

**PROGRAMME****Technology, Pharmacology & Artificial Intelligence****Sunday, March 03, 2024****Session Date/Time: Sunday, March 3, 2024 - 15:30 - 17:00**

MR 333 (Level 3)

**Technology, Pharmacology & AI Workshop: Monitoring EEG in Paediatric Anaesthesia**

Workshop Fee: 10 USD

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 anaesthetic 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*

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### Monday, March 04, 2024

**Session Date/Time: Monday, March 4, 2024 - 08:00 - 09:00**

405B (Level 4)

#### **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 **Questions and Answers**

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

405B (Level 4)

#### **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**  
*Liu Jin, China*

09:00 **Chair: Session Introduction**  
*Jin Liu, China*

09:02 **Sugammadex & Neuromuscular Monitoring**  
*Stephan Thilen, United States*

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**

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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.

### **Anaesthetic Drug Innovation and Development: Present and Future in China**

*Liu Jin, China*

11:40 **Chair: Session Introduction**

*Tony Gin, Hong Kong, China*

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 - 15:00**

Exhibition Hall

#### **Technology, Pharmacology & AI E-Poster Presentations: Basic Science**

All E-Posters will be showcased through a live 6-minute in-person presentation.

#### **Poster Moderator**

*Liu Jin, China*

#### **Poster Moderator**

*E Wang, China*

### **Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

#### **Technology, Pharmacology & AI E-Poster Presentations: Cardiovascular Technology**

All E-Posters will be showcased through a live 6-minute in-person presentation.

#### **Poster Moderator**

*Monty Mythen, United Kingdom*

#### **Poster Moderator**

*Matthieu Komorowski, United Kingdom*

### **Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

#### **Technology, Pharmacology & AI E-Poster Presentations: Equipment**

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All E-Posters will be showcased through a live 6-minute in-person presentation.

**Poster Moderator**

*Maxime Cannesson, United States*

**Poster Moderator**

*Laleh Jalilian, United States*

**Poster Moderator**

*Michael Wilkening, Germany*

**Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

**Technology, Pharmacology & AI E-Poster Presentations: Machine Learning, Haematology**

All E-Posters will be showcased through a live 6-minute in-person presentation.

**Poster Moderator**

*Jens Meier, Austria*

**Poster Moderator**

*Elena Bignami, Italy*

**Poster Moderator**

*Vesela Kovacheva, United States*

**Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

**Technology, Pharmacology & AI E-Poster Presentations: Neuroscience, General Pharmacology**

All E-Posters will be showcased through a live 6-minute in-person presentation.

**Poster Moderator**

*Patrick Purdon, United States*

**Poster Moderator**

*Choon Looi Bong, Singapore*

**Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

**Technology, Pharmacology & AI E-Poster Presentations: Remimazolam**

All E-Posters will be showcased through a live 6-minute in-person presentation.

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**Poster Moderator**

*Kenichi Masui, Japan*

**Poster Moderator**

*Talmage Egan, United States*

**Session Date/Time: Monday, March 4, 2024 - 14:00 - 15:00**

Exhibition Hall

**Technology, Pharmacology & AI E-Poster Presentations: TIVA, TCI**

All E-Posters will be showcased through a live 6-minute in-person presentation.

**Poster Moderator**

*Michel Struys, Netherlands*

**Poster Moderator**

*Sowmya Ramaswamy, Australia*

**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**

*Stephan Thilen, United States*

**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

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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*

**Session Date/Time: Monday, March 4, 2024 - 15:10 - 16:10**

MR 335 (Level 3)

### **Technology, Pharmacology & AI PBLD: Drug Dosing**

PBLD Fee: 20 USD

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*

**Session Date/Time: Monday, March 4, 2024 - 16:10 - 17:40**

MR 334 (Level 3)

### **Technology, Pharmacology & AI Workshop: A "Fireside Chat" about Total Intravenous Anaesthesia: Theoretical and Practical Considerations**

Workshop Fee: 10 USD

Theoretical and practical aspects of total intravenous anaesthesia is the focus of this interactive workshop/discussion. The session is organised as a "Fireside Chat:" Mini-lectures (5 min) followed by question and answers (10 min) addressing selected topics. A host will moderate the session, interviewing Dr. Egan and interacting with the audience. The audience will be asked to share their insights and experience.

#### 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.

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

*Pamela Flood, United States*

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

*Talmage Egan, United States*

**Session Date/Time: Monday, March 4, 2024 - 16:10 - 17:40**

MR 333 (Level 3)

### **Technology, Pharmacology & AI Workshop: Coding Neural Networks with Keras**

Workshop Fee: Complimentary

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*

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### 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.

##### **Assisted Ultrasound**

*Steve Margetts, United Kingdom*

13:00

##### **Chair: Session Introduction**

*Maxime Cannesson, United States*

13:02

##### **Camera-Based Heart Rate Estimation for Diverse Skin Tones and Scenes**

*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.



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- 14:00 **Chair: Session Introduction**  
*Valentina Bellini, Italy*
- 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*

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- 16:56      **AI and Hospital Management**  
*Alex Sia, Singapore*
- 17:20      **AI and Operating Room Logistics**  
*Valentina Bellini, Italy*
- 17:32      **Ethical and Legal Considerations with AI**  
*Elena Bignami, Italy*
- 17:44      **Questions and Answers**

## 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**

*Patrick Purdon, United States*

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.

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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.

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|-------|---|
| 11:15 | <b>Chair: Session Introduction</b><br><i>Maxime Cannesson, United States</i>  |
| 11:17 | <b>3D Printing Applications</b><br><i>Ruth Shaylor, Israel</i>  |
| 11:32 | <b>Blending Camera and 77 GHz Radar Sensing for Equitable, Robust Plethysmography</b><br><i>Laleh Jalilian, United States</i> |
| 11:47 | <b>Anaesthesia and Surgery during Interplanetary Spaceflight</b><br><i>Matthieu Komorowski, United Kingdom</i>                |
| 12:02 | <b>Questions and Answers</b>  |