For this child, at this particular moment, how much anaesthesia should I give? Determining drug requirements in paediatric anaesthesia is challenging, as children can have a more variable response to drugs compared to adults, depending on their age, developmental stage, co-morbidities, and neurodevelopmental status. The brain is the primary site of action for sedative-hypnotic drugs, yet it is not routinely monitored during general anaesthesia or sedation in children. This is likely due to the fact that until recently, physiologically principled approaches for anaesthetic brain monitoring have not been well articulated. Our knowledge of anaesthetic brain mechanisms has developed rapidly in recent years. We now know that anaesthetic drug effects that are clearly visible in the electroencephalogram (EEG) reflect underlying anesthetic pharmacology and brain mechanisms, in both adults and children. Recent clinical data have shown that anaesthesia-induced isoelectric events are prevalent in children receiving general anaesthesia. Anaesthesia-induced isoelectricity is a state of oversedation beyond what is required to maintain unconsciousness, suggesting that current models of anaesthetic management often predispose children to oversedation.

In this workshop, we will illustrate how EEG monitoring can be used to guide anaesthetic management in paediatric patients and improve patient safety. We will begin by reviewing how drug-specific and dose-dependent EEG signatures seen in adults are visible in children and infants, including those with neurodevelopmental disorders. We then discuss the clinical evidence that the existing model of anaesthetic dosing in children, which does not use the EEG, leads to unnecessarily deep anaesthesia. We will discuss the practical aspects of EEG monitoring in paediatric anaesthesia, including its applications and limitations, as well as how to troubleshoot problems during monitoring. Finally, we review detailed case studies which illustrate how the EEG can be used to guide anaesthetic management and enhance patient safety.

1. Understand age-dependent changes in anaesthesia-induced brain activity in infants and children, and how this activity relates to development of underlying brain circuits.
2. Understand the prevalence of isoelectric events in infants and young children undergoing general anaesthesia and how to identify and prevent these.
3. Understand the practical applications and limitations of EEG monitoring.
4. Understand how EEG monitoring can be used to guide anaesthesia care in infants and children.

Monitoring EEG in Paediatric Anaesthesia

Patrick Purdon, United States

Monitoring EEG in Paediatric Anaesthesia

Choon Looi Bong, Singapore
Session Date/Time: Monday, March 4, 2024  -  08:00 - 09:00

Nicoll 2 (Level 3)

Technology, Pharmacology & AI: New Paradigms in Pharmacology

This session will explain the background behind two current controversies in anaesthetic pharmacology.

1. Why do some studies appear to show that increasing the dose of anaesthetic does not correlate with increasing effect.
2. Is the concentration of anaesthetic directly related to the effect, or is there some delay or lag in effect depending on whether one is increasing (onset) or decreasing (offset) the concentration.

08:00  Chair: Session Introduction
Michel Struys, Netherlands

08:02  When More Drug Causes Less Effect - The Drug Titration Paradox
Talmage Egan, United States

08:24  Is "Waking Up" the Reverse of "Falling Asleep"? Neural Inertia and Anaesthesia Hysteresis
Jamie Sleigh, New Zealand

08:46  Questions and Answers

Session Date/Time: Monday, March 4, 2024  -  09:00 - 10:00

Nicoll 2 (Level 3)

Technology, Pharmacology & AI: Updates in Anaesthetic Pharmacology

This session will provide updates on some current areas of anaesthetic pharmacology. Understand the current role of remimazolam in anaesthetic practice. Understand some of the recent controversies regarding sugammadex, and neuromuscular monitoring.

09:00  Chair: Session Introduction
Jin Liu, China

09:02  Sugammadex & Neuromuscular Monitoring
Lars I. Eriksson, Sweden

09:14  Remimazolam
Kenichi Masui, Japan

09:26  Ciprofol (HSK3486)
E Wang, China

09:38  Mindreading for Anaesthesiologists: The Action of Volatile Anaesthetics on Creatures with Simple Brains
Christopher Connor, United States

09:50  Questions and Answers

Session Date/Time: Monday, March 4, 2024  -  11:40 - 12:40

406 (Level 4)

Technology, Pharmacology & AI: Drug Innovation
This session will discuss two innovations in anaesthetic pharmacology - the development of new anaesthetic drugs by structural modification, and the use of Artificial Intelligence in modeling drug behaviour.

11:40    Chair: Session Introduction
         Tony Gin, Hong Kong

11:42    Anaesthetic Drug Innovation and Development: Present and Future in China
         Jin Liu, China

12:04    Application of AI Models to Drug Behavior
         Steven Shafer, United States

12:26    Questions and Answers

Session Date/Time: Monday, March 4, 2024  -  14:00 - 15:30
MR 333 (Level 3)
Technology, Pharmacology & AI Workshop: Monitoring Neuromuscular Block
Workshop Fee: 10 USD

This workshop will provide state-of-the-art knowledge on neuromuscular monitoring during all phases of neuromuscular block, that is during onset, deep and shallow block, and finally how to assess return to normal neuromuscular function to avoid residual neuromuscular block. The objectives are to review the basic principals, routine applications, common pitfalls and recommendations for routine use of neuromuscular monitoring in the perioperative period.

    Monitoring Neuromuscular Block
    Lars I. Eriksson, Sweden

Session Date/Time: Monday, March 4, 2024  -  14:00 - 15:30
MR 334 (Level 3)
Technology, Pharmacology & AI Workshop: Simulation-Based Workshop to Understand Anaesthetic Drug Interactions
Workshop Fee: 10 USD

The workshop will provide hand-on instruction in the use of free open source web based pharmacokinetic / pharmacodynamic simulator programs. At a minimum, the program will teach the use of stanpumpR (see https://stanpumpR.io). Other programs may be added depending on accessibility, function, and open-source availability. Participants are encouraged to bring their own laptops.

1. Understand the basis of pharmacokinetic and pharmacodynamic models, including how “best in class” models are selected.
2. Understand how to model multiple drugs, both in advance of providing anaesthesia care and in real-time during the course of anaesthesia.
3. Understand the ability of such models to incorporate drug interactions.

    Simulation-Based Workshop to Understand Anaesthetic Drug Interactions
    Steven Shafer, United States

    Simulation-Based Workshop to Understand Anaesthetic Drug Interactions
    Pamela Flood, United States
Classically, drug administration in anesthesia is done on a "weight" base which can induce errors in drug dosing. More sophisticated methods taking into account more precise demographic patient characteristics can be helpful to optimize drug administration, certainly in frail patients.

**Drug Dosing**

*Michel Struys, Netherlands*

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**Learning Objectives:**

1. Describe the advantages of gaining access to the circulation via the lung for drug administration.
2. Define the term posology and understand how posology is different in anaesthesiology compared to other medical disciplines.
3. Explain how a surfing analogy can be helpful in understanding an approach to optimising anaesthesia posology.
4. Distinguish the three different practice domains for intravenous anaesthesia (i.e., dose, concentration, and effect).
5. Explain how pharmacokinetic-dynamic models are applied to the clinical realm through simulation.
6. Analyze the key kinetic-dynamic attributes of common total intravenous anaesthesia drugs (e.g., bolus front-end kinetics, infusion back-end kinetics, propofol Cp50 reduction by opioids, etc.).
7. Appraise how propofol and opioid kinetic simulations can inform anaesthesia posology decisions.
8. Describe some clinical tips and tricks for optimising total intravenous anaesthesia.
9. Explain how a target controlled infusion system is different than using a standard calculator pump.

**A “Fireside Chat” about Total Intravenous Anaesthesia: Theoretical and Practical Considerations**

*Talmage Egan, United States*

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The workshop will provide hand-on instruction in the use of Keras to program neural networks. Course instruction will be in...
the R programming language, or on Python using the Google Colab notebooks. Participants are encouraged to bring their own laptops.

1. Understand the basic building blocks of neural networks.
2. Understand the fundamental steps of neural network parameter estimation and validation.
3. Understand the Keras commands associated with each step.
4. Understand the application of RStudio / R for basic neural network creation, and Google Colab / Python for creation of more complex neural networks.

**Coding Neural Networks with Keras**

*Steven Shafer, United States*
PROGRAMME

Tuesday, March 05, 2024

Session Date/Time: Tuesday, March 5, 2024  -  08:30 - 09:30
MR 331 (Level 3)
Technology, Pharmacology & AI: Artificial Intelligence Live: Anaesthesia Q&A with a ChatBot
The panel will in real time ask anaesthesiology related questions to a ChatBot and discuss the implications of the answers for the speciality. The audience will also be invited to submit questions that the panel will also ask the ChatBot.

Chair: Session Introduction
Steven Shafer, United States
Panel Discussion
Pamela Flood, United States
Panel Discussion
Valentina Bellini, Italy
Panel Discussion
Elena Bignami, Italy

Session Date/Time: Tuesday, March 5, 2024  -  13:00 - 14:00
MR 331 (Level 3)
Technology, Pharmacology & AI: Artificial Intelligence and Image Processing
This session will explore the use of Artificial Intelligence to assist image processing. Understand the role of Artificial Intelligence in remote photoplethysmography, ultrasound imaging, and facial and airway recognition.

13:00 Chair: Session Introduction
Maxime Cannesson, United States
13:02 Remote Photoplethysmography
Laleh Jalilian, United States
13:34 Facial and Airway Recognition
Clyde Matava, Canada
13:50 Questions and Answers

Session Date/Time: Tuesday, March 5, 2024  -  14:00 - 15:00
MR 331 (Level 3)
Technology, Pharmacology & AI: Artificial Intelligence and Predictive Analytics
This session will cover how Artificial Intelligence has been used to predict events and outcomes in perioperative care, with detailed analysis of this application for patient blood management and in sepsis.

14:00 Chair: Session Introduction
Valentina Bellini, Italy
PROGRAMME

14:02  AI in Perioperative Care
   Elena Bignami, Italy

14:18  Patient Blood Management
   Jens Meier, Austria

14:34  AI in Sepsis
   Matthieu Komorowski, United Kingdom

14:50  Questions and Answers

Session Date/Time: Tuesday, March 5, 2024 - 15:30 - 16:30

MR 320 (Level 3)

Technology, Pharmacology & AI: Artificial Intelligence and Control Systems

This session will explore how Artificial Intelligence can be used to control drug administration. Understand how AI can assist the control of blood pressure in obstetric spinal anaesthesia. Understand how AI has been used to automate drug administration for anaesthesia. Understand the technical and regulatory requirements governing the implementation of control systems in anaesthesia.

15:30  Chair: Session Introduction
   Christopher Connor, United States

15:32  Personalised Blood Pressure Control in Obstetric Spinal Anaesthesia
   Vesela Kovacheva, United States

15:48  Automation of Drug Administration
   Michel Struys, Netherlands

16:04  Prerequisites for Safe and Secure AI Control of Anaesthesia
   Michael Wilkening, Germany

16:20  Questions and Answers

Session Date/Time: Tuesday, March 5, 2024 - 16:30 - 17:30

MR 320 (Level 3)

Technology, Pharmacology & AI: Artificial Intelligence and Healthcare Systems

This session will explore some examples of Artificial Intelligence and Big Data being used in healthcare. Appreciate the use of Big Data to improve perioperative care. Understand how AI is affecting Hospital Management. Understand the potential use of AI to improve Operating Room logistics. Understand some of the ethical and legal considerations with the use of Artificial Intelligence in Healthcare.

16:30  Chair: Session Introduction
   Michel Struys, Netherlands

16:32  Big Data in Perioperative Care
   Vesela Kovacheva, United States

16:56  AI and Hospital Management
   Alex Sia, Singapore
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<td>Valentina Bellini, Italy</td>
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<td>Ethical and Legal Considerations with AI</td>
<td>Elena Bignami, Italy</td>
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PROGRAMME

Wednesday, March 06, 2024

Session Date/Time: Wednesday, March 6, 2024  -  08:30 - 09:30
Nicoll 2 (Level 3)
Technology, Pharmacology & AI: Cardiovascular Technology
This is an update and review of the current technologies available for hemodynamic monitoring. Understand the latest
technology for monitoring cardiac output and oxygenation. Understand the current technology for predicting and managing
hypotension and fluids.

08:30  Chair: Session Introduction
Choon Looi Bong, Singapore

08:32  Advanced Cardiac Output and Oxygenation Monitoring
Thomas Scheeren, Germany

08:56  Closed Loop Fluid Management and Hemodynamic Optimisation Systems
Maxime Cannesson, United States

09:20  Questions and Answers

Session Date/Time: Wednesday, March 6, 2024  -  09:30 - 10:30
Nicoll 2 (Level 3)
Technology, Pharmacology & AI: Neurological Monitoring
This session explores recent advances in EEG monitoring. Understand recent research using AI in the use of EEG for
monitoring sedation. Understand recent attempts to reveal the Bispectral Index algorithms by reverse engineering.
Understand some of the differences in interpretation of the EEG in paediatric and geriatric patients.

09:30  Chair: Session Introduction
Jamie Sleigh, New Zealand

09:32  AI and EEG for Monitoring Sedation Level
Sowmya Ramaswamy, Australia

09:48  Reverse Engineering the Bispectral Index
Christopher Connor, United States

10:04  Monitoring EEG in Paediatric and Geriatric Anaesthesia
Patrick Purdon, United States

10:20  Questions and Answers

Session Date/Time: Wednesday, March 6, 2024  -  09:45 - 11:15
MR 325 (Level 3)
Technology, Pharmacology & AI Workshop: Starting to Use AI
Workshop Fee: Complimentary
The workshop will address the transformative field of Artificial Intelligence (AI) in Anaesthesiology and Critical Care. The
workshop aims to elucidate the basic principles of supervised learning, focusing on the intricacies of data preparation,
including the management of missing values using imputation techniques, inconsistency detection, and others.
Attendees will have the opportunity to participate in a live demonstration of an AI pipeline with the deployment of a predictive model. Through this demonstration, participants will gain practical insights into the application of supervised learning techniques, providing a comprehensive understanding of how AI can be effectively integrated into the field of anaesthesia and intensive care.

This workshop aims to stimulate discussion on the evolving role of AI in optimising patient care and clinical decision-making in anaesthesia and critical care. It will provide a basic insight into an AI pipeline and does not require prior field knowledge. The AI pipeline will be demonstrated only using open source software using the statistical language R.

1. To understand the differences of the three modalities of machine learning: supervised, unsupervised and reinforcement learning.
2. To demonstrate the necessity of data preparation including exploratory data analysis, handling of missing data and understanding the categories of data.
3. To understand the main parts of an typical AI pipeline: splitting the data in a training-, validation- and test-set; training the model; making predictions; evaluation of the quality of the predictions.
4. To demonstrate some pitfalls in machine learning like overfitting, asymmetrical problems, etc.

Starting to Use AI

Jens Meier, Austria

Session Date/Time: Wednesday, March 6, 2024 - 11:15 - 12:15
MR 320 (Level 3)

Technology, Pharmacology & AI: Technology for the Future

Understand the potential applications of 3D printing in anaesthesia. Understand the possible advances and advantages of virtual reality and remote monitoring. Understand the challenges regarding anaesthesia and surgery during interplanetary spaceflight.

11:15 Chair: Session Introduction
Maxime Cannesson, United States

11:17 3D Printing Applications
Ruth Shaylor, Israel

11:32 Virtual Reality and Remote Monitoring
Laleh Jalilian, United States

11:47 Anaesthesia and Surgery during Interplanetary Spaceflight
Matthieu Komorowski, United Kingdom

12:02 Questions and Answers