MPOG Retreat

Friday, October 18, 2019 – Orlando, Florida

Attendance

- 105 Participants
- This activity offers up to 6.75 CME credits, of which 0.5 credits contribute the patient safety CME component of the American Board of Anesthesiology's redesigned Maintenance of Certification in Anesthesiology™ (MOCA®) program, known as MOCA 2.0®. Please consult the ABA website, www.theABA.org, for a list of all MOCA 2.0 requirements.

Introductions and State of MPOG: Dr. Sachin Kheterpal

- Achievements:
  - 12 million patient records extracted, mapped, de-identified and available for research and quality improvement including 24 billion vital signed for these patients
  - Over 3,500 providers receiving feedback e-mails
  - MPOG contracts established at all contributing centers
  - Financial diversity including grants, MOCA, BCBSM, NIH and MPOG Contracts
- Research
  - Publications in JAMA
  - Publication committee reviewers across the country
  - First IMPACT (pragmatic trials) attempted at Vanderbilt
  - Dozens of manuscripts in accepted, in review or manuscript writing phase
- Quality Improvement
  - Impact beyond MPOG sites
  - New implementation tools
  - Measure advancement
  - National impact for >3,500 providers
- Technical Upgrades
  - New data types in production including, PACU, surgical registry, CMS national data, and Blinded record index
  - DataDirect 2.0
  - Application Suite with brand new case viewer

Panel: Perspectives on Multicenter Pragmatic and Observational Research from Journal Leaders – Drs. and Evan Kharash Hugh Hemmings, Jr.

Evan Kharasch - Anesthesiology

- *Anesthesiology* journal value proposition – develop trusted, credible evidence, and translate scientific discovery into clinical practice:
  - Transparency of reporting
  - Peer Review
  - Richness of content, Soundness of results, Validity of Conclusions
  - Reach and Readability
- Considerations for high-quality observational research

  - Analysis plan – in many cases, it is appropriate for analytic plan to be pre-specified prior to accessing data. In *Anesthesiology,* an explicit statement as to whether analytic plan was developed prior to data accessed, is now required for publications.
  - Pre-registration
  - STROBE guide
- What content is important to readers
  - Title and Abstract – as these are what the vast majority of readership will limit their reading to
  - What is removed – narrative, false precision, non-standard abbreviations, and spin

Hugh Hemmings – British Journal of Anesthesia

- National Audits (NAP) – key type of observational Research available in BJA; useful for reporting rare catastrophic events/outcomes
- BJA approach to retrospective analyses of large datasets
  - Move towards reporting of pre-specified analytic plan
  - Mandate STROBE guidelines to be followed, with checklist submitted
- Recent exemplary observational studies in BJA:
  - Provider volume and perioperative outcomes in total joint arthroplasty surgery
  - Deep-learning models for predicting 30-day postoperative mortality

Open Discussion

- *What needs to be valued/improved in core clinical journals going forward?*
  - Peer review – critical to credibility of scientific publications
  - Challenged by predatory journals, pre-prints, and incentives for reviewers
    - Incentivizing peer review – challenging to do; can subscribe to Publons, however ultimately comes down to individual motivation, departmental support through incorporating into promotion process

Environmental Impact of Anesthesia – Dr. Jodi Sherman

- Global warming will be the defining health concern of the 21st Century. 95% of inhaled anesthetic gases are vented out of the hospital roof and is destroying our ozone layer.
  - Evidence already seen in rising sea levels, increased CO2 levels, and more extreme weather.
  - Likely to see increase of average temperatures by 1.5 degrees Celsius by the year 2030.
- Pollution is a leading cause of non-communicable disease/deaths and disproportionately affects poor countries.
  - New patient safety movement is pollution prevention and we need to consider all areas of greenhouse gas (GHG) emissions
  - Healthcare is ranked 13th in the world for producing greenhouse gases and contributes 4.6% of global total GHG emissions.
- Considerations when forming the anesthetic/surgical plan for your patient:

    - Propofol does not contribute to GHG emissions or is marginal in impact
    - Desflurane is the most harmful anesthetic gas. Yale was the first hospital to eliminate this gas specifically in regards to protecting the environment.
    - Sevoflurane use increased however, this institution saved 1.2 million dollars across the health system per year by eliminating desflurane drug and vaporizers
    - "Yale Gassing Greener" phone app calculates the environmental impact you are having based on gas/flow used
        - 1 MAC hour administering 6.7% Desflurane at 0.5 L/min produces an equal amount of GHG emissions as driving a car 93 miles.
    - Surgical approach can also determine the amount of GHG emissions released during a procedure
        - Choosing single use instruments versus using instruments that are re-used after sterile processing creates more GHG emissions
        - Using a simple surgical approach leads to shorter procedure duration requires less anesthetic gas administration which decreases the amount of GHG emissions
- Feedback on environmental sustainability metrics to institutions and providers: scaling up practice improvement
    - SUS 01: Percentage of cases with mean fresh gas flow ≤ 3 L/min, during administration of inhaled anesthetics
    - Individual feedback reports, incentivize providers financially, educational campaigns, provide point of care information (i.e. dollars saved and GHG emissions produced during case)
- What's Next for sustainability metrics?
    - Real time decision support in the form of AIMS alerts when fresh gas flow exceed 1 L/min
    - CMS Pay for performance accountability
    - Feedback reports for other drugs: drug waste and overdosing impact on GHG emissions

Econometrics for Anesthesiologists – Dr. Eric Sun

- Why do we care about retrospective studies?
    - It comes down to what question you're trying to ask and the benefits and biases of the other options
        - Clinical trials have great internal validity, but are subject to issues with:
            - External validity due to population differences between the study group and the real world
            - Selection bias since those who enroll in a study may be inherently different from those who do not enroll

        - The goal of RCTs to limit effects of the real world to eliminate potential confounders also limits the potential for extrapolation of the results back to the real world environment
    - Retrospective trials may be a better representation of the "real world" in these respects, what matters is identifying and handling biases and limitations
- Confounders and biases are always present:
    - Confounders are observed, correlated variables and factors that must be taken into account
    - Biases are related variables and factors but are unobserved and unaccounted for
        - Address bias by controlling for it, or eliminating it
- There are costs of dealing with bias:
    - Controlling for bias changes the effective sample size, since the sample size is now driven by rarer occurrences or exceptions to the rule
    - Controlling also may detract from statistical power
- Controlling for bias in the context of the known knowns, known unknowns, and unknown unknowns:
    - Control or adjust for observable characteristics like age, sex, etc.
    - The richness of MPOG helps with fixed effects of physician or institutional practice patterns for example; helps control for the known unknowns
    - Quasi-randomization can be used by identifying instrumental variables or something that affects whether you get a certain treatment but has little effect on the outcomes such as the near random assignment to any given OR, time of case, or random daily variation of type of in-room anesthesia provider; all of which can be found in MPOG data
    - Regression discontinuity can be used by exploiting an arbitrary cut off found in the data to examine treatment effects, for example a platelet threshold for nerve block placement
- In summary:
    - Retrospective analyses add tremendous value if you can appropriately deal with bias
        - Adjust for potential confounders
        - Exploit quasi-randomization and regression discontinuity using the richness of MPOG data across many institutions

Best of MPOG Abstracts

- **Dr. Patrick McCormick –** Improved Compliance with Anesthesia Quality Measures After Implementation of Automated Monthly Feedback
    - Memorial Sloan Kettering was founded in 1884. In 2017, they were the first cancer center to contribute to MPOG and ASPIRE. They perform over 50,000 anesthetics per year, with 60 faculty attendings and 120 CRNAs. They perform all types of surgery except OB, trauma, cardiac and transplant.

- To implement ASPIRE they presented ASPIRE to the clinical providers
  - Background on ASPIRE program
  - Providers were to receive monthly feedback e-mails
  - Results were not punitive but for quality improvement
  - Memorial Sloan used a subset of ASPIRE measures that were most meaningful to the institution
  - They noted a surprising increase in compliance after these monthly emails were being sent.
  - Published results in Journal of Oncology Practice in June 2019
- Lessons Learned:
  - Reinforcement is difficult
  - Regular turnover with CRNAS, so training must be part of the new hire process.
- Decision support helps
- Still struggling with two issues: Core temp during GA with LMA remains difficult and PONV problem with giving steroids to immunotherapy patients can be harmful. This issue is ongoing and they are working with the oncology doctors to find the best way to treat these patients.
- Questions and Answers:
  - Q: Dr. Kurnz (sp?) from Cleveland Clinic. Why did you choose the way you introduced the measures?
  - A: We chose the Big Bang approach and introduced them all, but we did emphasize some more than others, i.e. hypoglycemia due to their institutions strange diabetes policy.
  - Q: Ben Cloyd, University of Michigan. Were financial incentives offered when this was rolled out?
  - A: No incentives are tied to improved compliance. They do get to claim MOCA credit.
  - Q: Someone from MD Anderson. He stated they were new to MPOG and wondered if Dr. McCormick thought it would be worthwhile to get input from other cancer centers?
  - A: Dr. McCormick stated this happens for many different subpopulations. These quality measures are more useful when they can be applied to a broad rule. It doesn't work well when a quality measure if just for one or two institutions.

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- **Dr. Eric Sun –** Associations of Overlapping Surgery with Peroperative Outcomes
    - Study: Association of Overlapping Surgeries with Perioperative Outcomes, Eric Sun et al. JAMA 2019
        - https://jamanetwork.com/journals/jama/fullarticle/2725689
        - Introduction:
            - Key to distinguish between overlapping vs. concurrent
                - Overlapping – when the cases may be occurring at the same time, but no key portions are actually overlapping, for this study, they defined this as, "2 operations performed by the same surgeon in which 1 hour of 1 case, or the entire case for those lasting less than 1 hour, occurs when another procedure is being performed"
            - Concurrent – key portions are also overlapping, this is not reimbursed by Medicare or Medicaid
        - This study examined overlapping surgeries at MPOG centers to determine the association between overlapping surgery and mortality, complications, and length of surgery
        - The novel aspect of this study compared to previously published data on this topic is that this was a multicenter study and the data was available in MPOG to answer this refined question
            - MPOG allowed for a multicenter assessment of surgical times, surgeon ID, data on outcomes and data for risk adjustment
            - This was challenging at points since all data is not 100% reported consistently across institutions, which did decrease the total number of institutions with viable data and the types of cases
        - Final study size: 66,430 cases with 8,224 cases overlapping
    - Results:
        - No significant difference in in-hospital mortality or postoperative complication rates was seen with overlapping surgeries for the primary analysis of all cases combined
        - Overlapping surgery was significantly associated with increased surgery length across the cohort

      Subgroup analyses did show an increase in mortality and complications associated with overlapping cases for CABGs and high
    - Questions:
        - How did you capture the 3-month data?
            - Each participating institution had resources to conduct 3-month follow-up
        - Did you ask why the patients are using opioids?
            - Selected for patients undergoing major operations

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- **Dr. David McIllroy** – Interoperative Fraction of Inspired Oxygen and Postoperative Outcomes
  - Background and rationale for study:
    - Oxygen is most common drug administered in the perioperative period
    - Goals of supplemental O2 administration
      - Protection from Hypoxia during surgery
    - Broad Objective: to inform debate on supplemental O2 administration
    - Specific Aims:
      - Explore the association between Intraoperative O2 delivery and adverse perioperative outcomes
      - Generate preliminary data to support funding for clinical trial testing the impact of strategies
      - Vet MPOG centers for quality/completeness of current data
    - Primary hypothesis: Excess (modifiable) intraoperative oxygenation is associated with postoperative organ injury
  - Study design
    - Multicenter observational cohort study
    - Inclusion: adults, duration of surgery > 120 minutes, GA-ETT
    - Exclusion: outpatient surgery, pregnant, jet ventilation, airway surgery, one-lung ventilation, intraoperative desaturation (SpO2 < 90% for => 3 minutes
    - Exposure variable: oxygen exposure (AUC_{FiO2})
    - Co-primary outcomes:
      - AKI defined by KDIGO
      - MINS
    - Secondary outcomes: 30D mortality, acute lung injury, etc
    - Statistical analysis plan: multivariate analysis with planned sensitivity analyses
    - Limitations: ascertainment bias: the same factors that led to higher FiO2 administration lead to higher complications
  - Execution (and challenges):
    - Challenges:
    - Identifying study cohort with existing MPOG variable structure
    - Inconsistent methods by centers of providing data to MPOG
    - Understanding and handling of missing data
    - Identifying and handling data that is inconsistent with dictionary definition (eg: in-hospital mortality)
    - Using outcomes such as troponin (varied ULN, changing assays)
  - Preliminary results:
    - All data: 4,576,464 → study population: 354,010
    - Median FiO2 administered per case: 50-55% with rightward tail
    - Different centers have different practice patterns
    - Primary outcome (AKI): No AKI (48.7),
    - Dose dependent response between oxygen exposure and AKI

- Future Plans:
  - Complete data cleaning and analysis
  - Manuscript preparation (Anesthesiology)
  - Pragmatic clinical trial informed by current data

QI Updates – Dr. Nirav Shah

- Welcome to new sites! Contact Nirav Shah (nirshah@med.umich.edu), Kate Buehler (kjbucrek@med.umich.edu), or Meridith Bailey (meridith@med.umich.edu) if interested in joining MPOG
- Current MPOG Landscape: Lots of Variation across sites
  - Duration of participation- varies from 0-10 years amongst sites
  - Existing Departmental QI Infrastructure- some only have MPOG, others have robust anesthesia QI program internally
  - Relevance of Measures
  - Departmental Support for MPOG
  - Emails/No Emails
  - MOCA/No MOCA
- New Measures
  - SUS 01: Significant variation across MPOG sites, room for improvement, many sites not working on SUS 01 improvement yet
  - BP 03: MAP <65 for 15 minutes or more reflects current practice better than BP 01; same inclusion/exclusion criteria as BP 01
  - PONV 03: Documented Occurrence of N&V or antiemetic in PACU; need sites to submit PACU data to participate
  - TOC 01: Intraop handoff measure examining the % of cases in which handoff occurred between in-room providers
- New Phenotype: CPT Prediction
  - Phenotype generated in anesthesia code based on procedure text & machine-learning algorithms
  - Enables more accurate inclusions and exclusions for ASPIRE measures
- New Partnerships with Michigan Society of Anesthesiologists, Michigan Association of Nurse Anesthetists, and Michigan Surgical Quality Collaborative to reach sites outside of MPOG within Michigan
- MQUARK: 2000 PACU audits to date across 20 sites; ready for new projects and analyses using MQUARK tool
- Surgical Site Infection Toolkit released; third MPOG toolkit now available
- MOCA Part IV
  - 350 providers now participating
  - Up to 25 points can be earned within 12 months of attestations

  - Click MOCA button in emails to attest to reviewing cases
  - MPOG submits data to ABA
- Future Measure Development
  - Focus on measures that need to be addressed at a system level
  - Evolve our attribution philosophy from 'failed' to 'flagged' cases for review
  - No longer must adhere to MIPS standards
  - Areas of Focus for new measures
    - Hypotension
    - Sustainability (Continued…)
    - Respiratory Management: Sugammadex
    - Transfusion Management extending into PACU
    - Glycemic Management
- Dashboard 2.0
  - Goals: Flexible, Visually interesting, Links to other MPOG Applications such as Data Direct, Phenotype Browser, Measure Specifications
- Measure Maintenance
  - Every 3 year review to assess need to retire, maintain, or update measures
  - Review specifications
  - Examine relevance
  - Make recommendations for measure modifications
- October 2019 Upgrade
  - Case Viewer 2.0 released: updated version of Case Viewer now available through the application suite. Improved formatting to handle preop/PACU data
  - DataDirect 2.0: Improved functionality of Data Direct with step-by-step instructions to guide users through query development
- Renew Pediatric and OB Subcommittees
  - Partner with specialty organizations
  - Identify peds/OB champions for newer sites
  - Build measures/tools for the subspecialties
  - Recruit pediatric hospitals
- Feedback Emails
  - Submitting grant to study effectiveness of email design, tailored messaging
- Things we've learned:
  - Need to adapt and listen to stay relevant
  - Need feedback from sites/providers
  - Stay nimble
  - Take calculated risks
  - Need new ideas

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Potential for Novel Pragmatic Clinical Trial Design – Dr. Jessica Spence

- Described the QA and QI programs within the anesthesia department of Michigan Medicine
- Explained out ASPIRE metrics and reporting are incorporated into the QI process: failed cases reviewed by Quality Champion and ACQR using review template. Subset of cases sent for additional review by departmental Patient Safety/QI Committee.
- A few ASPIRE metrics have been included in the OPPE reports for the anesthesia department: PUL 01, NMB 02, TEMP 03

- When choosing metrics for use in OPPE, need to ensure the measures meet the following criteria:
    - Relevant to clinical practice
    - Objective criteria to determine good vs. bad performance
    - Include a meaningful sample size
    - Reported frequently
    - High level of compliance

Errors in Academic Publications – Statistical Discussions – Dr. Tim Houle

- Statistical Methods with Inherent Reporting Challenges
    - **Propensity** – model specification & diagnostics
    - **Matching** – methods, algorithm, and software used
    - **Model** – specification, distribution, interaction, calibration
- Most common errors in academic publications
    - **Typographical errors/copy-paste**
    - **Data-driven confounder selection** – don't use stepwise variable selection
    - **Underdeveloped multiple imputation models** – "We used MI to replace missing data"
- Measurement Errors
    - Mismeasurements/misclassifications of all kinds
        - Mistaken entries
        - Inaccurate recordings
        - Imperfectly reliable measurements
    - Types of Measurement Error
        - Classical: Observed = True + Error, Error is normally distributed
        - Systematic: Observed = True + Bias + Error Bias = constant, error is normally distributed
        - Differential: Error dependent on the outcome
        - Berkson: Observed = True + cluster-specific (e.g. site) error/bias

- 5 Myths of Measurement Errors
  1) Measurement error can be compensated by large numbers of observations
  2) The exposure effect is underestimated when variables are measured with error
  3) Exposure measurement error is nondifferentiable if measurements are made without knowledge of outcome
     a. *Example:* Case-control studies – cases attend more to the existence of an exposure (patient is sick → will more closely monitor their own health than healthy patient)
  4) Measurement error can be prevented but not mitigated in observational data analysis
  5) Certain types of observational research are unaffected by measurement error

Take-Home Points

- Measurement error is nearly ubiquitous in observational data
  - Should address in methods section of manuscript
- Measurement error can have a counter-intuitive impact on observed associations
  - Must consider structure AND degree
- Strongly consider the use of formal strategies to mitigate error
  - Conduct validation efforts
  - Utilize formal statistical methods

Postoperative Delirium– Dr. Deb Culley

- Who's at risk and how to predict postoperative delirium?
- Risk Factors for Postop Delirium
  - Patient Factors: Age, pre-existing cognitive impairment, genotype, depression, sensory deficits
  - Surgical Factors: type of procedure- ortho, cardiac, major vascular & thoracic, emergency
  - Medical Factors: Fever, electrolyte imbalance, AF, Frailty
  - Physiologic Factors: Hypotension, Low SaO2, Hct, albumin
  - Pharmocologic Factors: Propofol, neuroleptics, medication history, anticholinergics, ketamine
- Vulnerability factors vs. Precipitating Factors: need to take both into account to determine risk
- Delirium incidence in geriatric patients: 15-60%
- Preoperative cognition predicts delirium:
  - Culley DJ, et al. Poor Performance on a Preoperative Cognitive Screening Test Predicts Postoperative Complications in Older Orthopedic Surgical Patients. Anesthesiology. 2017 Nov;127(5):765-774. Jones RN, et al. J Geriatr Psychiatry Neurol 2016; 29:3320-27
- Preoperative Frailty predicts delirium: Brown CH IV, et al. Anesth Analg 2016; 123: 430-35
- Electronic prediction rules built into the EHR and machine-learning can estimate delirium risk and apply multicomponent approaches to prevent delirium: Oh, ES, et al. JAMA 2017; 121: 318: 1161-74