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VRIJE UNIVERSITEIT BRUSSEL

PhD in Medical Sciences
2020-2021

INVITATION to the Public defence of

Hugo César Nogueira Carvalho

To obtain the academic degree of **'DOCTOR OF MEDICAL SCIENCES'**

Novel Approaches to Perioperative Neuromuscular Monitoring

The defence will take place on **Monday**, **30 August 2021 at 5 p.m.**

and will be organised online

via Zoom meeting, accessible through the following link:

https://gf.vub.ac.be/redirects/PhD_defense_Hugo_Cesar_Nogueira_Carvalho.php

and in Auditorium Vanden Driessche
Faculty of Medicine and Pharmacy, Laarbeeklaan 103, 1090 Brussel

ADMITTANCE to the auditorium will only be granted upon presentation of the personal invitation from the PhD candidate.

Summary of the dissertation

The present thesis aims to revisit the topic of perioperative neuromuscular monitoring from multiple viewpoints, with an underlying primary technological and clinically oriented focus.

The role of Neuromuscular Monitoring (NMM) on the prevention of Post-operative Residual Curarisation (PORC) is investigated by means of (network) meta-analytic approaches. Secondly, a practical solution for objective NMM is put forward, namely, an Android-based smartphone application that can leverage the ubiquitous modern smartphone kinetic sensors in order to quantify global hand movements and so potentially upcycle and convert outdated qualitative monitors into quantitative counterparts. This development, along with an ever-growing mobile Health (mHealth) market, leads to the presentation of a formal survey of Belgian anesthesia professionals on their receptivity of mHealth solutions for perioperative monitoring purposes.

Subsequently, given the movement artifacts plaguing modern anesthesia neuromuscular monitors, the present work presents and assesses a machine learning based solution targeted at filtering out abnormal/outlying neuromuscular measurements.

The last research objective shifts the focus to the pharmacokinetic /pharmacodynamic (PK/PD) realm. With the potential/fitness of current PK/PD modulation techniques being continuously challenged, this work similarly assesses the clinical endpoint prediction performance of Rocuronium PK/PD models in daily clinical care scenarios. The herein obtained performance results set the tone for some of the future direction suggestions put forward in the last part of the thesis.

Curriculum Vitae

Dr. Hugo Carvalho studied medicine at the Faculty of Medicine of Universidade do Porto (Portugal). After an ERASMUS exchange program and a research internship at the Pain Clinic at the University Hospital of Ghent, he enrolled in the Belgian Anesthesia specialist training. After rotations in several Belgian hospitals, he finished his specialization in 2020. He is working as a consultant anesthesiologist at the Universitair Ziekenhuis Brussel since 2021.

Dr. Carvalho does Anesthesia research related to Neuromuscular Monitoring and Management, eHealth applications, Machine Learning, as well as peripheral device development.

In 2017, he co-started the “Riglo” partnership project, focused on sustainably globalizing accurate neuromuscular monitoring. The project has been awarded development support from the Vrije Universiteit Brussel (Industrial Research Fund), the Universitair Ziekenhuis Brussel, the scientific fund Willy Gepts, the Society for Anesthesia and Resuscitation of Belgium (BeSARPP/SARB), the Flanders Innovation & Entrepreneurship agency (VLAIO) and FOD Economie.