan for 2015-1018. In 2015-2016 activity continued to advance work to meet these goals:

    i. Promote prevention and early intervention in chronic pain and pain related disability
    ii. Educate, promote skill development and build hope and confidence among people in pain and their families
    iii. Empower health care providers with the education, tools and skills they need to improve the lives of people in pain
    iv. Facilitate planning, action, evaluation, and innovation leading to service system change
    v. Engage a cross-sectoral coalition in collective action to raise awareness of chronic pain and reduce the stigma associated with it
    vi. Foster and encourage pain and pain-related disability research

2. Pain BC continues to offer the Connect for Health program for patients with pain that need social support services. Knowing and navigating these services can be difficult for people with pain. The program trains volunteer health sciences students about what resources

are available and how to support people in their applications for assistance. Accessing the program is free and is available by phone or email. For more information, contact Pain BC: http://www.painbc.ca/chronic-pain/connect-for-health

3. Pain BC continues to work with the professional health associations to improve education for their members and provide pathways for some to become "Pain Champions" in their field and communities:

    a. To date, Pain BC has worked with the following professions and their professional bodies to create these champions:
        i. Pharmacists
        ii. Mental Health professionals
        iii. Physiotherapists
        iv. Occupational Therapists
        v. Nurses
        vi. Registered Massage Therapists
    b. Pain BC has two overarching goals in these activities:
        i. To increase education and skill-based knowledge in the healthcare professions that are already involved with the care of people with chronic pain by providing the same scope of training in pain concepts, impacts, and management strategies to all the professionals. This will help create a common language and knowledge base.
        ii. To foster the development of virtual interdisciplinary pain networks at the local level.

4. Pain BC continues to develop new content for education and self management and to bring new thought and research from around the world from leaders in their fields. This is done through a variety of formats including webinars, audio podcast interviews, and articles. These are all available (new and archived material) on Pain BC's website: www.painbc.ca and on the Live Plan Be website: www.liveplanbe.ca

5. Pain BC was a co-applicant on the successful SPOR (Supporting Patient Oriented Research) grant from CIHR. This was a national multi center application lead by the team in McMaster at the DeGroote Pain Center. It is for $25 million over five years to support patient oriented research. UBC Department of APT contributed $50,000 per year from Dr. Roanne Preston's research funds as a matching contribution. Dr. Aaron MacInnes has agreed to be the UBC location Co-PI on the project.

6. Pain BC supported the work to create a Pain Vision for VCH with the support of the UBC/VGH Hospital Foundation and remains engaged with the VCH leadership to push for a staged implementation of coordinated pain services across VCH.

7. Pain BC has partnered with the Ministry of Health to host a second Pain Summit in 2017. Many of the goals of the 2011 Pain Summit have been achieved.

8. After 7 years as chair and a founding member, Dr. Michael Negraeff stepped down as Chair of Pain BC Society in 2016.

## *POST-GRADUATE MEDICAL EDUCATION PROGRAM*
## *ANESTHESIA RESIDENCY*

**Matthew Klas MD FRCPC**
**Program Director**

**New Graduates**
All six of our PGY5 residents were successful in the 2015 Royal College specialty examinations in Anesthesiology. This is due to their hard work and the dedication of our teaching faculty. Our PGY 5 Seminar Series continues to be very successful and a model for Royal College exam preparation, under the leadership of Dr. Ron Ree. Most graduates have found faculty positions at our UBC academic hospitals with 2 going to Vancouver General Hospital and 1 to Victoria General Hospital.

**Resident Selection Committee**
A very robust and active sub-committee of the Residency Training Committee (RTC) reviewed all applicants. The Selection Committee was chaired by Trina Montemurro, with committee members representing all of the major BC teaching hospitals: Bob Purdy, Yvonne Cysani-Fritz, Penny Osborne, Naomi Kronitz, Vit Gunka, Juliet Atherstone, Aeron Doyle, Ron Ree, Matt Coley, Cynthia Yarnold, Laura Duggan, Mike Atherstone, Hazhir Ahmadi, Jon McEwen and Peiter Swart. Also resident memberst Graham Noble, Sadiq Abdulla, Kali Romano, Justen Naidu, Chris Nixon-Giles, Miguel Fernandez and Ann-Marie Madden contribute to the committee.

These residents began their residency on July 1, 2015 at one of the three PGY 1 sites: Victoria General Hospital/Royal Jubilee Hospital, St. Paul's Hospital, or the Royal Columbian Hospital. The PGY 1 year continues to be an excellent basic clinical training year at all of these sites.

**Academic Program**
The full day academic program involving active participation from each of the teaching hospitals was very successful. The new format and curriculum developed in 2012 continues be very successful and get excellent reviews from the residents. The feedback form residents and faculty has been very positive and the day is felt to be more interesting and interactive. It is more in line with the newly developed National Curriculum of the Royal College Specialty Committee in Anesthesiology.

The Residency Training Committee continues to support the autonomy of each participating UBC teaching hospital in delivering their contribution to the residents' educational program. Program content was tailored to match the area of clinical expertise of each site. The participating sites are Vancouver General, St. Paul's, Royal Columbian, British Columbia Children's and British Columbia Women's Hospitals and Lions Gate Hospital. The Case-Based Learning portion of the academic day continues to be very successful in providing excellent educational experience. Resident coordinators and faculty members at each site demonstrated creativity and commitment in delivering the educational program. As always the extra work and dedication of the chief residents make these days a success. The academic days use videoconferencing from all sites for out of town residents.
Specific days on Airway Cases (in collaboration with ENT), Regional Anesthesia and Research also took place in 2015. A new full day on Cardiothoracic Ultrasound was introduced this year as well with excellent

reviews. Faculty from across the main teaching sites have gained major expertise in this area with leadership from Dr. Kevin Rondi at SPH.
The Summer Lecture Series (Basics of Anesthesia) continues to evolve and sessions on POEM (Perioperative emergency Management) were added along with some Simulation with great input from faculty and residents. Resident led CBL's along with lectures on basic science topics were also incorporated. One of our pharmacology colleagues, Dr. David Godin provided two of the lectures on a review of pharmacologic principles as part of the summer lecture series and this was very favorably received by the residents.

**Courses**

The RTC decided that either the Advanced Trauma Life Support course or something equivalent would continue to be provided to the anesthesiology residents. The Fundamentals of Critical Care Support course continues to be provided to all the PGY 1 Anesthesia residents and is a very useful course in teaching the fundamentals of critical care. All PGY 5 residents completed the Advanced Cardiac Life Support refresher course specifically designed for anesthesia. All courses (Neonatal Resuscitation Providers course (NRP), ATLS, ACLS update, and PALS) will now be provided to residents by PGY level instead on a 3 yearly cycle in order to provide more predictable numbers for planning, from educational and financial perspectives. PGY 2 residents again took part in a full day of the surgical CRASH course in 2015 focused on trauma and Perioperative Emergency Management (POEM) along with all junior Surgical and Emergency Residents. Feedback continues to be excellent on this collaborative day and there was excellent input from many Anesthesiology faculty members. Special thanks go out to Dr. Laine Bosma the APT Simulation director and resident Dr. Sui-Kae Yeong for their work developing an excellent curriculum that received excellent reviews from all attendees. This course is becoming a model that other Universities such as Harvard and Queen's are interested in emulating.

**Resident Retreats**

In June 2015, the annual residents' retreat was held at Whistler. This included lectures on various topics relevant to CanMEDS roles. A winter retreat also took place in December with educational and social activities.

**Simulation**

All of the PGY 2-5 residents went to the high fidelity UBC Anesthesia Simulator housed in the CESEI (Center of Excellence for Surgical Education and Innovation) at VGH. Dr. Laine Bosma, as the coordinator of the anesthesia simulator and their group of dedicated faculty ("Sim Docs"), ran the highly successful simulations 2/year for each UBC Anesthesia residents. BCWH and BCCH have also incorporated regular Simulation into the Obstetric and Pediatric curriculums. Also for the first time PGY 5's went through and Nationally developed Simulation scenario that will become standard for all Canadian Universities.

**Journal Club**

Journal Club remains an integral part of the academic program. Meetings occur monthly at faculty members' homes or other venues. Dr. Alana Flexman has done an excellent job in the coordinator role for 2015. Three separate residents act as moderators for each article presented. They continue to provide the residents with an excellent educational opportunity to learn about critical appraisal skills.

**Clinical Program**

The clinical program continues to be a strong element of the UBC Anesthesiology training program. The regional anesthesia rotation provides very good educational experience under the direction of

Dr. Steve Head, SPH. The mandatory community anesthesia rotations in Nanaimo and Prince George have received positive reviews by residents and Kamloops is joining this year. The four week anesthesia rotation at Victoria General Hospital/RJH continues to be well received and this year a more structured under the direction of on call experience is being developed. It will continue to be at the PGY 4/5 level, with residents able to choose pediatric anesthesia, adult general anesthesia, or subspecialty cardiac, neuro, thoracic or vascular anesthesia. BCCH continues its 4 consecutive mandatory pediatric rotations with 24 hour call to give better exposure to after-hours cases as well as out of OR care such as the Pain Service and Trauma calls. Many of the larger teaching hospitals continue to have increasing resident experience out of OR/Perioperative Medicine days which have been favorably viewed by residents and faculty. Residents are also on the Code Blue team at VGH and SPH.

**In-House Examinations**

The written examination for PGY 2 residents included the Anesthesia Knowledge Test, AKT 1, held in July and August 2015. In December 2015 the PGY 2 residents sat the AKT 6 exam. The AKT 24 exam, testing subspecialty anesthesia knowledge, is taken by PGY 5's. UBC residents continue to perform very well and compare very favorably with our national colleagues.

PGY 3-4 residents wrote the American Board of Anesthesiologist in-training examination in March 2015. The ABA Exam allows for more individual feedback and ranks the candidates with all trainees at their level.

The May and December in-house oral examinations continued with the Royal College format. All residents were examined in one day by faculty volunteer examiners. Each resident received two half-hour exams. Residents generally found the experience stressful but educational.

**9th Annual UBC Anesthesiology, Pharmacology and Therapeutics Research Day and Awards Night**

Anesthesia residents, anesthesia clinical fellows, pharmacology graduate students, and pharmacology post-doctoral fellows presented their research papers in the competition held in May of 2015. Awards night was held on June 11, 2015 where awards for research, academic excellence and clinical proficiency were presented. (Award winners are listed separately in the report). The evening was a success as evidenced by the attendance and the quality of research presentations.

**Residency Training Committee (RTC)**

This committee met every 2 months during 2015 and as always was very effective in guiding the activities of the residency training program. Committee members include hospital program coordinators from each site: Drs. Laine Bosma and Cynthia Yarnold SPH, Mike Wong BCWH, Gord Finlayson and Juliet Atherstone VGH, Mike Traynor BCCH, Kenneth Ryan RCH, Marshall Richardson Prince George, Sarah Hall Nanaimo, our Royal College Examiners, Dr. George Isac and Mike Barker, Roanne Preston Professor and Head, Dr. Peter Choi Research Coordinator, and Dr. Matthew Klas, Chair and Program Director.

Resident members on the RTC include the co-chief PGY 4 residents Steven Green, Sadiq Abdulla, Alex Wong and Jei Park. Also other site reps of PGY-1, PGY-2, PGY-3 are elected members.

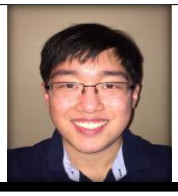
**Administration**

Ms. Jill Delane continued in her role as the Program Coordinator. Ms. Susan vanBruggen continues to be an excellent Program Secretary. Both have been invaluable in the administration of the program.

**Summary**

Overall**,** this has been a successful year for the UBC Anesthesiology Residency Training Program. This is due to the many hours of hard work on the part of our clinical faculty working with our residents, taking part in the academic program, as well as helping senior residents prepare for the oral exam and to become skilled anesthesiology consultants. The goodwill and high level of commitment to residency training is a credit to this department. Our full Academic Day and growing Simulation curriculum are a unique strength and selling feature of the residency at UBC. New and innovative programs continue to be developed to keep pace with new technology and training models. This will continue to expand as we move to a Competency based model in 2017. We also continue to attract high quality students to our program.

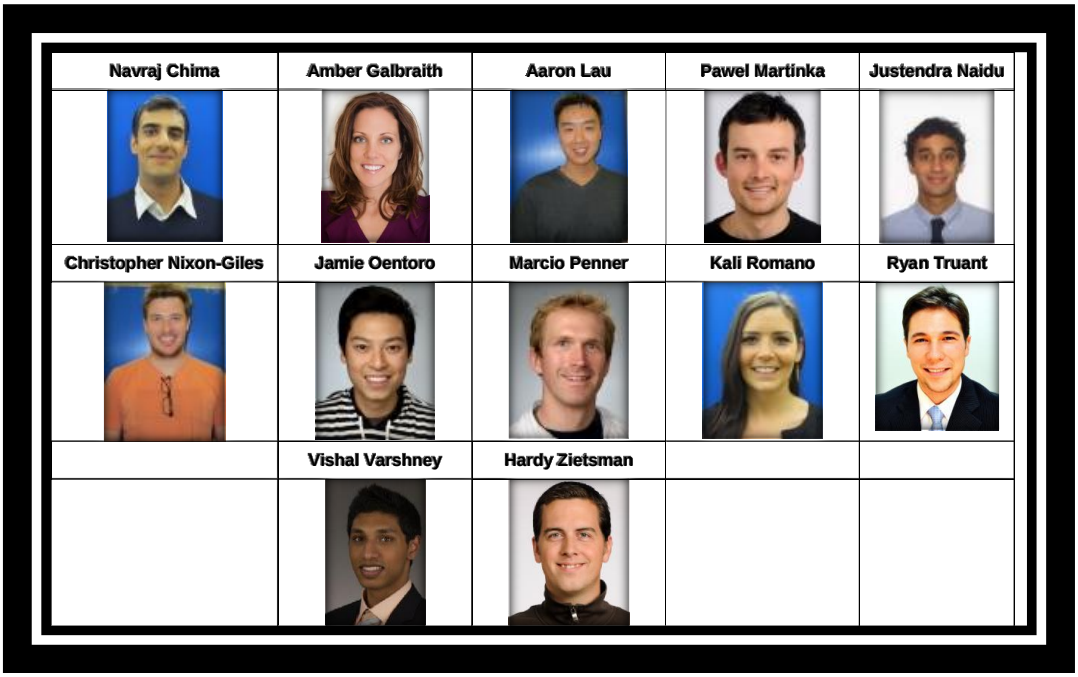
## UBC ANESTHESIA RESIDENTS 2014-2015 - PGY 1

| Martha DiGiuseppe | Katrina Genuis | Kristen Kidson | Katarina Kojic |
|---|---|---|---|
| | | | |
| **Victor Liu** | **Dmitry Mebel** | **Thomas Prasloski** | **Alan Tung** |
| | | | |
| **Matthew Walker** | **Andrew Wang** | | |
| |  | | |

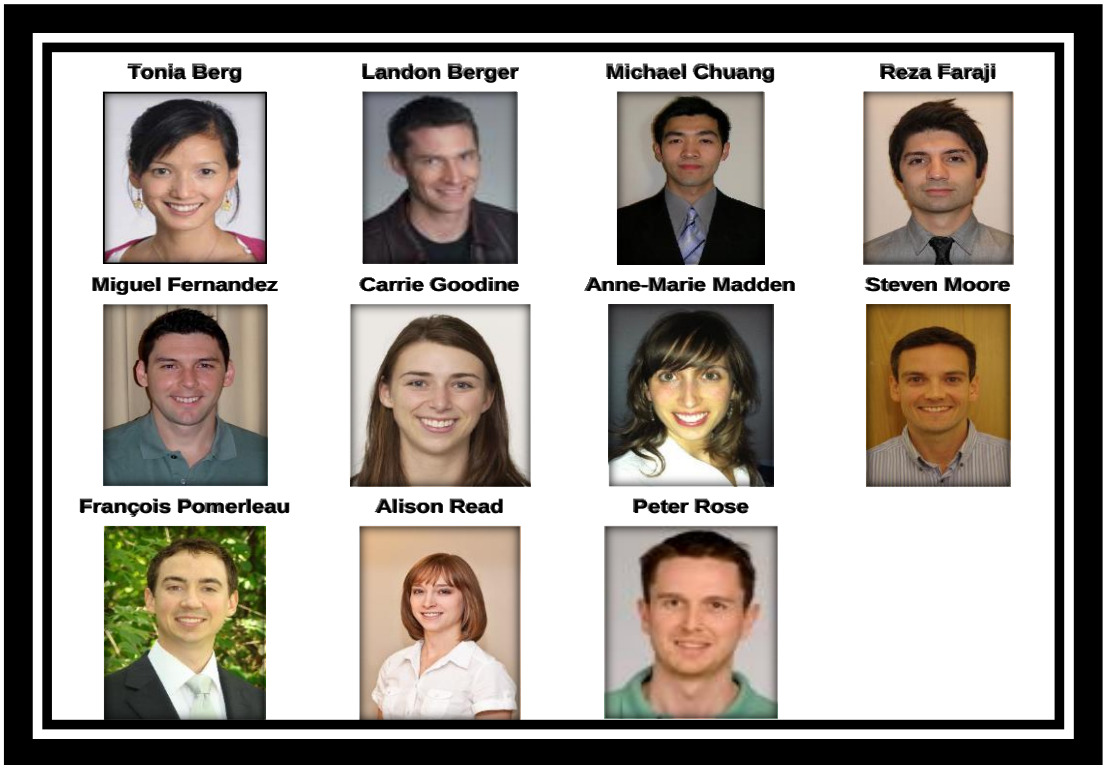
## UBC ANESTHESIA RESIDENTS 2014-2015 - PGY 2

| Richard Alexander | Hao Chen | Christine Graf | Rana Hamidizadeh |
|---|---|---|---|
| | | | |
| **Alexandre Lefebvre** | **Shannon Lockhart** | **Disha Mehta** | **Daniel Mok** |
| | | | |
| **Kelli O'Reilly** | **Derek Sargent (FPA)** | **Evan Shao** | **Terri Sun** |
| | | | |

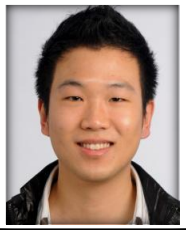
## UBC ANESTHESIA RESIDENTS 2014-2015 - PGY 3




## UBC ANESTHESIA RESIDENTS 2014-2015 - PGY 4



# UBC ANESTHESIA RESIDENTS 2014-2015 -PGY 5

| | | | | |
|---|---|---|---|---|
| **Sadiq Abdulla** | **Claire Carroll** | **Steven Green** | **Alexandra (Sandy) Kisilevsky** | **Cristin McRae** |
| **Graham Noble** | **Julie Paget** | **Jei Eung Park**  | **Cheryl Peters** | **Parisa Soltani** |
| **Sarah Sunderland** | **Sarah Waters** (until 22 Nov 2015) | **Alexander Wong** | **Donald Young** | |

**DR. JEAN TEMPLETON HUGILL CHAIR IN ANESTHESIA**
**HUGILL ANESTHESIA RESEARCH CENTRE**
**Chair, Stephan Schwarz, MD FRCPC**

The Hugill Anesthesia Research Centre is a collaborative initiative within the Department of Anesthesiology, Pharmacology & Therapeutics under the aegis of the *Dr. Jean Templeton Hugill Chair in Anesthesia*. Using *in vitro* and *in vivo* laboratory techniques as well as clinical studies, our research explores the neuropharmacology of anesthesia and analgesia and aims to build bridges between bench and bedside.

**NOTE FROM THE CHAIR & 2015 HIGHLIGHTS**

Welcome to the *Dr. Jean Templeton Hugill Chair in Anesthesia's* 2015 Annual Report! The last year has once again been one of exciting research activity and discovery, and I am delighted to report that 2015 was very successful in terms of productivity and publications in both the laboratory and clinical research domains. In total, 12 journal articles have been accepted/published under the aegis of the Chairship in 2015.

*Laboratory research* in the Hugill Anesthesia Research Centre yielded four full-length manuscripts in the peer-reviewed literature. This work featured seminal discoveries related to a first-in-class novel peripheral analgesic developed in our Centre, isovaline. One paper showed that isovaline's unique action involves peripheral mGluR II receptors; another reported on isovaline's potential to represent a novel and safe alternative to opioids for procedural sedation and total intravenous anesthesia when combined with propofol. This research was highlighted in a feature editorial and multiple news releases. Another line of investigation, emphasizing local anesthetic pharmacology and funded in part by a grants from the Canada Foundation for Innovation, the Canadian Anesthesiologists' Society, and a Pfizer Canada Neuropathic Pain Research Award, unveiled a new mechanism of local anesthetic CNS toxicity; the corresponding manuscript was accepted by *Anesthesia & Analgesia* in December 2015. *Clinical research* again highlighted the St. Paul's Hospital (SPH) Regional Anesthesia Program and the SPH Anesthesia-UBC Pharmacology collaboration with Dr. Alasdair Barr on postoperative delirium research. The latter yielded the first report in the literature on delirium following novel transcathether aortic valve implantations, pioneered at SPH, as well as an extensive study on delirium risk factors in a large cohort of cardiac surgery patients. The former has become an active research hub which in 2015 yielded new head-to-head data from two completed randomized controlled trials (RCTs) on ultrasound-guided regional anesthesia techniques and another completed RCT on ultrasound use for arterial catheterization. A fourth RCT, on optimizing subsartorial saphenous nerve blockade, has been completed; an abstract with the results has been accepted for presentation at the *International Anesthesia Research Society (IARS) 2016 Annual Meeting* (San Francisco; May 21–24, 2016). Our research has been award-winning: The RCT on "ultrasound-guided supraclavicular versus award brachial plexus blockade", published in the March/April 2015 edition of *Regional Anesthesia & Pain Medicine*, was previously recognized by the *IARS* with the distinction of "Best of Category" in Regional Anesthesia (of over 512). Lastly, a priority as *Hugill Chair* was for me to attract/recruit a suitably high-profile international speaker for our Department's second annual (i.e., 2015/16) lecture in Jean Hugill's honour; this has succeeded and I am very pleased to be able to report on the acceptance in October 2015 by the Editor-in-Chief of *Anesthesiology* and National Academy of Medicine Member, *Dr. James C. Eisenach* (FM James, III Professor of Anesthesiology and Physiology & Pharmacology, Wake Forest School of Medicine), supported in part by the Dr. Jean Templeton Hugill Endowment for Anesthesia Memorial Fund, this academic highlight will take place on April 27, 2016

**2015 IMPACT STATEMENTS**

**Dr. Jean Templeton Hugill Endowment for Anesthesia Memorial Fund**

The Dr. Jean Templeton Hugill Endowment for Anesthesia Memorial Fund, held in the Department of Anesthesiology, Pharmacology & Therapeutics, was established by the late Dr. Jean Templeton Hugill with the motivation to support anesthesia research and facilitate collaborative investigation between anesthesiologists and pharmacologists. Presided over by the *Dr. Jean Templeton Hugill Chair in Anesthesia,* Dr. Stephan Schwarz, the endowment in 2015 supported experimental work on innovative approaches to pharmacological pain control and anesthesia carried out by three graduate students in the *Hugill Anesthesia Research Centre*, with funds directed towards the requisite operational expenses, technical supplies, and student salary support. This work led to seminal discoveries related to a first-in-class novel peripheral analgesic, isovaline. For example, one of the resultant articles reported on isovaline's potential to represent a novel and safe alternative to opioids for procedural sedation and total intravenous anesthesia. This research was highlighted in multiple news releases and a feature editorial.

Another line of investigation unveiled new insights into the mechanisms of local anesthetic central nervous system toxicity which continues to threaten many patients; the corresponding manuscript appeared online in January 2016 in the journal, *Anesthesia & Analgesia*.

**Dr. Jean Templeton Hugill Chair in Anesthesia**

Dr. Stephan Schwarz, Associate Professor in the Department of Anesthesiology, Pharmacology & Therapeutics, holds the Dr. Jean Templeton Hugill Chair in Anesthesia. Spanning the range from *in vitro* and *in vivo* laboratory techniques to clinical studies, Dr. Schwarz' research explores the neuropharmacology of anesthesia and analgesia and aims to build bridges between bench and bedside. After his appointment to the Chair effective July 1, 2014 following the retirement of his predecessor, Dr. MacLeod, Dr. Schwarz' first priority was to provide continuity and leadership in directing and fostering the interdisciplinary team-based laboratory research in the Hugill Anesthesia Research Centre. Focusing on the pharmacology of analgesia and local anesthetics, emphasis in 2015 centered around three lines of innovative laboratory investigation, seminal results from which appeared in three full-length publications. The discoveries on a first-in-class novel peripheral analgesic with the potential to greatly improve patient safety were highlighted in multiple news releases and a feature editorial. Dr. Schwarz used the chairship's endowment to help fund the requisite supplies and equipment for these experiments as well as graduate student scholarship support. His second priority was to continue to expand the Chair's spectrum of activities and outreach to the realm of clinical anesthesia research in conjunction with St. Paul's Hospital where Dr. Schwarz serves as Anesthesia Research Director. The impact has included internationally award-winning research; the publication or acceptance in 2015 of six papers; and direct effects of findings on patient care and postoperative pain relief.

Dr. Schwarz continues to be a leading Canadian ambassador for academic anesthesia. Heavily involved in editorial peer-review and member of the *Canadian Journal of Anesthesia* editorial board, he received last year a "Top Ten Percent Reviewer" award by the flagship journal, *Anesthesiology.* In recognition "as an important international leader in academic anesthesiology", he was nominated and elected member in 2015 in the prestigious *Association of University Anesthesiologists* (AUA; honorific society). Dr. Schwarz also continues his activities as an award-winning teacher; in 2015, he adapted and developed for the new UBC undergraduate medical curriculum the pharmacological content related to anesthesia, analgesia, and anti-inflammatory therapeutics.

**RESEARCH PERSONNEL**

***Hugill Anesthesia Research Centre Core Faculty***

Stephan KW Schwarz MD PhD FRCPC
*Associate Professor and Dr. Jean Templeton Hugill Chair in Anesthesia*

Bernard A MacLeod MD FRCPC
*Associate Professor Emeritus*

Ernie Puil PhD
*Professor Emeritus and Past/Inaugural Chair*

Richard A Wall PhD
*Associate Professor Emeritus*

***Associate Faculty (Laboratory and Clinical Research)***

Eric Accili PhD- *Associate Professor (Cellular and Physiological Sciences)*
Alasdair M Barr PhD -*Associate Professor*
John B Bowering MD FRCPC- *Clinical Professor*
Stephen J. Head MD FRCPC -*Clinical Assistant Professor*
Steven Petrar MD FRCPC -*Clinical Instructor*
Ronald M Ree MD FRCPC- *Clinical Associate Professor*
Cynthia H Yarnold MD FRCPC- *Clinical Assistant Professor*
Michael JA Walker - *Professor Emeritus*

***Laboratory Research Associate***

Igor Putrenko PhD

***Graduate Students***

Khalid Asseri MSc; Yahya Asiri BPharm; Timothy Fung BSc

***Medical & Undergraduate Students***

Katarina Kojic; Stefan Kojic, BSc; John K Peel BHSc; Andrew Purcell PhD; Lurdes Tse MSc

***Anesthesia Residents***

Donald J Young MD; Cheryl Peters BSc (Med) MD; Sarah Sunderland MD

# SELECT PROJECT DESCRIPTIONS: LABORATORY RESEARCH

***Group II Metabotropic Glutamate Receptors Modulate Presynaptic Release of GABA in Nociceptive Thalamus***

Bernard MacLeod & Ernie Puil

Student: Khalid Asseri

Metabotropic glutamate receptors (mGluRs) belong to the family C of G-protein coupled receptors. Activation of group II mGluRs inhibit neurons by altering $Ca^{2+}$ and $K^{+}$ conductances. Group II mGluRs may regulate release of neurotransmitters at central synapses. Ventrobasal (VB) thalamic nuclei process somatosensory information including pain. Previous studies were unclear because a mixed group I/II mGluR agonist was used. We examined the analgesic effects of the selective group II agonist (LY354740) on VB neurons. Our hypothesis was that this inhibitory action would decrease the release of GABA by activating group II mGluRs on nerve terminals on thalamocortical neurons of VB nuclei.

Whole-cell patch clamp recordings were performed from Sprague-Dawley rat (P11-12) brain slices. The main sensory input (medial lemniscus or ML) and VB neurons were visually identified with a differential interference contrast microscope. Inhibitory postsynaptic currents (IPSCs) were evoked by electerical stimulation of ML. Kynurenate was applied to block ionotropic glutamatergic transmission, isolating the IPSCs. Internal Cesium was used to block postsynaptic actions of agonist. Drugs were applied in the bathing solution.

It was found that when applied alone, group II mGluR agonist (LY354740) had no effects on active or passive membrane properties in neurons. In a concentration-dependent manner, LY354740 reduced the peak amplitude of evoked IPSCs without affecting the decay time constants. With or without action potential-evoked release, LY354740 respectively reduced the frequency of spontaneous and miniature IPSCs. These reductions were blocked by co-application of LY341495, a selective group II mGluR antagonist. When applied alone, LY341495 increased the amplitude of ML-evoked IPSCs and increased the frequency of miniature IPSCs, suggesting tonic activation of group II mGluRs. All IPSCs were antagonized by $GABA_A$ antagonist bicuculline.

In conclusion, these studies have demonstrated that activation of group II mGluRs decreases the release of GABA. As heteroreceptors, presynaptic group II mGlu receptors may regulate the release of GABA in thalamic neurons, providing potential target for antinociceptive drugs. This project carries over from 2014; currently, Khalid is writing the full-length manuscript with the complete results in order to submit it for publication.

***Efficacy and Safety of the Novel Peripheral Analgesic, Isovaline, as an Adjuvant to Propofol for General Anesthesia and Conscious Sedation: A Proof-of-Principle Study in Mice***

Bernard MacLeod, Ernie Puil, Stephan Schwarz

Students: Ryan Whitehead, Yahya Asisri, Timothy Fung

The combination of propofol with an opioid analgesic is widely used for procedural sedation as well as total intravenous anesthesia. However, opioids produce respiratory depression, a primary cause of death due to these agents. Recent publications from the Hugill Centre reported on the antinociceptive actions of isovaline, a small non-biogenic amino acid that does not readily cross the blood brain barrier and acts via peripheral $GABA_B$ as well as metabotropic glutamate (mGluR2) receptors. The present project explored the possibility that isovaline represents an effective and safe alternative to opioids as an adjunct to propofol to produce anesthesia.

With approval from the UBC Animal Care Committee, an *in vivo* study was conducted in adult female CD-1 mice using Dixon's ''up-and-down'' method. Animals received intraperitoneal saline, propofol, isovaline, or fentanyl; or co-administrations of propofol with isovaline or fentanyl. Hypnosis was assessed by a loss of righting reflex and immobility by an absence of motor response to tail clip application; general anesthesia was defined as the presence of both hypnosis and immobility. Conscious sedation was assessed as a decrease in rotarod time without hypnosis. To evaluate safety, maximum tolerated dose (MTD) devoid of producing respiratory rates < 4 per min, apnea, or death were determined.

The results showed that either isovaline or fentanyl when co-administered with propofol at its $ED_{50}$ for hypnosis, produced general anesthesia (isovaline: $ED_{50}$, 96 mg/kg [95% CI, 88–124 mg/kg]; fentanyl, $ED_{50}$, 0.12 mg/kg [95% CI, 0.08–3.5 mg/kg]; $P < 0.05$). Propofol produced hypnosis without immobility ($ED_{50}$, 124 mg/kg; 95% confidence interval [CI] 84–3520 mg/kg). Neither isovaline nor fentanyl produced hypnosis at the dose which produced immobility (isovaline: $ED_{50}$, 350 mg/kg [95% CI, 286-1120 mg/kg]; fentanyl, $ED_{50}$, 0.35 mg/kg [95% CI, 0.23–.51 mg/kg]; $P < 0.05$). Isovaline at its analgesic $ED_{50}$ co-administered with a subhypnotic dose of propofol (40 mg/kg), did not exacerbate propofol-induced rotarod deficits. The $MTD_{50}$ of fentanyl co-administered with the hypnotic $ED_{50}$ of propofol was 11 mg/kg [95% CI, 8–18 mg/kg]; isovaline at the maximal deliverable (soluble) dose of 5000 mg/kg produced no apparent respiratory depression or other adverse effects including death. In conclusion, the novel analgesic, isovaline, co-administered with propofol produces general anesthesia in mice. The margin of safety for propofol-isovaline was considerably higher than for propofol-fentanyl.

This study demonstrates that propofol-based sedation and general anesthesia can be effectively and safely produced by replacing the conventional opioid component with the novel brain-impermeant peripherally-acting analgesic, isovaline. The combination of isovaline with propofol provides a potentially safer future approach to total intravenous anesthesia and procedural sedation in humans. This project was brought to completion in 2015; the full-length manuscript appeared in *Anesthesia & Analgesia* and was was highlighted in a feature accompanying editorial as well as multiple news releases.

***Central Nervous System-Toxic Lidocaine Concentrations Unmask L-Type $Ca^{2+}$ Current-Mediated Action Potentials in Rat Thalamocortical Neurons: An In Vitro Mechanism Of Action Study***

Stephan Schwarz

Research Associate: Igor Putrenko

Recent clinical studies, including multiple systematic reviews/metaanalyses, have demonstrated the effectiveness of intravenous infusions of the local anesthetic, lidocaine, for improved pain control and hastened recovery after abdominal surgery. However, high lidocaine concentrations in the blood circulation of humans exert well-known toxic effects on the central nervous system (CNS), including seizures, coma, and death. The underlying mechanisms are still largely obscure, and the actions of lidocaine on supraspinal neurons have received comparatively little study. The overall advancement that this project aimed to achieve is to identify the mechanisms that underlie lidocaine's toxicity in the brain. Laboratory investigations in the Hugill Centre recently discovered that lidocaine at clinically neurotoxic concentrations increases excitability mediated by $Na^+$-independent, high-threshold action potential spikes in rat thalamocortical neurons (*Anesthesiology* 2011, 115: 822–835). This work sought to test the hypothesis that these spikes are generated by high-threshold $Ca^{2+}$ currents, previously implicated in neurotoxicity, and to identify and isolate the specific underlying subtype of $Ca^{2+}$ current.

In these experiments, it was found that lidocaine (0.1–1 mM) abolished $Na^+$ dependent tonic firing in all neurons tested. However, in 85% of neurons, lidocaine unmasked high-threshold (HT) action potentials with lower amplitudes and rates of de-/repolarization compared to control. These HT action potentials remained during the application of tetrodotoxin (TTX, 600 nM), were blocked by $Cd^{2+}$ (50 μM), and disappeared following superfusion with an extracellular solution deprived of $Ca^{2+}$. These features implied that the unmasked potentials were generated by HT-activated $Ca^{2+}$ channels, and not by $Na^+$ channels. Application of the L-type $Ca^{2+}$ channel blocker, nifedipine (5 μM) completely blocked the HT potentials, whereas the N-type $Ca^{2+}$ channel blocker, ω-conotoxin GVIA (1 μM), had little effect. In summary, the results showed that at clinically CNS-toxic concentrations, lidocaine unmasks in thalamocortical neurons high-threshold action potentials mediated by the L-type $Ca^{2+}$ current while substantially suppressing $Na^+$-dependent excitability. On the basis of the well-known role of an increase in intracellular $Ca^{2+}$ in the pathogenesis of local anesthetic neurotoxicity, this novel action represents a plausible contributing mechanism for lidocaine's CNS toxicity in vivo. The results, presently in preparation for submission to the peer-reviewed literature, will help to understand the mechanisms of drug toxicity and develop, in the future, specific targeted treatments.

The overall significance of this research is that the findings help define the precise mechanisms of lidocaine at its supraspinal site of action, using a "bedside to bench" approach. The results enhance our understanding of therapeutic systemic local anesthetic action and hopefully aid in the future "bench to bedside" development of novel and innovative drugs for postoperative and neuropathic pain treatments that are effective, selective, and safe. The project was brought to completion in 2015 witch acceptance of the corresponding full-length paper by *Anesthesia & Analgesia*.

***Lidocaine Inhibition of the Hyperpolarization-Activated Cyclic Nucleotide-Gated HCN1 Channel Inversely Depends on Ion Flow Through the Pore***

Eric Accili & Stephan Schwarz

Research Associate: Igor Putrenko

Lidocaine is a drug that acts as a local anesthetic and topical analgesic, and, when applied systemically, produces central analgesia as well as sedation, and depresses both sinus node activity and cardiac conduction. In addition to its well-known action on $Na^+$ channels, lidocaine may produce its therapeutic actions, as well its known adverse effects, by acting on other target proteins, including hyperpolarization-activated cyclic nucleotide-gated (HCN) channels that produce the hyperpolarization-activated current, $I_h$. For example, lidocaine has been shown to inhibit native HCN channels in dorsal root ganglion neurons, thalamocortical neurons, cardiac Purkinje fibres, and sinoatrial node pacemaker cells, with 70-100% efficacy and varying potency. Two studies have examined the inhibition of heterologously expressed cloned HCN channels by lidocaine, with $IC_{50}$ and efficacy values of 67-276 μM and 42-44%, respectively. The mechanisms underlying the actions of lidocaine on HCN channels, the molecular mechanism of $I_h$ inhibition by this drug, and the basis for the variation in lidocaine's effects among studies of native vs. cloned HCN channels, remain unknown.

Using patch-clamp recordings from transfected Chinese hamster ovary (CHO) cells expressing the HCN1 channel, we examined the hypothesis that inhibition by lidocaine of the hyperpolarization-activated current $I_h$ and the HCN channels that underlie this current may be limited by ion flow through the channel pore. Precedence for such behaviour in HCN channels has been demonstrated recently for the drug, ivabradine, a heart rate reducing agent that inhibits $I_f$ in the sinoatrial node and $I_h$ in mammalian cells that express the HCN1 and HCN4 isoform. For the HCN4 isoform and $I_f$ in the sinoatrial (SA) node, the degree of inhibition by ivabradine depends inversely upon ion flow, called current-dependent block. In our studies, we focused on the HCN1 isoform, which has been found throughout the nervous system and in the conduction system of the heart and has been shown in HCN1 knockout mice to contribute to the electrical activity of sinoatrial pacemaker myocytes and somatosensory neurons.

The results showed that both potency and efficacy of lidocaine inhibition of HCN1-mediated $I_h$ were reduced when ion flow is increased, suggesting a non-competitive interaction between lidocaine and permeant ions. In other words, the findings indicate that lidocaine inhibition of $I_h$ in CHO cells expressing the HCN1 isoform is limited by permeant ions.

We conclude that the inhibition of $I_h$ recorded from CHO cells expressing the HCN1 channel depends inversely upon ion flow. Because the contribution of HCN1-mediated $I_h$ under physiological conditions is mainly in a limited range of voltages in and around the reversal potential, we propose that the inhibition of $I_h$ by lidocaine at clinically relevant concentrations can be substantial. A full-length manuscript with this project's findings is presently being submitted to the peer-reviewed literature.

***Thalamic Mechanisms of Pregabalin in Fibromyalgia and Chronic Pain: Effects on The Hyperpolarization-Activated Mixed Cationic Pacemaker Current, I(h)***

Stephan Schwarz

Research Associate: Igor Putrenko

Fibromyalgia is a potentially incapacitating chronic condition characterized by body-wide musculoskeletal pain, allodynia, and fatigue. Fibromyalgia patients also experience a variety of other symptoms such as sleep disturbances and disruptions in psychological functioning. Fibromyalgia prevails in women and is estimated to affect 4% of the general population. Economically, the average fibromyalgia patient burdens our health care system more than twice compared to the average health care user. Unfortunately, universally effective treatment of fibromyalgia has not been developed, largely due to the still unknown cause and mechanisms of this syndrome. The current treatment approaches, both pharmacologic and nonpharmacologic, are limited to the management of various symptoms, and only fewer than 50% of patients experience relief. Hence, there is a vital need to shed more light on the cellular and molecular mechanisms underlying fibromyalgia and its treatments. One of the few effective drugs is pregabalin, but how precisely it works in fibromyalgia is uncertain. Whereas the pathophysiology of fibromyalgia focuses on the thalamus, the actions of pregabalin on thalamic neurons are unknown. The overall advancement that this project – funded by the *2013 Canadian Anesthesiologists' Society Research Award in Neuroanesthesia* – aimed to achieve is to identify potential mechanisms that underlie the analgesic effects of pregabalin in fibromyalgia. We previously discovered in a separate project as a potentially promising new analgesic drug target in the thalamus the hyperpolarization-activated mixed $Na^+/K^+$ current, $I_h$ (*Anesthesiology* 2011, 115: 822–835). Partly on the basis of these findings, we sought to test the hypothesis that pregabalin alters excitability of thalamic neurons through modulation of $I_h$. This ionic current is central to the thalamus' function as "cerebral pacemaker" in the generation of the different physiologic states of consciousness and sleep, which are abnormal in fibromyalgia patients.

Work in 2015 involved further analyses and preparation for publication of the results from the experiments, which expanded from recordings of ventrobasal thalamocortical neurons in rat brain slices *in vitro* (using whole cell patch-clamp recordings aided by differential interference contrast infrared videomicroscopy) to recordings in a mammalian expression system, *i.e.*, transfected Chinese hamster ovarian (CHO) cells. The results from the CHO cell experiments showed that pregabalin delayed $I_h$ current activation by shifting its half-activation voltage and slope factor. However, pregabalin did not significantly affect $I_h$ current magnitude or de-activation. In rat thalamocortical neurons, passive electrical properties such as resting membrane potential, input resistance, and capacitance were not altered by pregabalin at a supratherapeutic concentration (200 μM). Pregabalin did not substantially affect tonic or burst firing, or the frequency response of neurons. In summary, we found subtle but little compelling evidence that the mechanisms of pregabalin significantly involve the hyperpolarization-activated mixed cationic pacemaker current, $I_h$, or alteration of firing properties of neurons in the thalamus. An abstract with the results has recently been accepted and will be presented at the *International Anesthesia Research Society (IARS) 2016 Annual Meeting* (San Francisco; May 21–24, 2016).

# SELECT PROJECT DESCRIPTIONS: CLINICAL RESEARCH

***Postoperative Delirium Following Transcatheter Aortic Valve Implantation: A Historical Cohort Study***

Alasdair Barr, Stephan Schwarz & John Bowering

Student: Lurdes Tse

Postoperative delirium has been recognized as a common complication of open heart surgery for more than 45 years. Although acute in its presentation, its implications extend beyond the temporary confusion and anxiety experienced by patients and their families, as delirium is linked to greater morbidity, mortality, and longer hospital stay, creating a huge burden on the Canadian health care system and economy while consuming taxpayer's money in this tight fiscal environment. In recent years, there has been a rapid development of novel alternative approaches to open heart valve replacement surgery that are minimally invasive and circumnavigate the need for a heart-lung machine. These novel percutaneous "transcatheter aortic valve implantation" (TAVI) techniques in recent research have proven to produce favourable results in high-risk patients; however, their effect on the incidence of postoperative delirium remains unknown. The overall advancement that this collaboration between Pharmacology & Therapeutics, Anesthesiology, and St. Paul's Hospital aimed was to achieve is to define the unknown incidence as well as specific risk factors of delirium after these novel heart valve replacement techniques.

Work in 2015 centered around the preparation for publication of the results from a retrospective cohort study on patients who underwent TAVI at the tertiary/quaternary care facility of St. Paul's Hospital (the pioneering centre for these procedures) over a two-year period. The primary outcome was a documented physician diagnosis of delirium. Abstracted data included information on demographics, medical history, surgical procedure, anesthesia, and postoperative care. A multivariable logistic regression model was employed to identify independent predictors of delirium. Variables in the logistic regression model included technique of TAVI received (there exist two with varying degrees of invasiveness – transfemoral [TF] vs. transapical [TA]), as well as a number of key predictors previously identified.

The results showed that delirium occurred in 12% of TF patients vs. 52% of TA patients ($P < 0.001$). Preoperatively, the groups differed significantly in the rates of hypertension, pulmonary hypertension, dyslipidemia, peripheral vascular disease, congestive heart failure, previous myocardial infarction, hearing loss, and memory impairment ($P < 0.001$). Differences in anesthetic management were also observed between the TF vs. TA group in terms of the inhalational anesthetics, opioids, neuromuscular blockers, antihemorrhagic drugs, and antibiotics that were used. Independent predictors for delirium after TAVI included coronary artery disease, cognitive impairment, and cardiac arrhythmia.

In conclusion, receiving TA-TAVI markedly and independently increased the risk of delirium. These results will significantly advance our knowledge about the safest way to provide heart valve replacement for our increasingly aged, multimorbid, and high-risk Canadian patient population while helping to save health care tax dollars. In 2015, the project's final full-length publication appeared in print (*Canadian Journal of Anesthesia* 2015: 62; 22–30). A particular note of thanks goes to Dr. Randy Moore and the St. Paul's Hospital Department of Anesthesia for the support of these studies.

***Incidence of and Risk Factors for Delirium After Cardiac Surgery at a Quaternary Care Cardiac Centre: A Retrospective Cohort Study***

Alasdair Barr, Stephan Schwarz & John Bowering

Student: Lurdes Tse

Delirium after cardiac surgery is associated with long-term cognitive deficits and increased mortality. Our objective was to determine the incidence of and risk factors for delirium in a mixed cohort of patients undergoing open-heart surgery and transcatheter aortic valve implantations (TAVI) in a Canadian quaternary care centre. The current study follows a pilot from the same centre on patients treated in 2007 (Burns KD et al., *BCMJ* 2009: 51; 206–210).

With the generous support of Dr. Randy Moore and the St. Paul's Hospital Department of Anesthesia, we conducted a retrospective cohort study of all patients undergoing cardiopulmonary bypass grafts (CABG), conventional valve replacements, combined CABG-valve replacements, transfemoral TAVI (TF-TAVI), or transapical TAVI (TA-TAVI) at St. Paul's Hospital in 2008. Data from 679 charts on demographics, medical history, medications, laboratory results, surgical procedure, and anesthesia were abstracted and analyzed using univariable and multivariable analyses. A predictive model was generated using binary logistic regression and bootstrapping.

The results showed that delirium occurred in 28% of patients. Consistent with to our previous study dedicated to TAVI patients (Tse L et al., *Canadian Journal of Anesthesia* 2015: 62; 22–30; cf. above), delirium was most common in TA-TAVI (47%), and least common in TF-TAVI (17%). Delirious patients were older and had greater preoperative cardiac and neurological burdens than non-delirious patients. According to the predictive model, age $\geq$ 64 years, history of delirium, history of stroke/transient ischemic attack, cognitive impairment, depression, and preoperative use of beta-blocker(s) were independently associated with delirium. Interestingly, intraoperative cefazolin use predicted a decreased incidence of delirium, although confounding by type of surgery could not be excluded.

In conclusion, the incidence of delirium varied greatly with the type of procedure. Our predictive model showed that age and certain pre-existing neurological conditions could accurately predict delirium after cardiac surgery. In 2015, the full-length manuscript with the results appeared in print in the *Journal of Cardiothoracic and Vascular Anesthesia.*

***A Comparison of Two Techniques for Ultrasound-Guided Saphenous Nerve Blockade***

Steve Head & Stephan Schwarz

Student: Rochelle Leung

In the care of patients undergoing foot and ankle surgery under regional anesthesia, reliable saphenous nerve blockade is a desirable complement to popliteal sciatic nerve blockade. However, the optimal method for accomplishing this is uncertain. The overall advancement that the present project aimed to achieve is to fill this knowledge void and compare two promising ultrasound-guided techniques for saphenous nerve block: First, a prone technique which aims to block the nerve distal to the adductor canal near the saphenous branch of the descending genicular artery, approximately 2.7 cm proximal to the superior patellar border (the "Peri-SBDGA" technique); and second, a supine technique which aims to blocks the nerve within the adductor canal, at a location approximately 12.7 cm proximal to the knee crease (the "Adductor Canal" technique). The specific goal was to test the hypothesis that the Adductor Canal technique would provide better nerve visualization and would be associated with a higher success rate than the Peri-SBDGA technique.

Work in 2015 centred around the period following completion of the data acquisition phase from a prospective, randomized, single-blinded trial of 102 patients undergoing foot surgery. The primary endpoint was saphenous nerve ease of visualization (visibility score $\geq$1, where 0 = nerve not visible, 1 = nerve visible with difficulty, and 2 = nerve easily visible.). Secondary endpoints included ease of vascular landmark visualization, block success (complete sensory blockade at 30 min), speed of onset (time required to reach complete sensory blockade), and time required to administer the block.

The results from 91 patients eligible for analysis showed that saphenous nerve visibility was not different between the groups (visibility score = 2: Adductor Canal group, n = 24/49 [49%] vs. Peri-SBDGA group, 20/42 [48%]; $P$ = 1.00). Vascular landmark visibility was better in the Adductor Canal group (visibility score = 2, 41/49 [84%] vs. 25/42 [60%]; $P$ = 0.018). Block success rates were similar (41/49 [84%] vs. 34/42 [81%]; $P$ = 0.79), as were onset times (median [IQR], 5 [5–10] vs. 8 [5–11] min; $P$ = 0.38).

In conclusion, in this randomized trial, we found no differences between the Adductor Canal and Peri-SBDGA techniques of ultrasound-guided saphenous nerve blockade in nerve visibility, block success rate, or onset, although the former technique provided superior vascular landmark visibility. Neither technique produced a sufficiently high success rate to reliably provide surgical anesthesia per se. In 2015, this project was brought to completion by appearance of the final full-length publication in print (*Canadian Journal of Anesthesia* 2015: 62; 37–44).

***Ultrasound-Guided Supraclavicular Versus Infraclavicular Brachial Plexus Block and the Risk of Hemidiaphragmatic Paralysis***

Stephan Schwarz, Steven Petrar, Mike Seltenrich & Steve Head

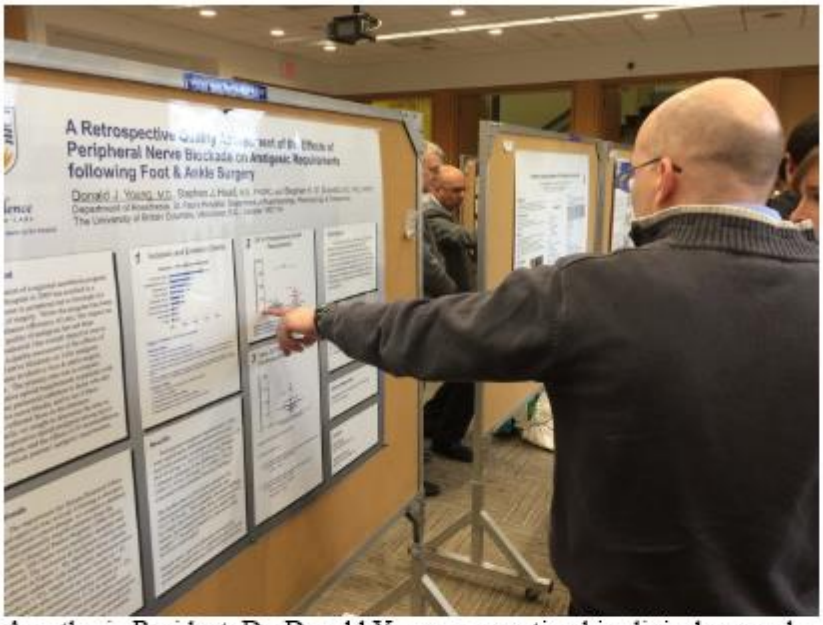
Long surgical waitlists, particularly for orthopedic surgery, continue to represent one of the central challenges to the Canadian health care system. Our research has previously shown that the use of novel care models based on parallel patient processing and ultrasound-guided regional nerve blocks can greatly improve patient throughput while allowing the provision of care on an ambulatory (outpatient) basis. For upper limb surgery, two different techniques of regional nerve blockade have become the standard of care: (1) supraclavicular, and (2) infraclavicular brachial plexus blockade. However, due to proximity to the brachial plexus, incidental phrenic nerve blockade resulting in paralysis of the diaphragm on the side of anesthesia, with possible subsequent respiratory difficulty in vulnerable individuals, can occur following brachial plexus anesthesia. Whereas it is possible that the (more difficult) infraclavicular technique represents an advantage in this regard over the (easier) supraclavicular technique, the precise risk and incidence of hemidiaphragmatic paralysis following ultrasound-guided supra- vs. infraclavicular brachial plexus blockade is unclear. The overall advancement that our research is trying to achieve is to define the safest method of providing regional anesthesia for upper extremity surgery. The specific goal of this particular project was to test the hypothesis that that with local anesthetic volumes used in routine daily clinical practice, ultrasound-guided infraclavicular blockade will result in a lower incidence of phrenic nerve palsy compared to an ultrasound-guided supraclavicular technique. The secondary objective was to obtain accurate quantitative data on the incidence of phrenic nerve palsy following ultrasound-guided infraclavicular brachial plexus blockade, previously unavailable in the literature.

To test the hypothesis, a randomized, blinded parallel-group study of 64 patients who underwent elective right-sided lower arm, wrist or hand surgery was conducted. Patients were assigned to ultrasound-guided supra- or infraclavicular blockade with 30 mL of 0.5% ropivacaine. The primary endpoint was complete hemidiaphragmatic paralysis at 30 min, defined as a > 75% reduction in diaphragmatic excursion measured with the voluntary sniff test using M-mode ultrasonography. Partial paralysis was defined as a 25%–75% reduction.

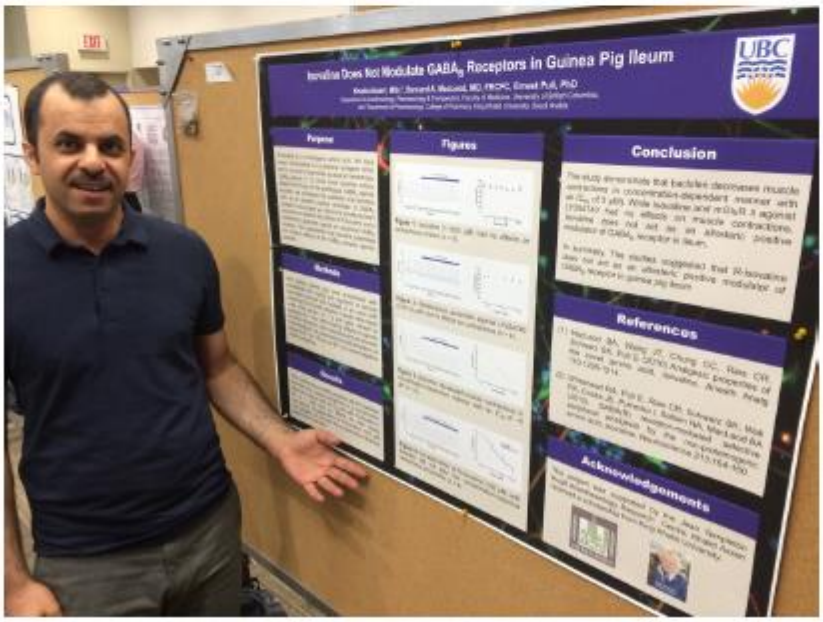
The results demonstrated that 11/32 patients (34%) in the supraclavicular group vs. 1/32 (3%) in the infraclavicular group had complete hemidiaphragmatic paralysis ($P = 0.001$ [one-tailed]; relative risk, 11.0 [95% CI, 1.5–80.3]); 44% vs. 13% had any (complete or partial) paralysis ($P = 0.006$; relative risk, 3.5 [95% CI, 1.3–9.5]). Eight/32 patients (25%) in the supraclavicular group vs. 5/32 (16%) in the infraclavicular group reported dyspnea ($P = 0.54$).

In conclusion, ultrasound-guided supraclavicular blockade with 30 mL of 0.5% ropivacaine produced complete hemidiaphragmatic paralysis in approximately one third of patients. The infraclavicular approach greatly reduced this risk but did not eliminate it. In 2015, this project – previously awarded the distinction of "Best of Category" [Regional Anesthesia] from over 512 projects by the *International Anesthesia Research Society* – was brought to completion by appearance of the final full-length publication in print (*Regional Anesthesia & Pain Medicine* 2015, 40: 133–138).

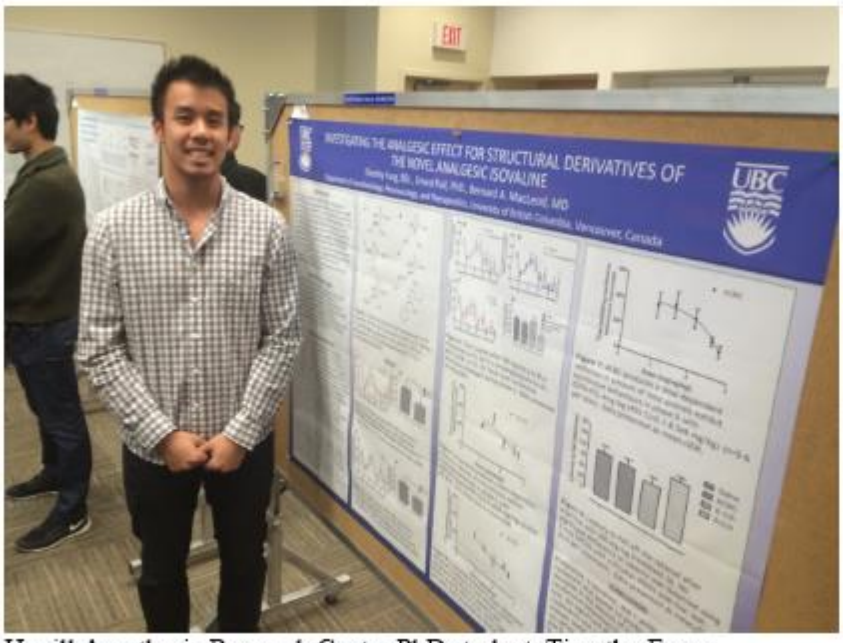
**PICTURE GALLERY**




Anesthesia Resident, Dr. Donald Young, presenting his clinical research project findings at the 2015 APT Research Day




Hugill Anesthesia Research Centre PhD student, Khalid Asseri



Hugill Anesthesia Research Centre PhD student, Timothy Fung

Hugill Anesthesia Research Centre students & Faculty discussing research project progress

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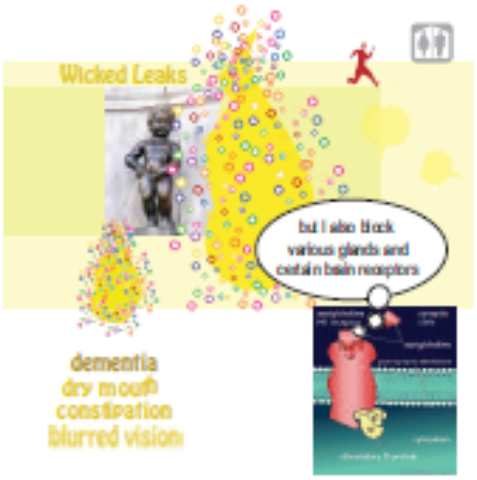
*THERAPEUTICS INITIATIVE NEWSLETTER*

therapeutics letter ©

THERAPEUTICS INITIATIVE Evidence Based Drug Therapy

therapeutics letter
January - February 2015

# Are claims for newer drugs for overactive bladder warranted?




Two previous Therapeutics Letters on drugs for overactive bladder (OAB) concluded that the antimuscarinic drugs (oxybutynin, tolterodine, darifenacin, solifenacin and trospium) had limited short-term potential symptomatic benefit (NNT = 7) and significant risk of adverse effects (NNH = 5).[1,2] This Letter compares drugs to one another, including newer drugs introduced since 2007, when our most recent Letter on this topic was published.[2]

## Background

OAB refers to symptoms of urinary urgency, with or without incontinence or increased micturition frequency.[3,4] This definition, standardized in 2002, shifted the emphasis from incontinence to urgency (the sudden strong urge to urinate) and widened the population to which these drugs were marketed. An independent population-based study in Finland (n=3727; age 18-79) reported an age-standardized OAB prevalence of 9.3% of women and 6.5% of men. However, if only those with incontinence are included, the prevalence drops to 2.4% of women and 0.7% of men.[5]

Treatment goals are to reduce distressing symptoms and improve quality of life. Reduction of incontinence is a key aim as it can affect quality of life more than urgency or frequency.[6] Non-drug treatments should be tried first as patients may benefit from lifestyle changes or bladder training, without any adverse effect.[2,7-9]

Antimuscarinics competitively block muscarinic cholinergic (acetylcholine) receptors. No drug is entirely selective for the muscarinic receptor types in the bladder, which are also distributed elsewhere in the body. All drugs exert dose-limiting anticholinergic adverse effects at these and other muscarinic receptor types. Drugs in this class can be broadly divided into short-acting, immediate-release (IR) and longer-acting or extended-release (ER) formulations.

## Antimuscarinic Drug Class Review

We conducted a systematic review of direct comparator randomized controlled trials (RCTs) of antimuscarinic drugs in OAB, using Cochrane review methods. For infrequent harms, including cognitive effects in the elderly, we also reviewed RCTs in people without OAB, placebo-controlled RCTs, and non-randomized studies. Outcomes were considered in a hierarchy based on importance to the patient: mortality, serious adverse events including cognitive impairment and urinary retention, quality of life, patient-reported improvement, withdrawals due to adverse effects, urgency incontinence, nocturia, and anticholinergic effects such as dry mouth, constipation or blurred vision.

**Results:** We identified two recent systematic reviews[6,10] and 35 direct, active comparator RCTs in patients with OAB, mostly of ≤12 weeks duration. Most (22 RCTs) compared oxybutynin IR with other formulations of oxybutynin, tolterodine (IR or ER), darifenacin, solifenacin or trospium IR.

Efficacy differences were small and of doubtful clinical relevance. For example, condition-specific quality of life did not differ or differences were below the threshold for clinical relevance, and incontinence episodes did not differ, or differed by 0.2-0.6 episodes/day. Differences between drugs in pharmacokinetics, metabolism, drug-drug interactions, bladder selectivity, and propensity to cross the blood brain barrier were not reflected in clinically meaningful differences.

Adverse event reporting was often inadequate and trials were under-powered to analyse serious adverse events. In general, ER formulations led to less dry mouth than IR, and the highest observed rates were with oxybutynin IR. However, many trials used higher doses of oxybutynin IR than of comparators.

The trials shared many methodological shortcomings, including non-equivalent dose comparisons, poor harms ascertainment, selective outcome

reporting, poor methods reporting, and publication bias. Reported outcomes often failed to reflect the full patient experience.

## Are 3 recently approved drugs for OAB better than older drugs?

**Fesoterodine fumarate (Toviaz®)**

Fesoterodine is closely related to tolterodine as it is hydrolyzed after absorption to tolterodine's active metabolite.[11] Three head-to-head RCTs compared fesoterodine with tolterodine ER.[13-14] In one trial, fesoterodine 4 mg/day (n=272) and tolterodine ER 4 mg/day (n=290) did not differ.[12] In the three trials comparing fesoterodine 8 mg/day (n=1927) with tolterodine ER 4 mg/day (n=1947), 7% more patients on fesoterodine reported improvement or 'cure' on a 3-day bladder diary. Patients experienced ~ 1 fewer urgency incontinence episode per 4 days, 1 fewer urgency episode per 3 days, and 1 fewer nocturia episode per 11 days. These modest differences failed to outweigh the increased harm: 10% more patients on fesoterodine had adverse events, 2% more withdrew due to adverse effects and 1% more had serious adverse events. This is consistent with a stronger anticholinergic effect from fesoterodine 8 mg/day vs. tolterodine ER 4 mg/day (e.g., non-equivalent doses).

**Oxybutynin chloride gel (Gelnique®)**

Topical oxybutynin formulations avoid first pass metabolism in the intestine and liver and reduce peak plasma concentrations of oxybutynin and its active metabolite N-desethyloxybutynin, hypothesized to be associated with dry mouth.[15] However, there are no comparative trials of benefits or harm of oxybutynin gel vs. alternatives in patients with OAB. As with other transdermal formulations, the gel's adverse effects include application site reactions.[16]

**Mirabegron (Myrbetriq™)**

Mirabegron is a recently approved, relatively selective ß3-adrenoceptor agonist.[17] Stimulation of the ß3-adrenoceptor relaxes the bladder smooth muscle during the storage phase, increasing bladder capacity.[17] Dose-dependent increases in blood pressure, heart rate and QT prolongation with higher doses led to a recommended usual dose of 25 mg/day in Canada.[18] Effectiveness vs. placebo is similar to antimuscarinic drugs.[18]

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Five RCTs comparing mirabegron (mostly 50 mg/day) with solifenacin or tolterodine ER showed no significant differences.[19-24] In one RCT, tolterodine ER reduced incontinence slightly more than mirabegron.[8,25] In another RCT, mirabegron did slightly worse than solifenacin (failure to demonstrate 'non-inferiority').[26]

Rates of serious adverse events, total adverse events, and withdrawals due to adverse events were similar for mirabegron and tolterodine or solifenacin.[8] Mirabegron led to less dry mouth but not to fewer adverse events in total.

## Antimuscarinic drugs and cognition

Most direct comparator RCTs did not actively assess cognition and were under-powered for infrequent serious cognitive adverse events; one poor-quality RCT showed no difference in cognition between oxybutynin IR and oxybutynin ER.[27]

An additional 15 RCTs assessed cognitive effects, mainly in healthy volunteers and/or vs. placebo. Assessed outcomes included recall on computerized cognitive tests and Mini Mental Status Evaluation. None of the RCTs allowed a conclusion of different cognitive effects with any specific antimuscarinic vs. another. No RCT assessed cognition with chronic use of antimuscarinic drugs.

A recently published, population-based cohort study in people ≥ age 65 (n=3434, mean follow-up 7.8 years) assessed risk of new onset dementia following long-term cumulative exposure to anticholinergic drugs (10% OAB drugs).[28] Exposure equivalent to oxybutynin 5 mg daily for ≥3 years was associated with an increased risk of dementia compared with no exposure: adjusted hazard ratio (HR) 1.54 (95% CI 1.21 to 1.96). These findings are consistent with two shorter-term cohort studies[29,30] and a recent systematic review.[31]

## Conclusions

- All drugs for overactive bladder have limited short-term potential benefit and appreciable risk of adverse effects.
- There is insufficient evidence that benefits of long-term treatment outweigh harm for any overactive bladder drug.
- Claims of superiority for any antimuscarinic drug (including fesoterodine and oxybutynin chloride gel) over the others are **not** warranted due to methodological shortcomings of available RCTs.
- Mirabegron is a poor alternative due to its lack of an efficacy advantage and cardiac risks.
- **Recent observational studies suggest that all long-term anticholinergic drugs increase risk of dementia.**

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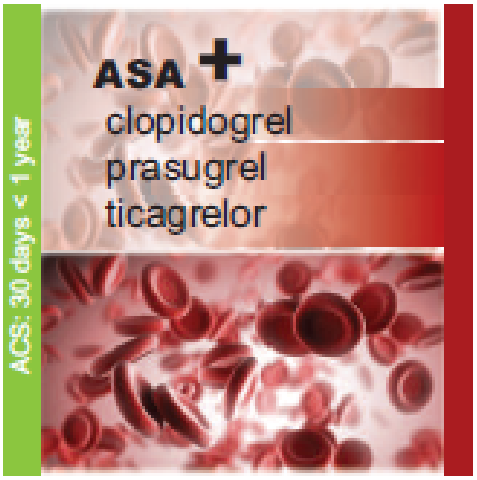
THERAPEUTICS INITIATIVE Evidence Based Drug Therapy



# Dual antiplatelet therapy: net health benefit or harm?




The antiplatelet drugs acetylsalicylic acid (ASA), clopidogrel (Plavix) and ticlopidine (Ticlid) were reviewed in TL#37.[1] Ticlopidine is no longer available in Canada. ASA has a unique action, irreversibly inhibiting platelet cyclooxygenase. Clopidogrel and two new drugs, prasugrel (Effient) and ticagrelor (Brilinta), reduce platelet activation and aggregation by inhibiting $P2Y_{12}$ adenosine diphosphate receptors. Prasugrel and ticagrelor have been suggested as alternatives to clopidogrel for patients presenting with acute coronary syndrome. This letter analyses published RCTs comparing these two new platelet inhibitors with clopidogrel, and includes additional information available from the US FDA's medical reviews of these RCTs.

## Background

The *SPS3* trial[2] showed in 2012 that harms of long-term dual antiplatelet therapy (DAPT) outweigh benefits after lacunar stroke; 3020 people with recent lacunar infarcts were followed for 3.4 years after randomization to ASA 325 mg/d plus clopidogrel 75 mg/d, or to ASA 325 mg/d plus placebo. DAPT increased mortality as compared to ASA alone: RR 1.45 [1.10-1.93], ARI = 2.3%, NNTH = 44 in 3.4 years. A meta-analysis of all trials of DAPT versus ASA alone (N = 69,644) found numerically higher mortality with this strategy, HR 1.04 [0.96-1.18].[3] A recently published study[4] comparing ticagrelor 60 or 90 mg twice/d plus low dose ASA 75-150 mg/d vs ASA alone did not affect mortality and when added to the meta-analysis will not change the conclusions. A 2015 meta-analysis limited to patients who had received drug-eluting stents demonstrated increased total mortality from DAPT> 1 year duration as compared to DAPT≤ 1 year duration, HR 1.22 [1.02-1.45].[5]

DAPT is indicated for early treatment of patients presenting with acute coronary syndrome (ACS), including unstable angina (UA), non-ST segment elevation myocardial infarction (NSTEMI) and ST-segment elevation myocardial infarction (STEMI), with or without revascularization with percutaneous coronary intervention (PCI).[6-10]

## Clopidogrel (Plavix)

Our understanding of clopidogrel in this setting is based primarily on the CURE RCT.[11] In this trial, adding clopidogrel to ASA did not reduce all-cause mortality, and information on total serious adverse events was not reported. DAPT reduced myocardial infarction, RR 0.77 [0.67-0.89], ARR = 1.5%, but increased major bleeds, RR 1.38 [1.13-1.67], ARI = 1%. Our assessment of this trial concluded that half of the cardiovascular benefit occurred within the first 24 hours after a loading dose of clopidogrel, and almost all within the first 30 days of therapy.

## Prasugrel (Effient)

Prasugrel was approved by Health Canada in 2010 for co-administration with ASA for ACS. It is not recommended for people >75 years, due to increased bleeding risk. Approval was based primarily on the multicenter, randomized controlled trial TRITON-TIMI 38, comparing prasugrel/ASA vs clopidogrel/ASA in 13,608 patients with ACS and scheduled PCI.[12] The investigators concluded that prasugrel 10 mg/d reduced ischemic events as compared with clopidogrel, but increased major bleeding events. Benefit of prasugrel was driven by a decrease in nonfatal myocardial infarctions (NFMI). 60% of NFMI occurred <24 hours after PCI ("periprocedural") and represented asymptomatic elevations in cardiac enzymes. These are of uncertain clinical impact, but clearly less dangerous than symptomatic myocardial infarction. Prasugrel (vs clopidogrel) did not reduce cardiovascular death or stroke. Prasugrel increased major bleeds by 0.6% (including life-threatening and fatal bleeds). More patients discontinued prasugrel than clopidogrel due to adverse effects, including haemorrhagic adverse events.

The US FDA review cautioned that methodological concerns about ascertainment of clinical outcomes should temper conclusions about this

study, noting that loss to follow-up occurred in 4.9% of patients (clopidogrel) and 5.1% (prasugrel).[13]

The overall clinical impact of prasugrel vs clopidogrel can be assessed by all-cause mortality and total serious adverse events (SAEs). TRITON-TIMI 38 found no significant difference in all cause mortality, RR = 0.95 [0.78-1.16], nor for total serious adverse events, RR = 1.02 [0.96-1.08]. Similarly, 5 years after the publication of TRITON-TIMI 38, the TRILOGY ACS trial of prasugrel vs clopidogrel in UA/NSTEMI patients without planned revascularization reported no difference for the primary outcome of cardiac death, nonfatal MI or stroke.[14] All-cause mortality did not differ and total serious adverse events were not reported.

## Ticagrelor (Brilinta)

Ticagrelor was approved by Health Canada in 2011 for co-administration with ASA for ACS. Approval was based primarily on the PLATO trial comparing ticagrelor/ASA vs clopidogrel/ASA in 18,624 patients with ACS (UA/NSTEMI/STEMI) managed by PCI, CABG or medical therapy alone.[15] The published report indicates that ticagrelor 90 mg bid decreased the primary outcome of death from vascular causes, MI or stroke at 12 months: 9.8% for ticagrelor vs 11.7% for clopidogrel, HR 0.84 [0.77-0.92], ARR 1.9%, NNT = 53. All-cause mortality was reported as ticagrelor 4.5% vs clopidogrel 5.9%, HR 0.78 [0.69-0.89], ARR = 1.4%, NNT = 71.

However, the FDA medical review documents a number of irregularities in reporting of serious adverse events (including deaths) that brings these findings into question.[16] Mortality was numerically higher with ticagrelor at North American sites, and was reduced only in countries outside of North America. Unblinding was declared in at least 452 patients, much higher than the numerical difference of 107 people for all-cause mortality or 150 for the primary end point. There were also important losses to follow-up in this trial: 19.7% of patients receiving ticagrelor and 18.1% for clopidogrel.

In contrast with the published report of PLATO, the FDA concluded that ticagrelor increased major or minor bleeding events vs clopidogrel (ARI = 1.5%, NNH = 66).[16] Ticagrelor also increased withdrawals due to adverse effects, ARI 2% mostly due to dyspnea or epistaxis. The overall net impact of ticagrelor could not be assessed, as there was inadequate reporting of total serious adverse events. To prepare this Letter, we contacted the PLATO study authors and the manufacturer of ticagrelor requesting details on total SAEs, but have received no reply by the date of publication. We remain uncertain about the net benefit/harm of ticagrelor vs clopidogrel. Independently conducted trials could resolve this uncertainty.

## Conclusions

- In assessing and interpreting the findings of clinical trials, important additional information and insight can be found on the FDA website: www.fda.gov
- **Long-term dual antiplatelet therapy (vs ASA alone) does not decrease all-cause mortality and increases it in some settings.**
- All antiplatelet agents cause increased bleeding, which reduces their net benefits.
- **Dual antiplatelet therapy is indicated after acute coronary syndrome. It should be started immediately and continued for a maximum duration of 1 year. Most of the benefit occurs in the first 30 days.**
- It is uncertain whether prasugrel or ticagrelor have any therapeutic advantages or disadvantages, compared with clopidogrel.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THERAPEUTICS INITIATIVE Evidence Based Drug Therapy

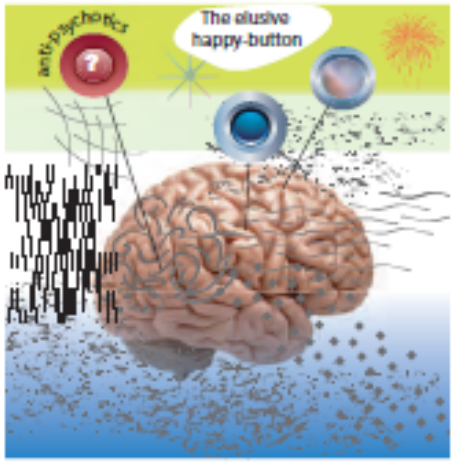
therapeutics letter
July - August 2015

# Antipsychotics should not be used for non-psychotic depression

This Letter reviews clinical evidence for use of antipsychotics for depression. In Canada, two antipsychotic drugs are approved to treat major depressive disorder (MDD) that is not responsive to other treatment. Quetiapine (Seroquel XR) is approved as monotherapy or in combination with conventional antidepressants for symptomatic relief of MDD "when currently available approved antidepressant drugs have failed".[1] Aripiprazole (Abilify) is approved only for adjunctive treatment of adults with "inadequate response to prior antidepressant treatments during the current episode".[2] Olanzapine, risperidone, ziprasidone, and amisulpiride (not available in Canada) have also been evaluated in randomized trials for MDD. **This Letter focuses on quetiapine because it is the most studied antipsychotic in this setting.**

Significant persistent depression that impairs quality of life and affects work, social and family functioning is called MDD. At its worst, it can lead to suicide. **The lifetime prevalence of MDD has been estimated in a systematic review at 6.7 per 100 people.**[3] Goals of therapy include amelioration of suffering, suicide prevention and restoration of normal functioning. Maintaining employment, positive social interactions and healthy lifestyle are obvious therapeutic targets, but avoiding drug-induced illness and any deleterious effects are equally important. Clinical trials are typically short, with the only measure of effect being symptom-based depression-rating scales.

Drug treatment of depression dates back to 1957, when Swiss psychiatrist Roland Kuhn claimed that imipramine improved severe depression dramatically and rapidly in hospitalized patients.[4] The ensuing search for drugs with similar effects led to a number of classes of antidepressant drugs: tricyclics, heterocyclics, selective serotonin reuptake inhibitors, serotonin-norepinephrine reuptake inhibitors and others. However, despite widespread use, antidepressants are only marginally better than placebo for all degrees of depression.[5-8] Beneficial effects are not dose-dependent.[9] Older antipsychotics, e.g. chlorpromazine, haloperidal, loxapine, etc. are rarely prescribed for depression, and then only for psychotic symptoms. The newer antipsychotics are also dopamine antagonists and not devoid of their predecessors' adverse effects.[10]




## Pharmacology

The marketing label "atypical (second generation) antipsychotic" camouflages properties shared with older antipsychotics. With the exception of clozapine, all antipsychotics block dopamine (D2) receptors, cause extrapyramidal symptoms and signs, tardive dyskinesia and elevate plasma prolactin. The parent drugs or their active metabolites also antagonize serotonin, histamine and alpha-receptors. Quetiapine's active metabolite, norquetiapine, blocks muscarinic cholinergic receptors, causing dry mouth and other anticholinergic effects.[1]

Drugs of this "class" can induce postural hypotension by blocking alpha receptors. They also cause weight gain, diabetes and hypercholesterolemia. Risperidone, quetiapine and aripiprazole increase mortality when used for behaviour control in dementia.[1,2,11]

Most use of these antipsychotics worldwide is not for schizophrenia, and much is for "off-label" or unapproved conditions.[12] All antipsychotics can impair alertness, concentration and thinking, often in a dose-dependent manner.

## Cochrane Systematic Review

The 2012 Cochrane review[12] of "second generation" antipsychotics for MDD and dysthymia in outpatients identified 28 studies using 5 drugs (amisulpride, aripiprazole, olanzapine, quetiapine and risperidone). The trials were short; 22 were 12 weeks or less in duration. Outcomes assessed were typically "response" or "remission" derived from scores on the Hamilton Depression Rating Scale (HAM-D) or the Montgomery Asberg Depression Rating Scale (MADRS). The authors concluded there is "limited" or contradictory evi-

dence either for solo antipsychotic therapy or augmentation therapy and that generally, treatment with second-generation antipsychotic drugs was associated with worse tolerability, mainly due to sedation and weight gain. This review has not yet been updated to include all trials for which results are now available.

## Quetiapine for MDD

We identified 10 double blind randomised control trials (RCTs) of quetiapine (25-600 mg/d) for MDD [11-22] and 1 RCT for MDD with "comorbid fibromyalgia"[23]. In 9 RCTs, quetiapine monotherapy was compared only with placebo, whereas 2 trials also compared it to duloxetine and escitalopram.[16,22] In 4 RCTs, quetiapine (or placebo) was added to standard antidepressants. Most trials were of 6-8 weeks duration, and only one was longer than 9 weeks. Astra Zeneca sponsored all trials, and designed, ran and analysed the 8 largest trials. One RCT involved 237 sites, most sites recruiting very few patients.[18]

All trials experienced large dropout rates due to adverse effects, higher for quetiapine than placebo. The high incidence of adverse effects made loss of blinding very likely.[14] Selection bias due to early loss of participants, high risk of bias due to loss of blinding, plus other biases made meta-analysis inappropriate, as it would only compound the bias. Quetiapine typically reduced depression scores (vs. placebo) by about 2-3/60 points (MADRS) or 4-5/50 points (HAM-D). "Response" or "remission" rates, defined as arbitrary reductions in rating scores, favoured quetiapine by about 10% absolute improvement. These small effects are not clinically significant[8] and could easily occur due to biases present in the trials. Furthermore the improvement in the rating scores could be explained by the sedating effect leading to improved sleep. Quetiapine was not better than duloxetine[16] or escitalopram[22], and adding quetiapine to fluoxetine in one RCT did not improve any outcomes.[14] The lack of long-term trials has resulted in Astra Zeneca advising physicians in the Product Monograph to use quetiapine for the shortest time that is clinically indicated: "When lengthier treatment is indicated, the physician must periodically re-evaluate the long-term usefulness of the drug for the individual patient keeping in mind the long-term risks."[1]

Harms caused by quetiapine include somnolence or sedation in up to 69% of patients, and anticholinergic effects in up to 57%. Adverse effects include weight gain, diabetes, extrapyramidal symptoms, dizziness and fatigue. There is no evidence that quetiapine reduces suicidality in MDD and effects on cognition were not reported. A single trial took depressed patients who tolerated and were stabilized on quetiapine and randomized them to continuing quetiapine or placebo. This trial demonstrated that in the first 14 days, treatment discontinuation symptoms were increased in the placebo group as compared to quetiapine. The symptoms included headache, insomnia, sweating, chills, nausea and diarrhea.[18] Long-term harms are unstudied, however quetiapine carries significant long-term risks associated with weight gain, diabetes and anticholinergic effects.[24]

## Other antipsychotics

Trials of aripiprazole and other antipsychotics studied fewer patients, but showed similar results and are limited by the same methodological biases.[12]

## Conclusions

- Quetiapine has not been shown to improve overall function as monotherapy or when added to an antidepressant for unresponsive major depressive disorder.
- There is insufficient scientific evidence that quetiapine reduces any depression-rating scores. Quetiapine causes sedation, which improves sleep.
- **Biased trial methodology exaggerates any apparent benefits, and minimizes disadvantages such as weight gain or other long-term harms.**
- Adverse effects include frequent sedation, anticholinergic effects and weight gain. Long-term harms are unknown, but likely include elevated cardiovascular risk related to weight gain and metabolic changes.
- Evidence for other antipsychotics for depression is **not** better.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# Benefits and harms of drugs for "neuropathic" pain

Chronic pain (at times presumed to be "neuropathic" in origin) is a common problem in clinical practice. It is now well recognized that the results of drug treatment are more often disappointing than not.[1] Despite this, from 2005-2014 the number of British Columbians prescribed gabapentin increased 1.8 fold, pregabalin 17 fold, and duloxetine 3.6 fold (from 2008). Use of venlafaxine (mostly for depression/anxiety) has remained relatively stable.

Most gabapentin, pregabalin, and duloxetine use in B.C. is for chronic pain, driven partly by concern about problems with long-term opioid therapy. For the same reason, tricyclic antidepressants (amitriptyline, nortriptyline, imipramine, desipramine) are often prescribed for "neuropathic" pain.

**In 2009 Therapeutics Letter 75 on gabapentin[2] concluded:**

- Gabapentin reduces neuropathic pain by < 1 point on a 0-10 point scale and benefits about 15% of carefully selected patients (NNT=6-8).
- A similar proportion of people suffer harm (NNH=8).
- A test of benefit/harm can be made after 1-2 days at a low dose (100-900 mg/day).
- Benefit is unlikely to increase with higher doses or longer treatment.

This Letter updates information on gabapentin and critically appraises randomized clinical trials (RCT) assessing the benefits and harms of three other drugs promoted for neuropathic pain: pregabalin, duloxetine, and venlafaxine. It is based primarily on 4 Cochrane reviews.[3-6] Like many systematic reviews, these either did not assess risk of bias, or did not fully reflect the implications of the risk of bias in their conclusions. We attempt to demonstrate how appreciation of the biases in RCTs can be incorporated into the conclusions of systematic reviews.

## Benefits

Although all pain metrics have limitations[7] a 50% or greater reduction from a baseline pain score has been promoted as a more clinically relevant outcome for "neuropathic" pain because it correlates with improvements in comorbidity, function and quality of life.[4] Using this outcome across all 4 Cochrane reviews, the mean number of people who must be treated for one to achieve a ≥ 50% reduction in pain (NNT) compared to placebo is about 6. This calculation is based on all doses that were statistically significantly superior to placebo. The evidence is weakest for venlafaxine, but even for gabapentin, pregabalin, and duloxetine, this NNT is likely very optimistic, as we judged the included RCTs to have a high risk of bias.

The greatest potential bias comes from the likelihood that patients and investigators were unblinded by observing drug adverse effects such as somnolence. Loss of blinding has been shown to be associated with a 68% exaggeration of relative benefits for subjective outcomes such as pain.[8] In addition almost all RCTs included in the Cochrane reviews were funded by drug manufacturers. A separate Cochrane review demonstrated that industry funded studies lead to "more favourable results and conclusions" than non-industry funded studies.[9] Accounting for these biases, we suspect the real NNT for benefit from these drugs is at least 10.

An alternative measure of meaningful benefit is the patient's reported global impression of change (PGIC). PGIC was not reported in any venlafaxine RCT[3] and no meaningful difference was found for duloxetine.[4] For gabapentin and pregabalin, the estimated NNT for "much or very much improved" PGIC ranges from 6-10.[5,6] Like the ≥50% pain score reduction, this is probably overly optimistic.

The evidence of benefit for tricyclic antidepressants for neuropathic pain is weaker and it is not possible to estimate a meaningful NNT.[10-13]

## Harms

Withdrawals due to adverse effects compared with placebo were higher with gabapentin, pregabalin, duloxetine and venlafaxine.[3-6] Approximately 80% of people receiving these drugs experienced at least one adverse effect. The most common were somnolence, dizziness, and nausea. Anticholinergic effects, such as dry mouth and constipation, were common with duloxetine. The rate of adverse effects reported in Cochrane reviews almost certainly underestimate the real world rates because patients at higher risk (e.g. from impaired kidney function, alcohol use, or with other morbidities) are excluded from RCTs. Furthermore, official product monographs for these drugs report higher rates of adverse effects than do the Cochrane reviews.

The most common adverse effects reported for the tricyclic antidepressants were dry mouth, sedation and constipation.[9-13] Likewise official monographs provide a better and higher estimate of the incidence of harms than the systematic reviews.

## To whom do the Cochrane reviews apply?

Patients averaged 50 years of age, had moderate levels of neuropathic pain, and were free of medical conditions other than those being studied (diabetes, fibromyalgia, or post-herpetic neuralgia). RCTs varied with respect to allowed use of other analgesics from acetaminophen only to the use of multiple analgesics including opioids.

## How soon is pain reduced?

In the majority of trials pain reduction compared with placebo was demonstrable within the first week. Very little additional pain reduction occurred after the second week.

## Is there evidence that increasing dose improves response?

For gabapentin, pregabalin, duloxetine and venlafaxine, RCTs demonstrated little or no benefit from doses higher than the lowest dose that was superior to placebo.[3-6]

## Clinical Implications

Evidence from 8 Cochrane reviews should temper expectations regarding the likelihood and magnitude of pain relief from gabapentin, pregabalin, duloxetine, venlafaxine, amitriptyline, nortriptyline, imipramine or desipramine. When initiating a therapeutic trial with one of these drugs in a patient, it is reasonable to start at the lowest recommended dose and assess the patient for benefit and harm at 1 week. If benefit harm ratio is unacceptable, consider stopping the drug. If insufficient but partial pain relief is achieved, increase the dose and reassess within 1 week. If functionally meaningful benefit is still absent, stop the drug and try something else. For patients who achieve clinically meaningful analgesia, use the lowest individualized effective dose to minimize adverse effects. Reassess regularly (e.g. every 2 weeks), as most patients treated with placebo also improve over time.

## Conclusions

- **The evidence base for drug treatment of neuropathic pain is weak, due to the small magnitude of clinically meaningful effects and the high risk of bias in the RCTs.**
- Probably less than 1 in 10 patients achieve a meaningful reduction in pain.
- **Most patients experience some adverse side effects like somnolence, dizziness, nausea, dry mouth and constipation.**
- To identify patients who respond, a therapeutic trial with early assessment is essential. Reassessment of drug utility is needed to detect people with spontaneous remission or placebo response.
- Higher doses are unlikely to achieve greater pain reduction, but are more likely to cause harm.


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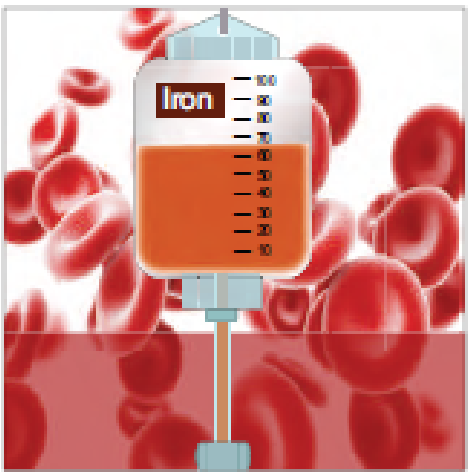
THERAPEUTICS INITIATIVE Evidence Based Drug Therapy

# Intravenous (IV) iron for severe iron deficiency

therapeutics letter
November - December 2015




Anemia affects about one-third of humans; iron (Fe) deficiency is the most common cause.[1] In Canada (2009-11), deficiency defined as serum ferritin < 15 mcg/L was estimated to affect 13% of females aged 12-19, and 9% of females aged 20-49.[2] This estimate is probably low, as the ferritin cutoff is arbitrary and it excludes residents of First Nation reserves, where nutrition is often inferior to the rest of Canada. Iron is essential for oxygen transport by hemoglobin (Hb), but also for energy metabolism, including the mitochondrial electron transport chain. Deficiency without anemia may cause non-specific symptoms (e.g. fatigue, impaired concentration, weakness) and signs (e.g. hair loss, nail and mucosal changes), but there is surprisingly little evidence about whether treatment is beneficial.[3,4,5] Identifying the cause is always important. Treatment with oral iron and/or diet is usually simple, although only a tiny fraction of ingested elemental iron is absorbed.[6,7]

**However, sometimes iron must be given parenterally.** IV iron can rescue patients unable to tolerate or absorb oral iron, or who lose blood rapidly. Examples include heavy menses, celiac disease, gastric bypass, inflammatory bowel disease, and GI bleeding. When iron repletion is urgent, IV administration saves time, blood transfusion, and money and is underutilized.[8,9] This Letter does not discuss controversy over IV iron use for hemodialysis patients.[10]

### 3 cases illustrate appropriate use

- **Menorrhagia:** a 20 y/o female university student had exertional dyspnea from anemia caused by chronic menstrual blood loss. Her resting heart rate was 126, Hb 70 g/L (120-155), mean cell volume (MCV) 55 fL (82-98), ferritin 2 mcg/L (10-150). She was about to travel overseas, and received 1 g IV iron dextran over 4 hours in preference to red cells. Within 24 days, her Hb was 117 g/L, MCV 71 fL, ferritin 28 mcg/L. Her symptoms resolved and her menorrhagia was addressed.
- **Chronic upper GI blood and malnutrition:** a 56 y/o homeless man suffered from schizophrenia and alcoholism. He was hospitalized after vomiting blood and collapsing in the street. His initial Hb was 56 g/L, MCV 78 fL, ferritin 20 mcg/L. A large gastric ulcer was treated at endoscopy and he received 3 units packed red cells. Emergency room records revealed chronic iron deficiency anemia for at least 7 years. While hospitalized, he was given 2 g IV iron dextran over 2 days. Two months later, his Hb had risen to 123 g/L, the MCV to 95 fL.
- **Chronic lower GI blood and limited iron absorption:** a 14 y/o boy with severe ulcerative colitis had daily bloody stools. Concurrent celiac disease limited iron absorption from a vegetarian diet. His Hb was 44 g/L, (MCV) 58 fL and plasma ferritin < 1 mcg/L. A test dose of iron dextran caused wheezing, back and abdominal pain, but after 25 mg IV diphenhydramine, he tolerated iron sucrose 600 mg. Seven weeks later, his Hb was 120 g/L and MCV 79 fL. Additional iron sucrose compensated for ongoing lower GI bleeding, and his Hb peaked at 143 g/L with a ferritin of 89 mcg/L.

## Indications and Dosing

Severe iron deficiency plus inability to tolerate or absorb oral iron is the main indication. In the face of ongoing blood loss or urgent surgery, IV iron corrects anemia much faster than oral iron. The bodies of well-nourished people contain about 4 - 5 grams of elemental iron, half circulating in red cells. The remainder is stored in the bone marrow, liver, and spleen. Adult patients with profound iron deficiency require at least 1 gram of elemental iron to replete body stores. To correct anemia, another 200 mg is required per 10 g/L increment in Hb. The convenience of iron repletion depends on hospital policies for administration, including availability of pre-printed orders.[11]

## Benefits

Meta-analyses report modest increases in Hb and reductions in transfusion for IV (and oral) iron, but no convincing harms.[12-14] The modest benefits are explained by trials which enrolled patients with relatively mild iron deficiency, or with chronic conditions limiting hematopoiesis.

## Harms

Early iron dextran preparations caused frequent anaphylaxis and some fatalities. Although this is now rare, monographs warn of possible anaphylaxis, and against use during active infection, and using iron dextran requires a physician's presence during a test dose. During 2013-2015 the European Medicines Agency required strengthened warnings about fatal anaphylaxis for all parenteral iron products.[15] Health Canada and the U.S. FDA tightened warnings about ferumoxytol,

which is officially contra-indicated for people with any drug allergy.[16] Subsequent decreased utilization ended ferumoxytol's availability in Canada in January 2016.

Comparative safety of dextran vs. non-dextran iron cannot be established, because randomized controlled clinical trials (RCTs) are too small for reliable comparison of infrequent serious adverse events, including death. RCTs comparing ferric gluconate, iron sucrose, or ferumoxytol do not establish a difference in incidence of anaphylaxis.[17]

Observational studies have not demonstrated a convincing overall safety advantage for any product.[18,19] A new retrospective FDA analysis of 688,183 U.S. non-dialysis recipients of IV iron between 2003-2013 (dextran, sucrose, gluconate, or ferumoxytol) identified 274 cases of anaphylaxis at first exposure, and 170 more episodes during repeat doses. The probability of an anaphylactic reaction during repletion with 1000 mg Fe appeared least with iron sucrose (21:100,000) and highest with iron dextran (82:100,000).[20] However deaths on the same day as the iron infusion did not differ between preparations (see Table on website). Crude incidence of death numerically favoured iron dextran (4:100,000) over iron sucrose (7-9:100,000), ferric gluconate (6-12:100,000), or ferumoxytol (7:100,000).[21] In dialysis patients, the incidence of fatal or life-threatening adverse events from iron dextran was estimated by the FDA at anywhere from 2 to 300 per million exposures.[22] **Risk of harms with red cell transfusion are similar in frequency.**[23]

Non-allergic toxicity includes local reactions to the infusate, delayed muscle and joint pains, transient hypotension, and fever. These are generally self-limited. Nothing is known about long-term toxicity. Increased risk of infection after IV iron is not established.

## Does premedication or IM injection improve safety?

Premedication is not required, and is not known to prevent dangerous hypersensitivity. IV diphenhydramine 25 mg predictably causes sedation.[24] IM iron injection is not safer, but has the disadvantages of local pain and delayed benefit.

## Parenteral iron formulations

Table 1 shows products available in Canada as of February 2016 and their approved indications.[25] While not approved officially for total dose infusion, iron preparations are widely used in Canada for rapid iron repletion. IV is preferable to intramuscular (IM) administration, because IM injections are painful and absorption incomplete.

## Conclusions

- **Intravenous iron markedly benefits appropriately selected people with chronic severe iron deficiency.**
- Rare but potentially fatal reactions occur with all IV iron products. This requires administration in a setting where immediate treatment is available, including adrenaline.
- **No formulation is proven to be safer than others. IV iron is preferable to IM injection.**

**Table 1: IV iron products available in Canada and their approved indications**

| Product (brand name) | Approved indications | Incidence of hypersensitivity reported in monograph* | Concentration | Price per 100mg Fe** |
|---|---|---|---|---|
| iron dextran (Dexiron) | iron deficiency when oral iron inadequate | no estimate provided | 50 mg/mL | $27.50 |
| sodium ferric gluconate (Ferrlecit) | iron deficiency anemia of hemodialysis | 3.3 per million to at least 6 per thousand | 12.5 mg/mL | $44.29 |
| iron sucrose (Venofer) | iron deficiency anemia in CKD | 23 per million | 20 mg/mL | $38.15 |

* these figures cannot be compared directly, as they are based partly on spontaneous ADR reports.

** Vancouver Hospital and Health Sciences Centre pharmacy, January 2016.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## RESEARCH

Research programs in our department focus on the physiology and pharmacology of the cardiovascular, respiratory, and central nervous systems; outcomes research in cardiothoracic anesthesia, critical care, neuroanesthesia, obstetric anesthesia, pediatric anesthesia, perioperative medicine, and regional anesthesia; patient safety and quality improvement; clinical monitoring; medical education and simulation; and therapeutics, evidence-based prescribing practice, and pharmacoepidemiology. With the strengths of three related but different sections in our department, our diversity enables us to build partnerships between the sections, which allow us to pursue investigations from the bench to the bedside to the population. Furthermore, our department has a long-standing tradition of collaboration with other groups within the UBC Faculty of Medicine (Critical Care, Neurology, Population and Public Health, Psychiatry) and other UBC faculties (Electrical and Computer Engineering). As you glance at our publications, you will see that research in the Department of Anesthesiology, Pharmacology, and Therapeutics is more than just drugs and putting people to sleep!

Peter Choi
Clinical Research Director (Anesthesiology)

Peer Reviewed Publication Summary:

7. Journals Articles refereed: 99
8. Journal Articles non-refereed: 1
9. Books: 1
10. Book chapters: 5
11. Editorials: 3
12. Commentaries and letters: 15

Canadian recommendations for critical care ultrasound training and competency. Robert T Arntfield, Scott J Millington, Craig D Ainsworth, Rakesh C Arora, John Boyd, **Gordon Finlayson**, William Gallagher, Colin Gebhardt, Alberto Goffi, Edgar Hockmann, Andrew W Kirkpatrick, Robert C McDermid, Jason Waechter, Natalie Wong, Samara Zavalkoff, Yanick Beaulieu, Can Respir J 2014;21(6): 341–345.

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## Non-refereed publications

### *Book chapters*

1. **Enright A**. Developing anesthesia equipment for low-resource environments. In: Roth R, Frost EAM, Gevirtz C, Atcheson CLH, editors. *The Role of Anesthesiology in Global Health: A Comprehensive Guide*. New York: Springer, 2015:85-92.

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### *Invited journal articles and editorials*

1. **Preston R**. Management of the obstetric airway – time for a paradigm shift (or two)? *Int J Obstet Anesth* 2015 Nov;24(4):293-6. [http://www.ncbi.nlm.nih.gov/pubmed/26421699]

### *Commentaries and letters*

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