Queen's University
38th Annual Anesthesiology Research Day

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Elizabeth VanDenKerkhof, RN, MSc, DrPH

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Vidur Shyam, MD, FRCPC **Nader Ghasemlou**, PhD

Guest Lecturer: **Gregory Bryson**, MD BSc FRCPC MSc

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Institutional support:

Queen's University **Kingston General Hospital** **Hotel Dieu Hospital** **Providence Care**

Held at Donald Gordon Centre, Kingston, Ontario, CANADA, March 31, 2017.

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Program booklet cover design by Ian Gilron

SCIENTIFIC PROGRAM OUTLINE

0800 – 0810 **Opening Remarks**
– Dr. Joel Parlow

0810 – 0820 **Introduction of Research Day Presentations**
– Dr. Ian Gilron

0820 – 0920 **Oral presentations (4)**

0920 – 1010 **Nutrition break**

1010 – 1125 **Oral presentations (5)**

1125 – 1230 *** LUNCH** (provided) *****

1230 – 1345 **Oral presentations (5)**

1345 – 1415 **Nutrition break**

1415 – 1500 **Oral presentations (3)**

EACH 10-MINUTE ORAL PRESENTATION WILL BE FOLLOWED BY A 5-MINUTE QUESTION PERIOD

The Judges will be:

Dr. Vidur Shyam, Assistant Professor, Queen's Department of Anesthesiology & Perioperative Medicine

Dr. Nader Ghasemlou, Assistant Professor, Queen's Departments of Anesthesiology & Perioperative Medicine and Biomedical & Molecular Sciences

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1500 **Dr. Gregory Bryson,** Associate Professor, Department of Anesthesiology, University of Ottawa

*** Guest Lecture ***

"I've presented at research day. Now what? How to get your work published."

Wine & Cheese to follow with * Awards Presentation * (Donald Gordon Center)

Oral Presentations (alphabetical order)

Liban AHMED, PGY-4
"Comparison of two strategies for the management of pain following arthroscopic rotator cuff repair: periarticular (around the joint) infusion of local anesthetic vs. interscalene brachial plexus block" (update)

Matthew BILBILY, PGY-2
"Use of objective neuromuscular monitors among Canadian anesthesiologists" (proposal)

Sophie BRETON, PGY-3
"Hepatitis C virus transmission: Can patients be infected through reuse of anesthetic medication vials accessed with clean needles and syringes?" (update)

Jamei ENG, PGY-3
"Improving post-operative pain control by increasing the alkalinity of epidural solutions." (update)

Alexander HAMILTON, RN BScN, (Queen's MNSc Candidate)
"An observational study examining the predictive utility of chronic pain coping strategies in emergency department use among patients attending an interdisciplinary pain clinic: preliminary results." (update)

Yuri KOUMPAN, PGY-3
"Oncologic outcomes in transurethral resection of bladder tumor (TURBT) patients undergoing general anesthesia vs. spinal anesthesia: a retrospective review" (update)

Jordan LEITCH, PGY-3
"Randomized Control Trial of Novel Formulation Trigger Point Injections for Relief of Chronic Myofascial Pelvic Pain" (update)

Sarah MAXWELL, PGY-3
"How does maintenance of intra-operative hemodynamic stability with esmolol, labetalol or fentanyl impact recovery during elective outpatient laparoscopic cholecystectomies?" (update)

Curtis NICKEL, PGY-4
"Perceptions of Yearly Summative Examinations in the Queen's Anesthesia Simulation Program." (update)

Farah PABANI, PGY-2
"Teaching self-assessment skills by involving medical students in defining global OSCE criteria" (proposal)

Jeff PARKER, PGY-3
"A retrospective cohort study to examine the effectiveness of perioperative brachial plexus nerve block to reduce healthcare use after shoulder surgery: Targeting the Quality-Based Procedures program" (proposal)

Jaqueline SILVA, Queen's DBMS Postdoctoral Fellow
"Cellular and molecular mechanisms of inflammatory pain" (proposal)

Kaitlyn TRESIDDER, (Queen's MSc candidate)
"The role of circadian rhythms in somatosensation" (update)

Danika VAUTOUR, PGY-2
"Improving Resident Self-assessment Accuracy in the Clinical Setting Through the Development of a Competency-Based Assessment Tool with Ongoing External Validation" (proposal)

Sam WALSH, PGY-3
"Postsurgical Pain After Hospital Discharge: A Systematic Review" (update)

Dana ZORATTO, PGY-4
"Does magnesium sulfate as a supplement in adductor canal blocks improve pain control after total knee arthroplasty?" (update)

Poster Presentations (alphabetical order)

Courtney Bannerman, Margot Gunning, Samuel David, Qingling Duan, Scott Duggan, Nader Ghasemlou. "Macrophage activation profiles in spinal cord injury pain."

Kai Chen, Nicole Relke, Tarit Saha, Gordon Boyd, Alain Deschamps, Michael Avidan and ENGAGES-cardiac co-investigators. "Impact of an EEG-guided anesthesia protocol on postoperative cognitive disturbances in elderly cardiac surgery patients: An extension of the ENGAGES-Cardiac multicenter trial."

Margot Gunning, Jihoon Choi, Courtney Bannerman, Matt Neville, Anastasiya Tarnouskaya, Nader Ghasemlou, Qingling Duan. "Network gene expression analysis of intractable pain following spinal cord injury."

Comparison of two strategies for the management of pain following arthroscopic rotator cuff repair: periarticular (around the joint) infusion of local anesthetic vs. interscalene brachial plexus block

Liban Ahmed, PGY4 Supervisor: Dr. John Murdoch

Background

Arthroscopic shoulder surgery can be associated with significant post-operative pain that may be difficult to manage and may delay patient discharge.[1] This pain can be alleviated by the peri-operative performance of a single shot interscalene brachial plexus block. However, this technique remains relatively specialized, and it is not within the skill set of all anesthesiologists. Moreover, the block has significant side effects and complications which may preclude its use in some patients.[2-3]

In knee and hip arthroplasty surgery, analgesia has been significantly improved and simplified with the introduction of the periarticular injection of an analgesic mixture containing a local anesthetic, ketorolac, morphine, and epinephrine.[4-8] This mixture is injected in extra-articular tissues, primarily muscular planes around the joint, during the surgery by the surgeon performing the operation. Despite its efficacy in lower limb surgery, there have been no studies examining this periarticular technique for postoperative pain management in upper limb surgery.

Purpose

We propose to study the periarticular instillation of the same mixture used originally in lower limb surgery in shoulder arthroscopic surgery. We will compare the periarticular analgesic injection to a single-shot U/S guided interscalene brachial plexus block in a single-blinded, randomized, controlled, non-inferiority trial.

Study Design

Inclusion criteria will include ASA 1-3 patients, aged 18-80, having elective shoulder arthroscopic surgery at Hotel Dieu Hospital. Following signed informed consent, participants will be randomized to receive either a (1) pre-operative single shot interscalene brachial plexus regional block or a (2) an intra-operative peri-articular injection. Participants will receive standardized premedication, a standardized general anesthetic, and standardized intra-operative analgesia and post-operative analgesia.

Outcomes

The primary outcome will be pain scores on a verbal rating scale (VRS) over 24 hours following surgery. Secondary outcomes will include opioid consumption over the first 48 hours, pain scores over the first 48 hours postoperatively, time to first analgesic request, opioid-related side effects, time to readiness to discharge, time to discharge, adverse events or complications (attributable to the surgery or medications), and overall satisfaction with the analgesia.

References

1. Stiglitz Y, Gosselin O, Sedaghatian J, et al. Pain after shoulder arthroscopy: a prospective study on 231 cases. Orthop Traumatol Surg Res 2011;97:260-6.
2. Verelst P, van ZA. Incidence of phrenic nerve block after interscalene brachial plexus block. Reg Anesth Pain Med 2011;36:411-2.
3. Hortense A, Perez MV, Amaral JL, et al. Interscalene brachial plexus block. Effects on pulmonary function. Rev Bras Anestesiol 2010;60:130-8.
4. Chaumeron A, Audy D, Drolet P, et al. Periarticular injection in knee arthroplasty improves quadriceps function. Clin Orthop Relat Res 2013;471:2284-95.
5. Ng FY, Ng JK, Chiu KY, et al. Multimodal periarticular injection vs continuous femoral nerve block after total knee arthroplasty: a prospective, crossover, randomized clinical trial. J Arthroplasty 2012;27:1234-8.
6. Parvataneni HK, Shah VP, Howard H, et al. Controlling pain after total hip and knee arthroplasty using a multimodal protocol with local periarticular injections: a prospective randomized study. J Arthroplasty 2007;22:33-8.
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The Use of Objective Neuromuscular Monitors Among Canadian Anesthesiologists

Matthew Bilbily, Richard Henry

Research Question(s): What proportion of Canadian Anesthsiologists routinely utilize objective neuromuscular monitors to assess neuromuscular recovery after administration of a neuromuscular blocking agent?

Related Area of Clinical Need: It has been well documented that post-operative residual neuromuscular blockade is common and may adversely affect patient outcomes by increasing the risk for post operative pulmonary complications. Most commonly, when neuromuscular blockade is used, visual or tactile evaluation of twitch amplitude is utilized by anesthesiologists to gauge recovery from neuromuscular blockade. However, we now know that even experienced anesthesiologists cannot detect fade when the Train of Four (TOF) ratio is greater than 0.4. Since a TOF ratio of greater than 0.9 is required to assure adequate recovery of neuromuscular function, perhaps we should be relying on objective monitoring to gauge recovery of neuromuscular function rather than subjective assessment of TOF.

Current Knowledge Gaps: As described above, quantitative evaluation of neuromuscular blockade is superior to subjective evaluation and leads to improved patient outcomes. Yet, the practice of many anesthesiologists does not incorporate regular use of quantitative monitors. Why is this the case? Do barriers to access of the technology exist? Are there varying perceptions of the incidence and effect of residual paralysis? Or is it a matter of practicality in the operating room environment?

Hypothesis: The majority of Canadian anesthesiologists do not routinely use objective neuromuscular monitors.

Proposed study design: 1. Develop a survey to assess the following areas
- primary outcome: proportion of canadian anesthesiologists who routinely utilize objective neuromuscular monitors
- perceptions of incidence of residual paralysis
- perceptions of accuracy of subjective neuromuscular monitoring
- barriers to use of objective neuromuscular monitors (access, practicality, etc)

2. Distribute survey to staff anesthesiologists at academic institutions across Canada
3. Analyze results of survey respondents

References:

Butterly A, Bittner EA, George E, Sandberg WS, Eikermann M, Schmidt U. Postoperative residual curarization from intermediate-acting neuromuscular blocking agents delays recovery room discharge. Br Anaesth. 2010;105(3):304–9.

Debaene B, Plaud B, Dilly M-P, Donati F. Residual paralysis in the PACU after a single intubating dose of nondepolarizing muscle relaxant with an intermediate duration of action. Anesthesiology. 2003;98(5):1042–1048.

Dimick JB, Chen SL, Taheri PA, Henderson WG, Khuri SF, Campbell DA. Hospital costs associated with surgical complications: a report from the private-sector National Surgical Quality Improvement Program. J Am Coll Surg. 2004;199(4): 531–7.

Gätke MR, Viby-Mogensen J, Rosenstock C, Jensen FS, Skovgaard LT: Postoperative muscle paralysis after rocuronium: Less residual block when acceleromyography is used. Acta Anaesthesiol Scand 2002; 46:207–13

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Sundman E, Witt H, Olsson R, Ekberg O, Kuylenstierna R, Eriksson LI. The incidence and mechanisms of pharyngeal and upper esophageal dysfunction in partially paralyzed humans: pharyngeal videoradiography and simultaneous manometry after atracurium. Anesthesiology. 2000;92(4):977–984.

Hepatitis C virus transmission: Can patients be infected through reuse of anesthetic medication vials accessed with clean needles and syringes?

S. Breton PGY3 - Staff supervisors: Dr Jaeger and Dr Van Vlymen
Affiliation: Dr Selena Sagan (McGill University)

Background: Hepatitis C virus (HCV) infections remain a significant cause of morbidity and mortality. Given the current knowledge of blood-borne diseases, it is alarming that patient-to-patient transmission of blood-borne viruses still occurs as a result of unsafe injection practices, poor sanitation procedures, or the use of contaminated medical equipment. In the 1990's increasing health care-associated HCV outbreaks attributed to poor injection practices served as the impetus for health agencies to develop the "One & Only" campaign which advocated '1 syringe + 1 needle + 1 time'. Despite the widespread adoption of these infection-control guidelines, health care-associated HCV outbreaks continue to be frequently reported. In most of these cases, there is no evidence that syringes were reused between patients and the anesthesiologists involved adamantly denied this practice. The practice of sharing medication vials between patients, combined with the inadvertent contamination of an anesthesiologist's workspace may be facilitating these outbreaks. Drug shortages and resources constraints drive the former, and the latter has been well demonstrated. As this contamination is widespread, it is feasible that the rubber diaphragm of a medication vial could become unknowingly contaminated with blood containing a significant viral load when caring for HCV-infected patients. Studies have shown that HCV remains stable on inanimate surfaces and within medications such as fentanyl, midazolam and propofol for days to weeks. If contamination such as this is unrecognized, the risk of transmitting HCV to subsequent patients could be significant, even if a new needle and syringe are used to access the medication.

Hypothesis: When caring for HCV-infected patients, an anesthesiologist may inadvertently and unknowingly contaminate the outside diaphragm of a medication vial with HCV-containing fluids and a sterile needle and syringe puncturing the diaphragm could inoculate the medication inside the vial with virus. This could result in sufficient quantities of infectious virus within the medication to infect subsequent patients receiving the drug with a new sterile needle and syringe. Secondary hypothesis: a single wipe of a 70% isopropyl alcohol swab across the vial top is not sufficient to eradicate the virus.

Preliminary results:

1) Contamination of vial diaphragms with 50 or 33uL (amount of accidental drop) of HCV stock was followed by needle punctures x 5 through the diaphragm into cell media. Cell media was then transferred to human hepatoma cells which were incubated for five days at 37ºC. This resulted in positive HCV inoculation of 10/10 and 3/3 vials respectively. Positive and negative controls were completed and results corresponded with the presence or absence of contamination.

2) Contamination of rubber access diaphragms with HCV stock and drying for 1 h followed by four cleaning protocols with 70% isopropyl alcohol: single wipe without drying time, single wipe with drying time, wipe for 10s without drying time, wipe for 10s with drying time. With the wipe 10s + drying time there was no HCV contamination of the cell media, however, in all other conditions contamination was still detected.

Significance: HCV infection via our hypothesized mode of transmission has now been demonstrated as plausible. A national survey enquiring about personal practices regarding the sharing of medication vials or bags will be sent and the data collected from this survey should demonstrate that medication sharing is a daily occurrence. Combined results from laboratory experiments and survey should highlight the critical importance of appropriate infection control practices as well as identify the necessary cleaning methods of vial access diaphragms to prevent inadvertent transmission of HCV. This research has the potential to significantly alter our daily practices concerning medication administration as well as influence pharmaceutical industries to package medication in smaller, single-dose vials.

Improving post-operative pain control by increasing the alkalinity of epidural solutions.

Presented by Jamei Eng PGY3
Supervisors: Dr. Richard Henry, Dr. John Murdoch

Despite the evolution of various other regional anesthetic techniques, epidurals are still thought to provide exceptional pain control. In patients with significant cardiac or respiratory conditions, epidurals are even more important in postoperative management than PCAs. Despite having a well-trained physician placing the epidural, and positive intraoperative clinical signs, patients are often in PACU complaining of pain. Failure rates for epidurals have reportedly been around 30% for both thoracic and lumbar epidurals. There are numerous reasons for epidural failures, the most common being epidural catheter migration or misplacement of the catheter, resulting in inadequate analgesia.

Current practice with laboring women that have epidurals heading to the OR for a cesarean section consists of administering a bolus of lidocaine in their epidural in order to obtain a rapid onset of surgical block. One of the common adjuncts particularly used in epidurals that had been previously placed includes sodium bicarbonate. In theory, lidocaine enters the epidural space as both its ionized and unionized form. The unionized form allows for migration across the lipid membrane in order to exert is action on the nerve root. The addition of sodium bicarbonate, creates a more alkaline environment, thus increasing the proportion of local anesthetic in its unionized form. By increasing the amount of local anesthetic reaching its target of action, the onset of block is faster, the depth of block is greater, and potentially may even affect the spread of epidural blockade.

Currently, there is no published data available detailing the use of sodium bicarbonate in non-obstetrical surgery. In this study, we hope to determine whether there may be a role of sodium bicarbonate in postoperative epidurals, specifically thoracic epidurals. Preliminary steps include determining the pH of our standard epidural solutions, and determining the pH after the addition of sodium bicarbonate. Secondly, if ethics approval can be obtained, a pilot study will be conducted with 10 randomly chosen patients to receive bicarbonate just prior to arrival to the post anesthetic care unit. Primary outcome measures will include patient pain scores as well as level of sensory block within 24 hours postoperatively. Secondary outcome will look at duration of time until inadequate block.

An observational study examining the predictive utility of chronic pain coping strategies in emergency department use among patients attending an interdisciplinary pain clinic: preliminary results.

Hamilton, ANJ, VanDenKerkhof EG, Wilson R, Edge D.

Background: Frequent emergency department (ED) users are a small group of patients who make a disproportionate number of visits and consume an imbalanced share of health system resources. Frequent ED use by individuals with chronic pain (CP) can be costly and structural challenges make this pattern of service use undesirable. Better understanding of what explains/predicts this form of health care use may improve management of ED use in this cohort. The purpose of this study is to examine the impact of CP coping strategies on frequent ED use.

Methods: This prospective cohort study linked patient-reported data (collected between September 2013 and July 2016) to ED use in the first six-months after admission to the HDH interdisciplinary pain clinic. Participants were classified as frequent (top 10%) or infrequent (bottom 90%) ED users based on number of visits during the six-month period. Binary logistic regression was used to identify coping strategies that predict frequent ED use, while controlling for potential confounders.

Results: The clinic sample (N = 573) was predominantly (66%) female with a mean age of 50.2 (*SD* = 15.7) years. Mean pain intensity was 5.6/10 (*SD* = 2.3) and 80% of respondents reported continuous pain. Seventeen percent (n = 97) lived alone and more than half (61%) suffered from moderate to severe depression. Twenty-four percent (n = 137) reported suicidal thoughts in the two weeks prior to survey completion. Illness-focused coping strategies including resting, guarding, and asking for assistance were used a mean of 4.5 (*SD* = 2.1), 4.4 (*SD* = 2.2), and 3.9 (*SD* = 2.5) days/week to deal with pain. Wellness-focused coping strategies including using positive self-statements, exercise/stretching, relaxation, task-persistence, and seeking social support were used a mean of 4.2 (*SD* = 2.2), 3.7 (*SD* = 2.4), 3.6 (*SD* = 2.3), 3.1 (*SD* = 2.2), and 3.0 (*SD* = 2.4) days/week. Fifty percent (n = 289) reported using opioid/combined opioid agonist-antagonist medications. Overall, respondents reported a median of two visits (IQR = 8) to non-physician providers (90^{th} percentile = 25), four visits (IQR = 4) to primary care (90^{th} percentile = 12), and two visits (IQR = 3) to specialists (90^{th} percentile = 7) for pain in the year prior to completing the questionnaire. Thirty-two percent of patients (n = 185) visited an ED or urgent care setting for pain at least once and the top 10% (n = 54) reported a median of eight visits (IQR = 9) in the year prior to completing the questionnaire.

Discussion: This study will improve our understanding about the relationship between coping strategies and ED use. Such insight might be useful for: (1) triaging individuals at high risk for ED use and potentially overlapping treatment after admission to pain clinics; (2) improving detection of individuals in need of cross-setting plans of care; (3) developing and testing interventions to reduce frequent ED use; and (4) supporting policy/continuing education development for managing this cohort in the ED.

*Analysis of ED use is underway. Additional results will be shown in the presentation.

Cancer outcomes in transurethral resection of bladder tumor patients undergoing general vs. spinal anesthesia

Yuri Koumpan, MD, Glenio Mizubuti, MD, MSc, Melanie Jaeger, MD, FRCPC, Rob Tanzola, MD, FRCPC, Rob Siemens, MD, FRCSC

BACKGROUND:
The main cause of cancer-related deaths is recurrence and metastasis. Various peri-operative factors have been implicated in negatively modulating the immune system to promote cancer cell growth, including surgical inflammation, volatile anesthetics, and opioid use1. On the other hand, regional anesthesia has been suggested to reduce peri-operative immunosuppression, improve the function of cancer-killing immune cells, and reduce the use of volatile anesthetics and opioids1,2. The aim of our study was to determine if anesthetic type (general vs. spinal) would influence time to cancer recurrence, cancer progression, and overall mortality.

METHODS:
This was an observational, retrospective study. 243 patients who underwent primary transurethral resection of bladder tumor (TURBT) surgery for non-muscle invasive urothelial bladder cancer at our center between 2011-2013 were enrolled in the study. 103 patients who had a general anesthetic were compared to 140 patients who had a spinal anesthetic. Chi-Square tests were conducted to test for associations between patient characteristics and incidence of recurrence, progression and overall mortality, and Kaplan-Meier estimates were conducted for time to recurrence, time to progression, and time to mortality. Multivariable analysis was conducted for recurrence using logistic regression, followed by a Cox model to control for time.

RESULTS:
In the univariable analysis, patients under spinal anesthesia had a longer median time to recurrence (37.8 months vs 17.2 months, p=0.009). In a multivariable analysis controlling for age, tumour grade, and adjuvant chemotherapy, patients under general anesthesia had a higher incidence of recurrence (OR=1.987, p=0.026) and earlier time to recurrence (HR=1.468, p=0.027) compared to patients under spinal anesthesia. Anesthetic type was not associated with cancer progression or overall mortality in univariable or multivariable analyses.

CONCLUSION:
Though anesthetic type was not associated with non-muscle invasive bladder cancer progression or mortality in our observational study, the increased incidence of, and earlier time to recurrence after controlling for multiple important variables should prompt further large-scale, prospective studies to definitively determine possible protective effects of spinal anesthesia in TURBT patients.

References:
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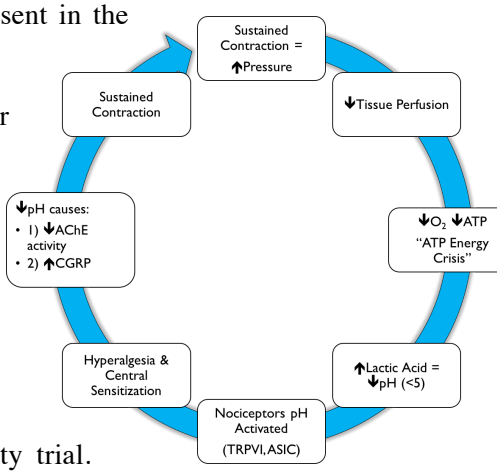
UPDATE: Randomized Control Trial of Novel Formulation Trigger Point Injections for Relief of Chronic Myofascial Pelvic Pain

J.Leitch, A.Webb, R.Nitsch, S.Chamberlain, J.Pudwell, R.Henry

Background:

Chronic pelvic pain is a common and disabling condition - it is estimated that 16% of women experience the debilitating functional, emotional, and sexual associated deficits. Practically, this is an extremely costly health care issue, accounting for one of every ten gynecologist visits, and is a frequent indication for surgery, despite little proven benefit.[1]

Trigger points account for the somatic pain experienced by patients, which can be either latent (painful when palpated) or active (unprovoked, spontaneous pain). Trigger points develop due to a failure of voluntary muscle to relax, resulting in a chronic state of contraction and a relative ATP (energy) crisis. Essentially, chronic contraction causes decreased tissue perfusion, which in turn results in a local decrease in energy production and increase in anaerobic cellular respiration. The hydrogen ions (lactic acid) produced during anaerobic metabolism stimulate peripheral nociceptors that cause pain.[2] The contraction is further perpetuated by a lack of inhibition of the ryanodine receptors (due to a deficiency of both ATP and magnesium) which results in an increase in the amount of calcium present in the sarcoplasm to facilitate muscle contraction.



Current recommendations for the treatment of myofascial pain and trigger points according to the Society of Obstetricians and Gynecologists includes trigger point injections, physical therapy, and manual therapy. Various formulations have been trialed, including local anesthetics, steroids, and botulinum toxin.[3] Lidocaine formulations are the most commonly used, despite a paucity of robust research and sound study design demonstrating benefit. As such, there is no clear consensus or guidelines on the most appropriate injection formulation.

Study Design & Methods:

Our study is a single-center, double-blinded, randomized control superiority trial. The primary outcome is pain score 2 weeks after the final trigger point injections on the visual analog scale. We will also assess secondary outcomes including quality of life, functional movement, concomitant medication usage, procedural pain, time to resolution of pain, and adverse events. Participants will be recruited via referrals to our pain clinic, with 30 patients randomly assigned into either the lidocaine-only or the novel formulation arms. The novel formulation is comprised of magnesium, sodium bicarbonate, dextrose and lidocaine. A third arm will consist of 30 patients on the clinic waitlist and will serve as a control. Each participant in the treatment arms will have 9 visits (8 treatments) during which they are assessed, receive injections, and complete questionnaires.

Results:

We have recruited 12 patients to the intervention group (3 completed) and 17 patients into the control group (8 completed). The original stratification based on opioid use has been removed from the study design as there were not an adequate number of participants referred to the clinic who are managed on opioids to allow comparison. The study design has been shown to be feasible, the timeline realistic, and the intervention appears effective over the control group (NB: results have not been analyzed nor the blinding removed at this time).

LABETALOL AND TIME TO DISCHARGE IN LAPAROSCOPIC CHOLECYSTECTOMIES

Authors: Dr. Maxwell, Dr. Tanzola, Dr. Engen, Dr. Marois, Dr. VanDenKerkhof

Introduction: Abdominal insufflation during laparoscopic cholecystectomy produces a profound sympathetic response resulting in elevations in heart rate (HR) and mean arterial pressure (MAP). Intraoperative management often includes opioid boluses but this may lead to opiate related side effects. Studies have shown that an opioid sparing technique with the sympatholytic esmolol can effectively control intraoperative hemodynamics and improve postoperative outcomes. We evaluated whether labetalol could effectively maintain intraoperative HR and MAP and whether labetalol would be as effective as esmolol at improving postoperative outcomes compared to fentanyl.

Methods: Local ethics committee approval was obtained and all patients provided written informed consent prior to study enrollment. One hundred and fourty-three ASA class I-III patients undergoing elective ambulatory laparoscopic cholecystectomy at an academic hospital were randomized to one of 3 double blinded groups for management of increased intraoperative HR or MAP over 20% of baseline: 1) IV fentanyl bolus 50 mcg q5 min., 2) IV labetalol bolus 5 mg q5 min. or 3) IV esmolol bolus 0.25 mg/kg followed by a titrated infusion of 5-15 mcg/kg/min. Time from arrival in post-anesthesia care unit (PACU) to readiness for discharge was recorded as the primary outcome. Secondary outcomes included intraoperative and PACU hemodynamics (HR, MAP), total PACU fentanyl requirements, time to first PACU analgesia, the incidence and management of postoperative nausea and vomiting (PONV) and pain scores. Pain was assessed with the Visual Analogue Pain Score (0=no pain, 10=worst pain) and the incidence and treatment of PONV was assessed at 5, 30, 60 and 120 minutes post-arrival in the PACU. Patient satisfaction scores (1= most satisfied, 5=dissatisfied) were recorded at 24 hours.

Results: The following are preliminary *blinded* results of the 143 patients enrolled out of the target of 144 patients (table 1). No treatment was required for intraoperative or PACU hypotension or bradycardia following administration of study drugs. Patient satisfaction at 24 hours was equivalent for each group (1.5/5). A subset of patients in each group did not have hemodynamic derangements requiring study drug administration.

Variable	Group A (n=47)	Group B (n=49)	Group C (n=47)
Time to discharge (min)	169	166	179
Time to first PACU fentanyl (min)	12.3	12.2	12.1
Total PACU fentanyl (mcg)	69.7	54.1	59.0
Pain scores (#/10)			
PACU arrival (t=0 min.)	2.8	2.3	2.8
t=30 min.	4.3	3.0	4.0
t=60 min.	3.5	3.1	3.0
Incidence PONV (%)			
PACU arrival (t=0 min.)	23.0	26.5	14.9
t=30 min.	23.9	30.6	23.9
t=60 min.	19.6	23.4	8.7
PONV treatment (% required)			
Dimenhdrinate	14.9	20.4	6.4
Metoclopramide	34.0	42.9	25.5

Discussion: The preliminary blinded results demonstrate a safe protocol and post-operative pain was well controlled with minimal PACU opiate requirements for the three medication groups. We hope the final results of this study will expand on the potential benefits of beta-blockers for managing intraoperative sympathetic stimulation and specifically identify the utility of labetalol. Labetalol may more effectively control intraoperative hypertension given additional activity at alpha adrenergic receptors, is easier to administer since does not require an infusion, and is less expensive than esmolol.

Title: Perceptions of Yearly Summative Examinations in the Queen's Anesthesia Simulation Program

Authors: Dr. Curtis Nickel, Dr. M. McMullen

Introduction and Rationale: There has been a significant increase in the usage of simulation based education and assessment methods throughout many professional domains in the past ten to fifteen years. As this has progressed, there has been a renewed exploration of high fidelity simulation as a high-stakes summative assessment method.

Research surrounding simulation as an educational and assessment tool has mirrored its increased usage. There are many potential benefits to using simulation beyond more traditional assessment methods. Research has shown that simulation provides the ability to assess higher levels of competency in Miller's pyramid of competence, specifically the "does" or "Shows How" levels in the behavioural categories. As well, it can assess non-medical knowledge and identify gaps in safe anesthesia practice. Finally, simulation provides an excellent opportunity to assess rare or complicated scenarios in a safe environment.

The practice of anesthesia education and certification is currently undergoing a significant change. The move towards Competency Based Medical Education will drive forward many new and old assessment methods and it is likely that simulation will begin to play a large role in the assessment of residents. In Canada and at Queen's University specifically, the introduction of the CanNASC program for PGY 4-5 has already begun to do this. However, using simulation as a high-stakes summative assessment goes against much of the traditional model of simulation education that focuses on formative assessment and the ability to make mistakes without concern for your academic standing. As these changes evolve, many programs are without a defined simulation assessment tool or evaluation, Queen's included.

Study Objective: Investigate the fundamental perceptions of major stakeholders (program administrators in postgraduate medical education, faculty facilitators in medical simulation, and anesthesia residents) surrounding the adoption of a simulation curriculum that incorporates yearly summative or examinations.

Methodology: The study will be completed using a qualitative methodology. Purposive sampling will identify the appropriate stakeholders. An survey will be used to gather data and identify themes. Semi-standardized interviews can be completed to further elucidate themes obtained from the survey.

Outcomes: This project will assist in the elucidation of important benefits and barriers to using simulation as a summative assessment. It will also help to identify fundamental aspects desired in simulation assessment, which will inform the development of a simulation assessment tool. Finally, it will assist in the discussion around simulation education and assessment in our residency program and potentially help develop a collaborative simulation research laboratory at Queen's University.

Teaching self-assessment skills by involving medical students in defining global OSCE criteria

Farah Pabani, PGY2 Anesthesia
Supervisors: Dr. Winthrop, Dr. Patterson, Dr. Jaeger

Background: The benefits of self-assessment in learning and achievement are well known in the general education and medical education literature.[1-4] However, health professionals have shown limited accuracy in self-assessment.[5] The needs, safety and well-being of patients are compromised when physicians lack self-awareness in their clinical abilities and independence in life-long learning. Medical training programs encourage self-assessment of skills and knowledge as a learning tool to achieve a certain level of clinical performance, but do not adequately invest in teaching self-assessment skills essential for lifelong independent learning. Sustainable self-assessment skills require training and yet there has been limited research investigating strategies to teach and improve the accuracy of self-assessment of clinical skills in medical students.[1] Involving students in the development of criteria used to assess them is a known method of teaching self-evaluation.[6] It allows students to create self-driven meaning from the criteria they establish for themselves and may help improve their capacity to self-assess.[6]

Purpose: In this study, we will explore whether or not third year medical students involved in developing and defining OSCE criteria for global performance do better at self-assessing global OSCE performance compared to students without experience developing and defining global OSCE criteria.

Study Design: Under the guidance of a clinician educator, third year medical students of the class of 2019 will develop and define global OSCE criteria over multiple small group sessions many weeks before their summative OSCE. Although standardized global OSCE criteria have already been developed by Queen's Undergraduate Medical Education, students have not seen these criteria and will therefore go through the development process independently to create self-driven global OSCE criteria. The class of 2018 will serve as the control group. Both groups will be provided with the standardized global OSCE criteria from Queen's Undergraduate Medical Education two weeks before the OSCE. For the intervention group, these standardized criteria will seem similar to the criteria they developed independently. Immediately after the OSCE, students will be asked to identify the specific global competencies they felt were important for each OSCE station and to self-assess performance on all global competencies for each OSCE station. Two weeks post-OSCE, students will repeat the same tasks after reviewing a video of their performance. They will also be presented with a Likert scale questionnaire to explore the perceived impact of their experience on their self-assessment skills, actual performance and confidence across the global competencies.

Outcomes: The primary outcome is the difference in self-assessed scores on global competencies for each OSCE station in comparison to the examiner's score. Secondary outcomes include the relationship between actual OSCE performance and capacity to self-assess, the difference in self-assessed scores compared to examiner's score after video review, and the perceived impacts of the experience on self-assessment skills, performance, confidence and attitudes towards self-assessment as a learning tool.

Hypothesis: We hypothesize that medical students involved in developing global OSCE criteria will do better at self-assessing global OSCE performance compared to students who were not involved in developing the criteria.

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A retrospective cohort study to examine the effectiveness of perioperative brachial plexus nerve block to reduce healthcare use after shoulder surgery: Targeting the Quality-Based Procedures program

Resident Investigator: Jeffrey Parker, MD, CCFP (FPA)
Staff Investigators: Louie Wang, MD, FRCPC; Glenio Mizubuti MD, MSc; Elizabeth VanDenKerkhof, RN, MSc, DrPH; Monakshi Sawhney, NP, PhD; Stephen Mann, MD, FRCPC

Background: Shoulder surgery can be performed under general anesthesia, brachial plexus nerve block, or a combination of both. In addition, continuous brachial plexus nerve blocks can provide post-operative pain control for several days. Studies have demonstrated the benefits of brachial plexus nerve blocks in shoulder surgery to include improved post-operative pain control, greater passive shoulder movement, and the decreased incidence of side effects associated with opioid consumption.[1-4] Peripheral nerve blockade during rotator cuff surgery has also been shown to reduce the length of stay in postoperative anesthesia care units and reduce the rate of hospital admissions.[4,5]

The Ministry of Health and Long Term Care of Ontario established Health System Reform Funding in 2012 to promote the delivery of quality health care services. Quality Based Procedure (QBP) funding is a key component of this reform.[6] Ontario is considering expansion of the QBP program to include degenerative disorders of the shoulder, including shoulder surgery. In anticipation of this expansion, the purpose of our research project is to examine the effectiveness of a perioperative intervention to reduce pain and discomfort after shoulder surgery. Specifically, we will be examining the impact on postoperative healthcare access and utilization.

Objective: To use population-level data to examine the effect of brachial plexus nerve block on the rate of hospitalization, length of hospital stay, use of Emergency Department services and the rate of unplanned hospital admissions following elective shoulder surgery for degenerative disorders of the shoulder.

Methods: Administrative data, available through the Institute for Clinical Evaluative Sciences, will be used to identify all Ontario residents who underwent elective surgery for degenerative disorders of the shoulder from 2009 to 2014, using predefined inclusion and exclusion criteria. Patient, provider and system characteristics of the study cohort will be described and stratified by type of anesthesia. Bivariate statistics will be used to describe the relationship between brachial plexus block and study outcomes. Multiple regression analysis will be used to identify patient and provider characteristics and control for confounding variables. Finally, reasons for post-operative health care utilization will be described and stratified by type of anesthetic.

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Cellular and molecular mechanisms of inflammatory pain

Jaqueline Silva, Ian Gilron, Nader Ghasemlou

Tissue injury, such as occurs in surgical incision and infection, results in a well-orchestrated inflammatory response where immune cells are recruited to the injury site where they clear tissue debris and pathogens to help the tissue heal itself. This immune response also warns the host of damage through the sensation of pain: it is increasingly clear that molecular and cellular interactions between the nervous system and immune system play important roles in the development and maintenance of pain, though the exact cells and signals mediating these effects remain unclear. We recently characterized the contribution of circulating immune cells (including neutrophils, monocytes, and T cells) and their secreted products to inflammatory pain outcomes and found that a specific subset of monocytes mediate mechanical (touch) but not thermal (heat) hypersensitivity. Specialized pain-sensing neurons densely innervate the skin and can be activated by various immune mediators. There are several distinct populations of immune cells found primarily in the skin, many of which are activated within seconds after tissue injury. However, their contribution to the pain response remains unknown. We hypothesize that these tissue-resident immune cells play an important and previously unappreciated role in the pain response. The goal of this study is to identify those cells and their secreted mediators that are capable of activating pain-sensing neurons. These studies have the potential to transform our understanding of neuro-immune interactions and identify new mechanisms underlying pain.

The role of circadian rhythms in somatosensation

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Introduction

Somatosensory modalities include mechanoreception (touch), thermoreception (hot/cold), and nociception (pain). Sensory stimuli are transmitted through specific ion channels and receptors that can be activated and/or sensitized by various factors such as cytokines, chemokines, and other secreted mediators. Many of these channels have also been implicated in pain conditions, including neuropathic and inflammatory pain. Neuropathic pain conditions are estimated to affect as much as 8% of the population and currently, the most common treatment strategies involve the suppression of neuronal activity. Clinical studies have demonstrated that patients with chronic neuropathic pain often exhibit circadian fluctuations in pain intensity, with patients reporting significantly higher levels of pain in the evening than during the day. We therefore sought to understand whether a link exists between circadian rhythms and somatosensory activity using a mouse model.

Methods

Male and female C57BL/6 mice were used in all studies. Standard and newer behavioural assays were used to measure mechanical, thermal and cold sensitivity at three times of the day – 9am, 3pm and 9pm. Thresholds were measured first in naïve animals. Spared nerve injury, a procedure which is commonly used to model chronic neuropathic pain, was then used to assess changes in pain thresholds over the course of the disease at 9am, 3pm and 9pm, as before.

Results

We found that naïve male mice showed a significant change in thermal sensitivity using the Hargreaves radiant heat test, with increased sensitivity at 9am and 3pm compared to 9pm. Female mice, on the other hand, did not show this effect. Interestingly, hot plate analysis of the animals at specific temperatures (45-55°C) revealed distinct changes in sensitivity for both naïve male and female mice. Pharmacological characterization of this effect, using the intraplantar injection of capsaicin, suggests that the observed rhythm is modulated by the transient receptor potential vanilloid 1 (TRPV1) ion channel. Specifically, mice displayed a higher level of sensitivity to capsaicin when injected at 9am than at 9pm. The mechanisms through which these effects are controlled are being examined further using molecular biology tools. Analysis of male mice after spared nerve injury found a loss of the heat effect but a change in circadian control of chronic mechanical hypersensitivity.

Conclusion

Our work will lead to an increased understanding of the underlying physiology of ion channels and their link to hypersensitivity and the circadian variation of neuropathic pain.

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Concordance Between Resident Self-Assessment and Faculty Assessment of Competency Over the Span of a Residency Program with the Transition to Competency-Based Medical Education

Authors: M. Fleming, G. Mizubuti, M. McMullen, R. Egan, S. Field, And D. Vautour

Background & Rationale

Improving physician competency requires quality training, the provision of feedback to guide residents in their development, and the valid and reliable assessment of residents' entrustability across a range of competencies. The medical literature shows that medical residents generally do poorly at self-assessing their performance (Gordon 1991; Eva and Regehr 2005). However, iterative and targeted feedback based upon well-defined criteria has also been shown as a means to potentially improve residents' self-assessment accuracy (Boud 1995). Competency Based Medical Education (CBME) is a curricular shift that calls for structured and iterative assessment across pre-determined and distinct professional activities, with granulized requirements clearly outlined with enabling competencies and milestones. As such, there is a unique opportunity to assess, develop, and refine systematized mechanisms of synchronous and blinded assessment between residents and supervisors, with subsequent calibration through written and/or verbal feedback. As a leader in CBME, Queen's University has a unique opportunity to evaluate the effectiveness of self-assessment as an important measure of resident entrustment. Entrustment based on self-assessment transcends the current state of training by honing residents' ability to accurately determine the limits and extent of their ability, a skill that is essential for continuing professional development and has the potential to enhance patient safety and care quality into the future.

In this study, we propose that in addition to externally evaluated entrustment on competencies and entrustable professional activities (EPAs), residents need the ability to accurately self-assess their strengths and weaknesses. Within the Competency Based Medical Education (CBME) structure there will also be stage specific assessment reviews that will be amenable to examining residents' trends in self-assessment and provide an opportunity with Academic Advisors for the residents' to reflect and develop their abilities in self-assessment. We will evaluate resident self-assessment accuracy at different stages and within different sub-specialties.

Methodology

Phase 1- Instrument Design - Development of a self-assessment tool.

Phase 2 – Pilot Study Data Collection

Participating sub-specialties will begin pilot data collection of daily faculty and resident paper assessments. Qualitative data will subsequently be compiled, analyzed, and triangulated by research assistants working with the OHSE.

Phase 3 – Data Collection, Analysis & Results Communication

Entrada Project©, the integrated teaching and learning platform tool, will be used in the consistent design of online distribution, collection, and analysis of self-assessment forms/data. Postdoctoral fellows with the OHSE will collect, conduct and analyse the quantitative data.

Phase 4 – Qualitative Interview - Interview investigating resident and staff perspective from a lived experience lens and also evaluate if/how residents' used the trends in their self-assessment to inform their perspectives on practice.

Outcomes

Through this project we will:

1. Establish a shared vision and approach to self-assessment within the Queens CBME context.
2. Establish an evidenced based approach to Entrada self-assessment design.
3. Collect data on self-awareness accuracy trajectory across residents at different stages and within different (sub) specialties over 1.5 years of their programs.
4. We will provide the literature with one of the first longitudinal self-assessment studies concentrating not on if self-assessment is accurate, but rather how accuracy can be approved over time and across contexts.

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Postoperative pain in patients post hospital discharge: A systematic review

Authors: Samuel Walsh, Elizabeth VanDenKerkhof , Amanda Ross-White, Ian Gilron.

Clinical Need: Major advances in have been made in the treatment of pain in patients admitted to hospital; however, patients continue to report high levels of pain after discharge to the community.(1). A 2013 survey in the United States found that of a random sample of 300 patients 74% experienced moderate to major pain after being discharged from hospital(2). These findings are consistent with a Canadian study that reported 68% of inpatient and 49% of outpatient surgery patients had high levels of pain(3). Poorly controlled postoperative pain has a major impact on quality of life during the recovery process and may delay return to work. In addition many patients seek additional unplanned health care for pain, which places additional strain on health care resources. A multicenter RCT studying pain in 171 patients post total knee replacement found that 60% had to seek additional medical attention from a primary care provider and 3 patients returned to hospital for pain management(4). Acute pain is also related to chronic pain. A recent expert review by Katz and Seltzer identifies moderate to severe acute pain as a major risk factor for the development of chronic pain(5).

Currents gaps in knowledge: A majority of studies focusing on postoperative pain are conducted on inpatients or on day surgery patients. There is a small but growing body of literature about postoperative pain at home after hospital discharge. A review of the existing literature could help guide optimal management for larger more painful procedures and improve patient experiences and outcomes at home.

Progress: Three iterative search strategies were developed. These focused on; severity and duration of postoperative pain, delayed time to return to work and emergency room visits or readmission due to pain. After hand reviewing the studies around 10% of the results were actually met the stated criteria. Unfortunately, many of these studies addressed the question tangentially and with widely varying outcome measures and time frames. Several recent RCTs focusing on ambulatory peripheral nerve block catheters gave both arms of the study multimodal oral analgesia. These studies offer a new approach to addressing my research question.

Revised research question: Does multimodal analgesia and early contact with a health care professional result in better pain control, reduced side effects of analgesic medications and decreased morbidity secondary to pain compared to the current routine practice in post-operative analgesia.

Study design: Perform a systematic review of the literature to identify studies comparing home peripheral nerve block catheter plus multimodal analgesia to placebo plus multimodal analgesia. Perform a second review to find studies with patients having similar surgeries with routine post-operative analgesia and compare the outcome measures to the placebo group from the peripheral nerve block catheter studies.

Limitations: A preliminary review of the literature on peripheral nerve block catheters suggests that most of the studies will focus on orthopedic procedures with a much smaller number examining TAP catheters after abdominal surgery. This will limit the generalizability of the review however after three different approaches it is clear that variability in the existing literature makes the results of a broader review unwieldy.

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Does magnesium sulfate as a supplement in adductor canal blocks improve pain control after total knee arthroplasty?

Resident: Dana Zoratto, PGY4 Supervisor: Dr. Shyam

Background and Rationale

Total knee arthroplasties (TKA) are widely recognized as effective treatments for degenerative joint disease. The number and prevalence of TKAs have increased significantly over the last quarter century with over 57,000 performed in Canada in 2012-2013 alone. One of the many challenges of TKAs is balancing postoperative analgesia with safe early ambulation to facilitate efficient hospital discharges. Multimodal approaches have been instituted including periarticular injections, patient-controlled intravenous narcotics, and various regional techniques. Numerous medications have also been investigated including the addition of magnesium to both systemic and regional techniques to improve both duration and efficacy of analgesia. This research investigates whether the addition of magnesium sulfate to an adductor canal block will increase the duration of a sensory block to the operative knee while maintaining normal quadriceps strength in patients undergoing TKAs. We hypothesize that patients who receive the magnesium sulfate will have prolonged analgesia without increased risk of falls and thus shorter hospital lengths of stay.

Study design

This study is designed as a single-centred, double-blinded, randomized controlled-trial with three groups of 40 participants each to compare (1) current standard of care (spinal anesthetic with epimorph, periarticular injection and patient-controlled analgesia), to a group receiving (2) standard of care plus an adductor canal block with only local anesthetic, and (3) to a group receiving standard of care plus an adductor canal block with both local anesthetic and magnesium sulfate. Statistical analysis will include the use of analyses of variance (ANOVAs) and t-tests for parametric data to compare between group differences. Mann-Whitney U tests will be used for the non-parametric data such as visual analogue scale scores. A value of $p=0.05$ will be considered statistically significant.

Outcome Measures

Primary outcome: time to first analgesic request (first use of PCA pump after surgery).

Secondary outcomes: (1) cumulative PCA morphine-equivalent consumption in the first 24-hours postoperatively; (2) VAS pain scores post adductor canal block within the first 24 hours at different intervals; and (3) hospital length of stay.

Update and Plan

One hundred and thirty-two patients have been recruited. The data entry is nearing completion. Statistical analysis will follow data clean-up. Unfortunately, primary outcomes are missing from a number of patients as it relied on active patient participation.

Funding was obtained through both the Senate Advisory Research Committee (SARC) and the Alison B. Froese grant.

Critical Appraisal

By: Matthew Bruder, MD, PGY1, Queen's Anesthesiology & Perioperative Medicine

Publication Title: *Use of deep laryngeal oxygen insufflation during laryngoscopy in children: a randomized clinical trial*

Authors: J.W. Steiner, D.I. Sessler, N. Makarova, E.J. Mascha, P.N. Olomu, J.W. Zhong, C.T. Setiawan, A.E. Handy, B.N. Kravitz, P. Szmuk

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The induction of anesthesia has been associated with apneic periods which can lead to blood oxygen saturation decreases in both children and adults[1,3]. In children especially, due to their unique physiology and metabolic requirements, these apneic periods can lead to clinically relevant desaturations[2]. Passive oxygenation has long been shown to effectively improve oxygen saturations during apnea in adults[3]. Previous studies have shown that passive ventilation via nasal prongs can delay apneic desaturations and that laryngoscope blades with integrated oxygen channels can delay desaturation even further, via delivery of higher partial pressures of oxygen to the lungs during apnea[4]. This study compares three methods of intubation and oxygen delivery; standard direct laryngoscopy, direct laryngoscopy with an attached oxygen cannula, and video laryngoscopy with oxygen cannula. The intubation and oxygen delivery methods were then compared in terms of rate of oxygen desaturations, and time until 1% oxygen desaturation from patient baseline. The results showed that laryngeal oxygen insufflation increases the time to 1% desaturation from baseline, and reduces the overall rate of oxygen desaturations during pediatric intubations. While there are issues with clinical applicability outside of the study, the findings suggest that deep laryngeal insufflation of oxygen during intubation could be an important tool in improving anesthetic safety during pediatric intubations.

Methodology

This is an experimental, prospective, randomized single-blinded control trial. The demographics were children aged 1-17 years old, with ASA status I to III, who were undergoing dental procedures with general anesthesia and nasotracheal intubation. The study exclusion criteria were significant cardiorespiratory disease, recent respiratory infection, patients at risk for pulmonary aspiration, and patients with known or suspected difficult airways. All patients enrolled in the study provided written informed consent. The study took place at the Children's Health, and Children's Medical Centre Dallas, between June 2013 and July 2014. The study was approved by the Institutional Review Board, and its design avoids any ethical problems; all patients received standard anesthetic medications, and were not withheld any treatments. The study compared three different means of nasotracheal intubation: standard direct laryngoscopy, direct laryngoscopy with oxygen, and video laryngoscopy with oxygen.

Patients were each randomized to one of the three groups via computer generated randomization, with the protocol being recorded in a sealed envelope, opened at the time of anesthetic induction. Randomization was 1:1:1 between the three groups.

Anesthesia was induced in all patents using sevoflurane 8% in oxygen (100%) via face mask. Following induction, an intravenous cannula was placed, and rocuronium

(0.6mg/kg) and propofol (dosed according to clinician preference) were administered. Sevoflurane was then decreased to 2-2.5% and patients were mask ventilated for 3 minutes with 70% N_2O and 30% 0_2. Patients were then randomly assigned to one of three groups: standard direct laryngoscopy (group DL), video laryngoscopy with oxygen cannula attached (group VLO_2), or direct laryngoscopy with an oxygen cannula attached to the side of the blade (group DLO_2). Direct laryngoscopy was performed normally. Laryngoscopy with insufflated oxygen was performed using either direct or video laryngoscopy, with oxygen delivered at a rate of 2 liters per minute for laryngoscope blades 0 and 1, and a rate of 3 liters per minute for laryngoscopy blades 2 and 3. Following pre-oxygenation, the face mask was removed, and the designated laryngoscope and blade, with or without oxygen attached for insufflation, were used for nasotracheal intubation. The nasotracheal intubations were completed using standard RAE nasotracheal tubes and McGill forceps. Once the trachea was intubated successfully correct placement was confirmed with end-tidal CO_2. The study protocol was well-documented and easily reproducible.

Study data was collected using an additional SpO_2 probe, in addition to the standard ASA monitors, connected to the patient's toe prior to induction of anesthesia. The SpO_2 sensors provided measurement values each 1 second, which were then recorded by a connected computer. The laryngoscopy times were also recorded, along with the intervals for mask ventilation times, and time until $etC0_2$ tracing confirmed tracheal intubation.

Using the data collected, time to 1% decrease in saturation from patient baseline, and desaturation rate were calculated, to allow comparison of the experimental groups. Patient characteristics, airway assessment, and anesthetic information was also recorded, in additional to heart rate and blood pressure (at 1 minute intervals)

Statistical analysis was then performed using Cox proportional hazards regression to compare the three groups on time to 1% desaturation and overall rate of desaturation. Additionally, a post-hoc analysis to assess if the differences in rate of desaturation or time to 1% desaturation depended on subject BMI or age was completed. Study sample sizes were calculated using the primary outcome of time to 1% desaturation, rather than using rate of decline, because its analysis required more subjects. Assuming time to a 1% desaturation of 35 seconds for direct laryngoscopy, and an exponential distribution, a sample size of 169 subjects per group was needed. The assumption that 1% desaturations take on average 35 seconds during direct laryngoscopy came from the study's preliminary data, and fairly closely matched the final values.

Results

Table 1 Baseline subject characteristics and intubation characteristics for three randomized groups. Values are reported as the mean (SD) or *n* (%), as appropriate. DL, direct laryngoscopy alone; DLO_2, direct laryngoscopy with cannula; VLO_2, Truview PCD laryngoscope

Characteristic	VLO_2 (*n*=153)	DLO_2 (*n*=145)	DL (*n*=159)
Baseline characteristics			
Age (yr; mean [minimum, maximum])	4.7 [1.5, 15]	4.4 [1.7, 16]	4.3 [1.2, 12]
≤3 yr old [*n* (%)]	43 (28)	53 (36)	64 (40)
3–5 yr old [*n* (%)]	71 (46)	59 (41)	58 (37)
>5 yr old [*n* (%)]	39 (26)	33 (23)	37 (23)
Female [*vs* male; *n* (%)]	72 (47)	71 (49)	71 (45)
Weight [kg; mean (SD)]	20 (6)	20 (9)	20 (9)
ASA physical status [*n* (%)]			
I	73 (48)	70 (48)	80 (50)
II	71 (46)	72 (50)	71 (45)
III	9 (6)	3 (2)	8 (5)
Heart rate [beats min^{-1}; mean (SD)]	110 (26)	114 (24)	110 (27)
Systolic blood pressure [mm Hg; mean (SD)]	99 (13)	98 (14)	97 (12)
Diastolic blood pressure [mm Hg; mean (SD)]	58 (14)	60 (14)	58 (12)
Oxygenation before laryngoscopy [%; mean (SD)]	99.7 (0.6)	99.4 (1.9)	99.6 (0.8)

Table 2 Results for primary and secondary outcomes. For the primary analysis, we compared VLO_2 and DLO_2 with DL on two outcomes: time to 1% reduction in saturation from baseline using Cox proportional hazard model; and overall desaturation rate (slope) via linear mixed effects model with repeated measures. For secondary analyses, the VLO_2 and DLO_2 groups were compared using similar models to those for the primary analysis; overall desaturation rate results are reported as the difference in mean slopes using the linear mixed effects model; for the incidence of desaturation ($S p_{O_2}$ <90%) as desaturation relative risk using Pearson's χ^2 test; for the age and BMI effect, the desaturation hazard ratio is reported for an increase of one unit in age or BMI using the Cox proportional hazard model. CI, confidence interval; DL, direct laryngoscopy alone; DLO_2, direct laryngoscopy with cannula; VLO_2, Truview PCD laryngoscope; Sp_{O_2}, haemoglobin oxygen saturation. *Kaplan–Meyer estimate 25th percentile along with adjusted 95% confidence limits were reported instead of the usual 50th percentile (median) because there were insufficient non-censored data for the DLO_2 group (not many patients experienced 1% reduction in Sp_{O_2} from their baseline). †Model-based mean slope estimates and difference in mean slopes were reported. ‡Median laryngoscopy time was reported as the median [first quartile, third quartile], in seconds. ¶Confidence limits reflect the Bonferroni adjustment for multiple pairwise comparisons, correction for several primary and secondary outcomes, and adjustment for five interim analyses in order to maintain the overall type I error rate at 2.5% for the primary and 5% for the secondary outcomes; all the reported CIs correspond to superiority tests. §Significant *P*-values corresponding to superiority tests.

Ouctome	VLO_2 (*n*=153)	DLO_2 (*n*=145)	DL (*n*=159)	Estimate	P-value
Primary outcomes					
Time to 1% saturation reduction (s)*	75 (37, 122)	67 (35, 149)	30 (24, 39)	Hazard ratio (97.5% CI)¶	
VLO_2 *vs* DL				0.18 (0.11, 0.29)	<0.001§
DLO_2 *vs* DL				0.16 (0.10, 0.27)	<0.001§
Overall desaturation rate (% s^{-1})†	0.03 (0.004, 0.05)	0.04 (0.02, 0.06)	0.13 (0.11, 0.15)	Difference in slopes (97.5% CI)¶	
VLO_2 *vs* DL				−0.10 (−0.13, −0.07)	<0.001§
DLO_2 *vs* DL				−0.09 (−0.12, −0.06)	<0.001§
Secondary outcomes					
(i) VLO_2 *vs* DLO_2				Hazard ratio (95% CI)¶	
Time to 1% saturation reduction (s)*				1.10 (0.59, 2.08)	0.63
				Difference in slopes (95% CI)¶	
Overall desaturation rate (% s^{-1})†				−0.01 (−0.04, 0.02)	0.26
(ii) Desaturation rate after initial 1% reduction (% s^{-1})†	0.12 (0.04, 0.20)	0.19 (0.09, 0.29)	0.35 (0.30, 0.40)	Difference in slopes (95% CI)¶	
VLO_2 *vs* DL				−0.23 (−0.32, −0.13)	<0.001§
DLO_2 *vs* DL				−0.16 (−0.27, −0.05)	<0.001§
VLO_2 *vs* DLO_2				−0.07 (−0.19, 0.06)	0.08
(iii) Incidence of desaturation ($S p_{O_2}$ <90%)	18 (12%)	15 (10%)	78 (49%)	Relative risk (95% CI)¶	
VLO_2 *vs* DL				0.14 (0.05, 0.35)	<0.001§
DLO_2 *vs* DL				0.12 (0.04, 0.32)	<0.001§
VLO_2 *vs* DLO_2				1.16 (0.36, 3.72)	0.70
(iv)				Hazard ratio (95% CI)¶	
Age effect on time to 1% saturation reduction, for 1 yr increase				0.92 (0.83, 1.03)	0.03
BMI effect on time to 1% saturation reduction, for 5 kg m^{-2} increase				1.01 (0.70, 1.47)	0.92
Median laryngoscopy time (s)‡	110 [88, 139]	91 [70, 113]	74 [60, 88]		

A total of 1518 patients were screened for study eligibility. Of these, 482 patients were enrolled in the study and divided into the three experimental groups. 1036 patients were excluded from the study. Additionally, 25 further patients were excluded following randomization for equipment or software failure (n=21), vomiting during induction (n=2), lack of resources (n=1) or withdrawal of consent (n=1). 159 patients (35%) were randomized to Direct Laryngoscopy, 145 (32%) to Direct Laryngoscopy with Oxygen, and 153 (33%) were randomized to Video Laryngoscopy with Oxygen.

The primary outcome measured was non-inferiority of DLO_2 and VLO_2 to DL in time to 1% decline of oxygen saturation from baseline, and overall rate of oxygen desaturation. Both $DL0_2$ and VLO_2 were found to be non-inferior to DL in both cases, to a significance of p<0.001. The study was

able to therefore conclude that laryngeal oxygen supplementation is beneficial during both direct and video laryngoscope intubations, as a method of slowing oxygen desaturations and time to 1% desaturation from baseline in children.

It should be mentioned that the study had originally planned to use time to 90% hemoglobin saturation as the primary outcome. However, even in pediatric intubations where desaturations can be common, the researchers found desaturations to 90% to be a rare event, which would have required an excessively large study. Following the first interim analysis the original primary outcome was therefore changed to avoid these issues.

The secondary outcomes of the study compared the VLO_2 and DLO_2 groups oxygen desaturation slopes, evaluating the association between time to 1% desaturation from baseline with age and BMI. The VLO_2 and DLO_2 groups did not differ on either time to 1% desaturations, or on rate of desaturation.

Discussion

This study concludes that deep laryngeal oxygen, delivered via either direct or video laryngoscope blade, is effective in slowing both the time to a 1% reduction of saturation from baseline, and the overall desaturation rate in apneic children. Unsurprisingly, both methods of delivering deep laryngeal oxygen were effective in improving oxygenation. What was striking though, was how much benefit the deep laryngeal oxygen provided. Both delivery methods more than doubled the time to 1% desaturation from baseline, from 30seconds during standard direct laryngoscopy, to 75 seconds (VLO_2) and 67 seconds (DLO_2). Additionally, the rate of desaturations was slowed in both deep laryngeal oxygen groups from 0.35% SpO_2/second to 0.19 (DLO_2) and 0.12 (VLO_2).

The study did not show a significant difference in direct vs video laryngoscopy in terms of its ability to delivery deep laryngeal oxygen. Further study is required to identify if one method or another is more effective in delaying or slowing the rate of oxygen desaturations.

While the study did collect data on age and BMI, it was not able to slow any associations between these characteristics and oxygen desaturation during intubations. However, the authors note that the study was not powered to make such correlations. Previous studies have shown desaturations following apneic periods occurring more quickly in younger children but those findings were not mirrored here[6]. Steiner et al. do note that apneic oxygenation is likely less effective in smaller children because they have increased oxygen requirements on a per kilogram basis than larger children or adults.

The clinical applicability of this study is tempered by several issues. To begin with, the authors of the study chose to oxygenate patients during mask-ventilation with a 70% N_2O/30% O_2 mixture, rather than a more concentrated mixture of oxygen. The researchers note that this oxygen concentration was chosen to promote desaturations; with higher concentrations, few patients were desaturating at all prior to intubation. In practice though, clinicians are likely to use higher concentrations of inspired oxygen, prolonging the time before desaturation, and making the extra time afforded by deep tracheal oxygenation less important. While doubling the time to desaturation from 30 to 60 seconds, as this study does, is certainly useful clinically, moving the time from 70 to 100 seconds, for example, may have less impact. That said,

the study does show significant increases in the time before desaturation, which may be useful in certain situations, especially in patients with reduced respiratory reserves or expected prolonged airway procedures. In choosing their intubation method, the study similarly limits its applicability. The researchers note that they chose to use nasal intubations rather than a more straight forward oral intubation to increase the difficulty and time required for intubation, and again predispose towards oxygen desaturations. This concession was made to encourage longer intubation attempts during the study, allowing time for oxygen desaturation. Given the difficulty of studying relatively rare events though, such as clinically significant oxygen desaturations during uneventful intubation attempts with full pre-oxygenation, the above consents do seem reasonable.

The applicability of this study to the Kingston General Hospital patient population is quite high. The patient population of children aged 1-17 years old, ASA category I-III, undergoing dental surgery, is one frequently encountered. However, it would be difficult to extrapolate the findings beyond these groups of patients and to a larger anesthetic population. In terms of anesthetic protocols, the methods and treatment protocol used and described in the study largely resemble the clinical practice seen at KGH. While specific video laryngoscopic airway tools are unlikely to be available at all institutions, one form or another capable of delivering laryngeal oxygen is likely available at most centers. Additionally, standard laryngoscope blades with integrated oxygen delivery channels should be available at all centers, including KGH.

Despite the limits to clinical applicability noted above, this study does show that deep laryngeal oxygen can effectively lengthen the time before oxygen desaturations, and slow the overall rate of oxygen desaturations during pediatric intubations. This extra time during intubations could provide an additional level of comfort and safety to both anesthesiologist and patient. Given the low cost, simplicity, and minimal risk of using supplemental deep laryngeal oxygen, and the large safety benefits that come from improved oxygenation during intubation, integrating these methods into clinical practice should be considered.

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Critical Appraisal Essay – Carl Chauvin, PGY1

Publication title: ***"Early postoperative oral fluid intake in paediatric day case surgery influences the need for opioids and postoperative vomiting: a controlled randomized trial."***

Authors: ***Chauvin C, Schalber-Geyer AS, Lefebvre F, Bopp C, Carrenard G, Marcoux L, Mayer JF, Schwaab C, Joshi GP, Diemunsch P.***

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INTRODUCTION

Post-operative nausea and vomiting (PONV) is a problem of particular importance in anesthesia, both complicating a significant proportion of anesthetic cases and often proving refractory to management. Furthermore, in the paediatric population there is an added wrinkle: young children are often not able to clearly communicate causes for distress, and post-operative nausea can therefore be difficult to differentiate from other distressors in the post-operative period. In particular, post-operative pain, post-operative nausea, thirst, and hunger can present very similarly in pre-verbal children. Despite the similarities in presentation, however, the treatments are quite distinct; indeed, mistaking nausea or thirst for pain and administering opioids can promote or exacerbate PONV. It therefore behooves clinicians to use all tools at their disposal to differentiate between various causes of post-operative distress and be judicious in administration of opioids to post-operative paediatric patients.

The study under examination seeks to decrease both the incidence of post-operative vomiting and unnecessary opioid administration in the post-operative pediatric patient through a trial early oral fluid administration as a first response to the undifferentiated distressed child. It attempts to show that a significant proportion of distress in these patients can be attributable to thirst rather than pain or nausea, and can therefore be soothed with oral fluids, thereby obviating the need for pro-emetic opioids and decreasing PONV in these patients.

The study is the result of work done by a group of clinicians based in Strasbourg, France, at the Hôpital Hautepierre-CHU Strasbourg. Of note, the author of the study to be examined and the author of this appraisal bear no known relation to one another; their shared surname and first initial is solely happenstance.

METHODOLOGY

The study design is a single-centre, prospective randomized controlled trial. The study was approved by an ethics review board and informed consent was obtained from parents of all participants in the study. Justification for the study was made by noting the substantial effect that post-operative vomiting has on delayed discharge home, unplanned hospital admission, increased patient discomfort, and reduced patient/parent satisfaction.

Subjects in the study included children aged 6 months to 4 years, ASA class I-III, undergoing day surgery under general anesthesia at a single tertiary care centre in France between September 2013 and June 2014. Exclusion criteria were patients not able to take oral intake in the immediate post-operative period for anesthetic or surgical reasons, known digestive pathology predisposing to PONV (such as hiatus hernia and GERD), and enrolment in another study. Patients not able to drink fluids immediately post-operatively precluded them from receiving the experimental intervention and therefore were ineligible. Those with significant PONV risk factors were presumably excluded to maintain generalizability of results to a widespread pediatric population without a clear leading

presumptive etiology for post-operative distress. Those patients already enrolled in another study could not be guaranteed to have a standardized anesthetic free of confounding interventions as dictated by other experimental protocols.

Randomization was performed post-operatively in the PACU by independent research personnel not otherwise associated with the study. Enrolled patients were randomized to either the liberal group (LG) or the control group (CG). Subjects' post-operative distress was graded according to the Face Legs Activity Cry Consolability (FLACC) score; subjects with a FLACC score ≥4 were given an intervention to treat their distress according to their experimental group as follows:

i) *Control group (CG)*: Given IV opioid analgesia according to standard institutional pain protocol: nalbuphine 0.2mg/kg or morphine in titrated dosing (not further specified).
ii) *Liberal group (LG)*: Offered (but not forced to consume) 10mg/kg diluted apple juice. If FLACC score ≥4 persisted following experimental intervention, subsequently given IV opioid analgesia according to standard institutional pain protocol.
iii) In both groups, ondansetron 0.15mg/kg was administered to subjects after second episode of post-operative vomiting (POV) or upon parental request.

Primary end point was the global incidence of POV during the first 3 days after surgery. Secondary end points were total dose of opioids administered in PACU, length of PACU stay, number of POV episodes in PACU, on the ward, and on post-operative days 1 and 3, and post-operative adverse events, including difficulty swallowing and oxygen desaturations <94%.

The FLACC scale is a behavioural scale specifically designed to score post-operative pain in young children. It has been shown to be both valid and reliable in assessing pain in children aged 2 months to 7 years; however, it has not been previously validated to reliably assess other causes for distress such as post-operative nausea or thirst.[1]

A detailed reproducible outline of anesthetic and analgesic agents used for patients enrolled in the study was published in the paper; all patients received a standardized anesthetic including premedication with either midazolam or hydroxyzine, induction of anesthesia with sevoflurane, followed by airway securing and mechanical ventilation, and maintenance of anesthesia with sevoflurane. The paper reports that sufentanil or alfentanil boluses were administered intraoperatively as needed, and locoregional anesthesia was administered after induction if appropriate, but does not go into further detail as to criteria used to determine need for these analgesic interventions.

Of note, although patients were randomized in a blinded fashion by individuals not otherwise associated with the study, the PACU staff, day care nursing staff, and parents involved in assessing pain and providing interventions were not blinded to the groups that subjects were allocated to.

RESULTS

276 patients were deemed eligible to participate in the study during the study period; of those, parents of 42 patients refused consent and were excluded. 234 patients were randomized; of those, 3 patients were subsequently excluded due to incomplete data (CG=1; LG=2). The remaining 231 subjects were included in the final analysis (CG=117; LG=114).

The paper provides a detailed table describing the patient characteristics and clinical variables of the two groups. There were no statistically significant differences between the two groups among the variables recorded. The groups were statistically similar by age, gender, ASA status, and type of surgery; they were fasted pre-operatively for similar periods of time, and received similar intraoperative opioids, locoregional anesthesia, and intravenous fluids. Notably, greater than 80% of the total study participants were male; no specific explanation is given for this preponderance, but it is likely at least in part accounted for by the nature of surgeries performed on the study population, approximately 40% of which were urological.

35.9% of CG subjects (42 of 117) and 38.6% of LG subjects (44 of 114) had a post-operative FLACC score ≥4, prompting intervention. In the LG intervention subgroup, 30 of 44 patients (68.1%)

accepted oral fluids with average intake 4.2mL/kg; the remaining 14 patients refused fluids and were treated with IV opioids as per protocol.

The study yielded a statistically significant primary end point: the incidence of POV was 11.40% in the LG, as compared to 23.93% in the CG. Several secondary end points also yielded positive results: post-operative opioid analgesics were needed in 14.04% of LG subjects versus 35.89% of CG subjects (implying an absolute risk reduction of 21% resulting from distressed children being soothed by post-operative fluids and therefore not receiving opioids due to a reduction in FLACC score from ≥4 to <4); the PACU stay was shorter in the LG group relative to the CG group (53.45 vs. 65.05 min); total doses of opioids administered to patients were 0.18mg/kg vs 0.20mg/kg in the LG and CG respectively. All differences above were reported to be statistically significant. The study reported no complications related to early oral intake such as aspiration.

Although the sample size calculations yielded a required sample size of 404 subjects in each group to obtain sufficient study power to detect a decrease in POV incidence of 50% (power of 80%, type I error rate 5%), data was analyzed weekly after enrolment of 150 total subjects via sequential Bayesian paradigm analysis to allow for early study termination with positive statistical results without type I error inflation. The study was therefore stopped with the above number of patients once the Bayesian analysis suggested sufficient evidence to demonstrate a positive effect of early post-operative fluids on the primary end point of reduction in incidence of post-operative vomiting.

DISCUSSION

The main conclusion of the study is that early post-operative oral fluids in the distressed paediatric patient significantly reduces the incidence of post-operative vomiting. The study further concludes that early post-operative oral fluids decreases need for and amount of post-operative opioid analgesia, and decreases length of PACU stay. As the stated aim of the study was to investigate the role of early post-operative feeding on the use of opioids and the incidence of POV, the study adequately and affirmatively addressed its hypothesis.

The primary conclusion – that early oral fluids reduces paediatric post-operative vomiting – appears to be clinically as well as statistically significant. As demonstrated by the incidence within the study group, post-operative vomiting is exceedingly common in the pediatric population, and a 12% absolute risk reduction correlating to a >50% relative risk reduction has important clinical relevance. However, several of the secondary conclusions have more debatable true clinical relevance. An 18% reduction in the amount of time spent in PACU in the experimental group seems impressive, but the average time reduction of 11.6 minutes has less convincing merits. Similarly, it is difficult to assess the clinical benefit of an (albeit statistically significant) 0.02mg/kg difference in total opioid administration between LG and CG, especially given that both nalbuphine and morphine were used without information or references provided as to their equianalgesic characteristics in the patient population (although it should be noted that other studies have demonstrated a similar analgesic efficacy between the two).[2]

To its credit, the paper clearly brings attention to one important limitation of the study: the issue of blinding. Although subjects were allocated to LG or CG in a randomized fashion, the clinical staff who were assessing subjects' FLACC scores in PACU and on the ward were not blinded to group allocation. This lack of blinding introduces the potential for bias in FLACC scoring, particularly particularly those scores recorded after oral fluid administration in the experimental group that determined the secondary end point of subsequent opioid administration. Furthermore, as post-operative IV morphine was administered in a titrated fashion as opposed to a set standardized dose, the amount of opioid administered to patients in both the LG and CG may have been biased by the lack of blinding for the intervention.

The study population was limited to surgical day patients. This limits the generalizability of the study; it remains to be investigated whether the demonstrated benefits of post-operative oral fluids applies to pediatric patients with more invasive surgeries. The study population also excluded patients with significant risk factors for PONV; it therefore cannot be determined whether the demonstrated results apply to those paediatric patients who are at the highest risk of developing PONV and could therefore most benefit from interventions that mitigate that risk.

Finally, the paper makes only fleeting reference to the possible adverse effects of early oral intake, including aspiration and its attendant sequelae. It notes that no adverse events were seen in the study, but makes no mention of whether the study has sufficient power to demonstrate a lack of risk, or whether they accounted for this statistical question when determining the size of the study population. Greater study should be given to the question of the safety of the intervention of early fluid intake in the post-operative paediatric patient.

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Introductory PGY1 Critical Appraisal Essay

By: Emily Cook, M.D., PGY1, Queen's Anesthesiology & Perioperative Medicine

Publication Title: "*Calling the patient's own name facilitates recovery from general anesthesia: a randomized double-blind trial"*

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Anesthesia **(February 2017), 72, pages 197-203**

Introduction

This critical appraisal will review a research study, completed in Korea, that attempts to answer the question every anesthesiologist is tired of being asked: "Can you wake up the patient faster?" by studying whether calling the patient's own name during emergence from general anesthesia results in faster wake-up times than using a generic phrase. The utilization of patient's names is something that is done in almost every operating room however until this point there was no research to suggest that it actually had any clinically significant impact on the timing of emergence.

Response to ones own name is something that is anecdotally well supported with the 'cocktail party effect' as people are able to selectively hear a familiar word among various ongoing sounds[1]. Prior electrophysiology studies have also demonstrated that individuals have increased brain activity when hearing their own name while asleep[4] or in minimally conscious or vegetative states[5]. This however, has never been formally studied during emergence from a general anesthetic and therefore the researchers of this article set out to investigate it.

Based on the previously existing research, Jung et al. hypothesized that patient's would have faster recovery from a general anesthetic when their own name was called, as opposed to a generic phrase, as measured by time to eye opening. By studying this concept, the researchers suggested that there may be a simple, non-pharmacological tool available to anesthesiologists to improve wake-up times and subsequently improve operating room flow.

Methodology

This research study was completed with a prospective, randomized double-blind experimental design. There were two involved anesthesiologists: one responsible for induction and maintenance; the other for emergence. Both of the anesthesiologists and all of the patients were blinded to the group assignments. Ethical approval was obtained from the Institutional Review Board of Seoul National University Hospital.

The research was conducted on females undergoing general anesthesia for elective breast cancer surgery with propofol and remifentanyl infusions. All patients were between the ages of 20-70 and had an ASA class of 1 or 2. Patients were excluded if they had: hearing problems; neurological, cardiovascular, hepatic or renal dysfunction; a BMI greater than 30; a history of alcohol or drug use; used any medications affecting the central nervous system; or did not speak Korean. The authors did not explicitly justify why they chose this study population but did recognize it was a limited group. The exclusion criteria were also not justified in the article but were likely initiated to allow for more consistency with the anesthetic technique and communicating with the patient.

This sample population does not represent most patients undergoing general anesthesia in our region. The studied individuals were very healthy with ASA classes of only 1 or 2 and did not include

any male patients. They also did not include any patients speaking English, the most common language in Kingston's population, or patients maintained under anesthesia with an inhalational agent. Nonetheless, the investigated patients do exist in our population and we can still use the information provided to predict results in other patients.

For this study, 120 patients were assessed for eligibility and after removing patients with exclusion criteria, 101 individuals were randomly assigned to either an experimental group where they would hear their own name followed by the phrase "open your eyes" during emergence, or a control group where they would hear the generic phrase "patient, open your eyes." This sample size was chosen based on a previous report stating that the average time until eye opening after discontinuing a propofol and remifentanyl infusion was 7.4 minutes[3] and a 30% reduction in this time with a power of 0.8 and risk of type I error of 0.05 would require 47 patients in each group. It should be noted that this prior study was in a different population undergoing lumbar discectomy.

The experimental protocol was explained very well in this article and was both designed to test the hypothesis and detailed enough to be reproducible however, there was no explanation as to how the methodology was validated. Patients were randomly assigned to the name or generic phrase group with a computer generated random sequence in a 1:1 ratio. Both groups were monitored with non-invasive blood pressure, pulse oximetry and electrocardiography. Two electrodes of an acceleromyograph and a BIS sensor where applied to the ulnar nerve and forehead, respectively. Forced-air warming was applied to the upper and lower body and temperature was monitored with a nasopharyngeal probe. Weight-based doses of propofol and remifentanyl were administered for induction followed by rocuronium. A weight-appropriate iGel LMA was inserted only when the train-of-four twitch response was 0 and the BIS value was less than 60. Ventilatory settings were also based on weight and the propofol and remifentanyl infusions were adjusted to maintain the BIS <60 and mean arterial pressure and heart rate within 20% of baseline. At the end of surgery, the infusions were stopped and when train-of-four twitches were greater than 90%, pyridostigmine and glycopyrrolate were administered. Noise-cancelling headphones were then applied over the patient's ears and a pre-recorded message including either a generic phrase ("Patient, open your eyes") or their full name (i.e. "Emily Cook, open your eyes") was played and repeated at 10-second intervals. The primary endpoint was the time to eye opening with secondary endpoints including: time to iGel removal; time to BIS >60; analgesia and anti-emetic drug use in PACU; length of PACU stay and; whether patient's remember hearing the phrase "open your eyes." The patient's heart rate and blood pressure were also monitored during the emergence phase and compared between the two groups.

The article did not explain how all of the data was collected and specifically did not discuss who identified the time of the patient's eyes opening and at what point of emergence they were considered open (i.e. first flicker versus maintained opening). The data was however listed in appropriate detail and was then analyzed with an appropriate intention to treat approach. Categorical variables were compared using Fisher's exact test and the mean blood pressure and heart rate during emergence were compared using repeated-measures ANOVA or the Friedman test, followed by post-hoc analyses using two-sided independent t-tests or Mann-Whitney U-tests with Bonferroni correction.

Results

As mentioned, 120 individuals were assessed for eligibility and 101 patients were randomly assigned to either the name group or control group after eliminating patients with exclusion criteria. No patients were lost to follow-up in either group, a fact that is unsurprising given that the primary end-point occurred while the patient was still in the operating room.

The demographics of the experimental and control groups were published in the article and both groups were fairly comparable. The patient demographics can be seen in Figure 1.

Figure 1FigureFigure 1: Baseline characteristics of patients hearing either their own names or a general term during emergence from anesthesia. All patients were women. Values are mean (SD) or number (proportion).

The results regarding the endpoints that occurred in the Operating Room (eye opening, iGel removal and time to reach BIS <60) were well explained in the text of the article and are listed below in Figure 2.

	Name Group *Mean (SD)*	**Control Group** *Mean (SD)*	**Difference** *(95% CI)*	**p-value**
Eye opening	337 (154) sec	404 (170) sec	-67 (-130 to -4) sec	0.041
iGel removal	385 (152) sec	454 (173) sec	-69 (-132 to -6) sec	0.036
BIS <60	174 (133) sec	205 (160) sec	-31 (-88 to 26) sec	0.3

Figure 2: Time to primary and secondary outcomes after hearing own name or general term during emergence from anesthesia.

Secondary outcomes measured in the PACU were also presented in the article, as seen in Figure 3. Also, although not part of the initial hypothesis, heart rate and blood pressure were monitored during emergence and presented in a graph-format. This can be seen in Figure 4.

	Name group n = 50	Control group n = 51
Age; years	50.3 (8.6)	50.1 (8.5)
Weight; kg	57.9 (8.0)	59.0 (8.3)
Height; cm	158.3 (4.7)	158.3 (4.7)
Body mass index; kg.m^{-2}	23.1 (3.0)	23.6 (3.2)
ASA physical status 1	32 (64%)	35 (69%)
Medical conditions		
Hypertension	10 (20%)	9 (18%)
Diabetes mellitus	6 (12%)	2 (4%)
Asthma	0 (0%)	1 (2%)
Size 3 i-gel	30 (60%)	34 (67%)
Anaesthetic drug doses		
Propofol; mg	634.6 (209.0)	
Remifentanil; µg	473.0 (188.9)	
Rocuronium; mg	39.8 (7.9)	
Type of surgery		
Mastectomy	10 (20%)	
Quadrantectomy	28 (56%)	
Lumpectomy	12 (24%)	
Side of surgery; left	41 (82%)	
Duration of surgery; min	59.4 (21.2)	
Duration of anaesthesia; min	85.5 (25.2)	
At discontinuation of anaesthesia		
Predicted effect-site concentration of propofol; µg.ml^{-1}	1.7 (0.3)	
Predicted plasma concentration of	1.6 (0.3)	

	Name group n = 50	Contr group n = 5
Body temperature on admission; °C	36.1 (0.4)	36.0 (
Patients receiving medication		
Fentanyl	18 (36%)	15 (
Ramosetron	10 (20%)	12 (
Memory of verbal command in the operating room	9 (18%)	11 (
Length of stay; min	43.8 (3.4)	47.3 (

Figure 3: Details of stay in the post anes in 101 patients hearing either their own general term during emergence from ane are mean (SD) or number (proportion).

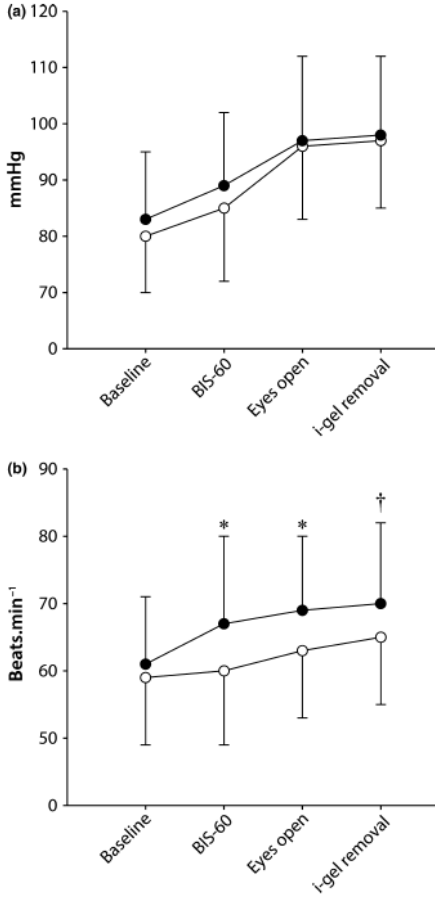

Figure 4: Mean blood pressure (a) and hea rate (b) of patients hearing their own name (•) or a general term (o) during emergence from anesthesia. Bars are SD. *p = 0.0004, †p = 0.011

Discussion

After analyzing the results, Jung et al. concluded that using the patient's own name during emergence may be an easy and effective method to facilitate recovery from general anesthesia. Although already done by almost every anesthesiologist, the effect of calling a patient's name during emergence was never formally studied before and it therefore adds interesting information to the anesthesiology literature suggesting that non-pharmacological interventions for waking a patient do actually have statistical and clinical significance.

This conclusion was supported by the statistically significant shorter amount of time until eye opening (67 seconds), iGel removal (69 seconds) and duration of PACU stay (3.5 minutes) observed in the experimental name group. The experimental group also had significantly higher heart rates thus further supporting the conclusion that calling the patient's name may have facilitated emergence. There were no significant differences in the patient's recorded blood pressures and the time for BIS >60 did not differ between the two groups. From the results of this study, it is difficult to say whether a one minute decrease in the time for eye opening and iGel removal is enough to be clinically significant however one could argue that gaining the one minute per case would have clinically significant effects over the course of the day.

Jung et al. suggest that the reason for the significantly faster time to eye opening and iGel removal in the experimental group is due to the fact that the patients heard their own name upon waking. They support this fact by noting the strong similarities between the groups in terms of demographics and anesthetic techniques. There are no other well explained interpretations to the data. They also support their findings with the previous electrophysiology research involving sleeping and comatose patients being exposed to their own names[4, 5] and the thought that this would also apply to a general anesthetic.

Before accepting this information however, it must be recognized that this study has several limitations and leaves several unanswered questions. The authors of the study admitted that the investigation only looked at the clinical response to hearing one's own name and did not investigate any of the electrophysiological findings of hearing your own name during emergence from general anesthesia. They also rightly recognized that they only investigated women undergoing general anesthesia with propofol and remifentanyl and that different results may be obtained in men or with volatile anesthetics. It should also be recognized that the studied patients were all very healthy and alternate outcomes may be observed in individuals with multiple comorbidities. Additionally, the phrases were spoken directly to the patient through noise-cancelling headphones and different results may be obtained with different voice pitches and volumes and when words are spoken in the noisy operating room environment.

Based on these limitations, this research lends itself to future investigations that may include looking at EEG changes during emergence when hearing one's own name as well as repeating the research with different population groups and different anesthetic techniques. It is also of interest to see whether the same results are obtained when using nicknames, first names only or if the study is performed in languages other than Korean.

Applicability

After reading this study, it is clear that saying a patient's name during emergence may help facilitate their recovery from a general anesthetic. Although there were several limitations to this study and the results were only demonstrated in a very limited population, there are virtually no disadvantages to saying a patient's own name during emergence and because it is such an easy thing to do, one could argue that it is something that we should be doing to all patients for even the slightest potential benefit. Using the patient's own name also has the added benefit of helping to breed familiarity as a patient emerges from a general anesthetic in the unfamiliar operating room environment.

This information will hopefully help ensure that anesthesiologists continue to use patient's own names as they emerge from a general anesthetic and take the extra time to clarify the patient's name when they do not remember it. As I am currently so early on in my career, having this information now will hopefully help form a habit of using the patient's own name during emergence and will hopefully improve patient care and operating room flow.

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Critical Appraisal Essay – Emma Torbicki, PGY1

Publication Title: **Children and parental anxiolysis in paediatric ambulatory surgery: a randomized controlled study comparing 0.3 mg/kg midazolam to tablet based interactive distraction**

Authors: Marechal, C., Berthiller, J., Tosetti, S., Cogniat, B., Desombres, H., Bouvet, L., Kassai, B., Chassard, D., and de Quieroz Siqueira, M.

Pediatric perioperative anxiety is an issue commonly encountered in general anesthesiology practice which has implications not only on child and parent's satisfaction with the procedure, but can also impact the child's behavior following discharge home. There are currently very few evidence based methods of managing perioperative anxiety in children. The study discussed here, assessed an non-pharmacologic alternative to benzodiazepines for management of this common problem . The study was conducted at Hopital Femme Mère Enfant in Lyon, France by a team of anesthesiologists, pharmacists, and psychologists.

Introduction

Perioperative anxiety, and more specifically pre-operative anxiety, in children has been the subject of much research over the past two decades. Indeed, it is encountered so frequently that pediatric anesthesiologists have been shown to be more effective at predicting a child's level of anxiety at time of induction, than the child's parent . Research in this area has largely focused on pre-operative anxiety as a predictor of negative behavioural changes in the post-operative period1,2, , . Approximately 60% of children will experience post-operative behavioural changes such as nightmares, opposition to authority figures, fear of doctors, and separation anxiety1.

Stress and anxiety have been shown to have hormonal sequelae; serum levels of cortisol and epinephrine are increased, altering immune function and influencing post-operative morbidity and mortality , .

Pharmacologic interventions are the mainstay of treatment for managing children with preoperative anxiety. Benzodiazepines, particularly midazolam, are the most commonly used agent, though ketamine has been suggested as an alternative , . Such medications have associated risks, including increased sedation and paradoxical reactions. It would therefore be beneficial to identify an easily accessible non-pharmacologic method of mitigating preoperative anxiety in children. However research in this area has thus far been sparse .

In this study Marechal, et al. compared the efficacy of midazolam, the standard of care at the study hospital, and tablet computer games (TAB) in controlling perioperative anxiety of both children and parents at specific time points. If effective, TAB would provide a safe, effective, cheap method of managing perioperative anxiety in children.

Methodology

This was a prospective, randomized trial conducted at a tertiary care centre in France. Researchers were not able to be blinded due to the nature of the intervention and scoring methods used. Justification was based on the

negative sequelae of perioperative anxiety and the paucity of available treatments. The study was approved by the University of Lyon ethics committee. Informed consent was obtained from legal guardians prior to participation in the study. Assent was obtained from children over of the age of seven prior to participating.

Patients were included in the study if they were: children aged 4-10 years of both genders, undergoing general anesthesia for an ambulatory procedure, ASA I-III. The exclusion criteria were: age under 4 or over 11, pre-existing psychiatric disorder or intellectual disability, more than 3 previous operations, regular use of psychotropic medication, or refusal to participate. Children younger than 4 were felt not to be capable of interacting with the games effectively. It was not specified why children over the age of 10 were excluded, though it may have been a reflection of more adult coping mechanisms in this age group. The other exclusion criteria eliminate confounding effects of alternate medications, and mitigate the influence of prior experiences in the operating room on anxiety scores. Overall, the study population is representative of that encountered in Kingston.

Prior to enrolment, researchers conducted a feasibility study in order to determine the sample size needed to obtain a power of 80% with $P<0.05$ being significant. They based it around a 10 point difference in anxiety score at time of mask induction. Based on these calculations, they determined that a minimum of 53 patients were needed in each intervention group. Despite adequate enrolment however, the study was still underpowered as the real difference in anxiety scores was much smaller than the predicted 10 points.

The primary endpoint was the difference in modified Yale preoperative anxiety score (m-YPAS) score between midazolam and TAB groups at time of mask induction (time 3). The researchers also assessed differences in m-YPAS score on arrival to the ambulatory surgery ward (time 1), at separation from parent (time 2), and on return to the ambulatory surgery ward (time 4). Further outcomes were parental anxiety scores, satisfaction of parents and staff with anxiolysis, and patient behavior at home postoperatively.

Protocol

The researchers randomized participants into two groups using a computer generated list restricted by blocks of four. One group was assigned to receive 0.3 mg/kg of midazolam PO or PR 20-30 minutes before induction. The second group (TAB) was given an iPad 20 minutes before induction and asked to select an age-appropriate game to play while waiting. The children's anxiety was assessed by using the m-YPAS, a validated score , at 4 time points. Parental anxiety was assessed using the state-trait anxiety inventory (STAI), another validated anxiety scale . As parents were not permitted to accompany children into the operating room, nurses were asked to rate their satisfaction with the induction on a scale of 0 (not satisfied) to 10 (highly satisfied). Parents were also asked to rate their satisfaction with the perioperative experience on a 0-10 scale prior to discharge. The researchers also attempted to collect data regarding postoperative behavior changes using a non-validated scale.

All patients underwent mask induction on a 50/50 mixture of sevoflurane and nitrous oxide, and were maintained with sevoflurane. Analgesia was achieved using a combination of acetaminophen, NSAIDs, and nalbuphine. Patient in the TAB group were allowed to resume playing on the tablets in PACU once sufficiently awake.

The study does not provide quite enough detail of the methodology to be reproducible. No information regarding the nature of the games included in the study is provided. The researchers do not elaborate on how the games were selected, what sort of criteria were involved in selection, or which games were most popular with study participants. Additionally, while it is mentioned that two psychologists were involved in determining m-YPAS scores, it is unclear whether the psychologist was present through each child's hospital visit observing their behaviour, or whether surrogate personnel were used for data collection.

The study protocol is clinically relevant as it uses readily available interventions (midazolam and mobile game applications). One deviation from practice patterns in Kingston, was timing of parental separation. At our centre parents routinely accompany their child into the operating room, are present until the child is asleep, and are permitted in PACU in the early postoperative period. This study did not examine whether the anxiolysis obtained through the interventions studied was additive with parental presence.

Data Analysis

At the end of the study 58 patients were enrolled in the midazolam group and 60 patients were enrolled in the TAB group. Three patients in the midazolam group were excluded from data analysis; two had not actually received midazolam, and the third had received both midazolam and hypnosis. As such only 55 patients in the midazolam group were included in the statistical analysis.

Of the 55 patients in the midazolam group included in the analysis three met exclusion criteria: two had had more than 3 previous operations, and the third required an overnight stay in hospital.

Analysis was conducted on SAS software by an independent team using an intention to treat analysis. Student's t-test was used to compare quantitative variables between the two groups, and Fisher's exact t-test or the chi-square test was used for categorical variables.

Results

Baseline characteristics of the study participants, including type of surgery, are outlined in Table 1 of the paper. There was no difference in baseline characteristics between the two groups. Three patients were eliminated from the midazolam group, as outlined above. A further three patients in the midazolam group met exclusion criteria but were included in data analysis, possibly to avoid being under sample size necessary for adequate power.

The results are presented in a combination of easy to follow charts, tables, and figures. The main conclusion of the study was that there is no difference between midazolam and TAB on anxiolysis at time of mask induction: 40.5 (18.6) and 41.8 (20.7), P=0.99. No significant difference in anxiolysis was identified between the groups at the other time points measured.

Mean m-YPAS score was significantly lower in the TAB group, P=0.03. Parents and nurses both rated TAB as significantly more satisfactory than midazolam: 9.1 (1.5) versus 9.6 (0.7), P=0.04 for parents and 8.0 (2.3) versus 9.7(0.7) for nurses, P<0.0001. Postoperative behaviour questionnaire scores were not significantly different between groups.

Discussion

This study is a negative study. The researchers were unable to determine whether mobile game apps were more effective than midazolam at reducing anxiety in children in the perioperative period. The authors acknowledge the discrepancy between their result and that obtained by Seiden, et al10. They attribute it to their use of psychologists for m-YPAS scoring, rather than hospital personnel and to the exclusion of children under 4 years in whom the m-YPAS is less reliable.

The secondary outcome of mean anxiety score was shown to be significantly lower in the TAB group, and parent satisfaction was higher in the TAB group. Given this, it is possible that an adequately powered study would elucidate a difference in anxiolysis between midazolam and TAB. However parent satisfaction is biased in this trial as it is impossible to blind for TAB intervention, and the games facilitate interaction with the child during a stressful time.

Despite not demonstrating superiority to midazolam it is helpful to know that mobile game apps are effective at reducing anxiety perioperatively. The majority of pediatric patients in Kingston have parents with a tablet or smart phone containing games. Encouraging nervous parents and children to play while awaiting their procedure could be an effective nonpharmacologic management strategy.

Future directions of this research could include applicability to pediatric inpatients undergoing surgery, and efficacy of TAB for anxiolysis during minor procedures such as G-tube and IV insertion. It would also be interesting to assess whether patients managed with TAB had lower preoperative anxiety scores when undergoing a second surgery.

Applicability

This paper addressed a common issue in anesthesia: management of perioperative anxiety, specifically in the pediatric population. It demonstrated that nonpharmacologic interventions can be as effective as pharmacologic management, with fewer adverse effects. It also brought to my attention the longer term sequelae preoperative anxiety can have on pediatric patients and their families, which may affect their future interactions with healthcare.

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