INTERNSHIP PROPOSAL

Aerosol treatment efficiency and deposition

Aerosol treatment during the COVID-19 pandemic

It is considered a worldwide threat that the SARS-CoV-2 virus could be transmitted through aerosol. Therefore, it might be dangerous to use aerosol producing therapies e.g. nebulization treatments. During the COVID-19 pandemic the pressure on hospitals and pulmonologists increased and led to a decrease in health care quality. In many regions the use of aerosol generating procedures have either stopped or are only performed under strict conditions. One of the aerosol generating procedures is nebulization treatment. Nebulization treatment is harder to administer properly to children due to their tendency not to cooperate, therefore nebulization masks are used. These masks vent bio-aerosol and medical aerosol through ventilation holes into the environment. High concentrations of aerosols are generally present and are evidently inhaled by clinician and parents in that room. This is normally not considered a significant problem, as the dose of medication that is inhaled is considered low. However, the potential danger of COVID-19 being spread through aerosols demands optimization of the nebulization therapy, such that the treatment would become more efficient for the patient, and safer for patients, healthcare personnel and bystanders.

Project description

Aim

The attached BEP proposals are meant for Bachelor students and confined to 10 EC. Team VERO can also offer larger projects that may serve as internship or final master project. The exact nature of the project will depend on the disciplinary background of the student and will therefore be defined together with the student and his/her departmental supervisor.

Potentially, we may

- improve current measurements by reproducing realistic breathing behaviour of patients of various ages
- aim for more accurate, automated image analyses for aerosol measurements
- prototype new products / masks
- explore requirements for a commercial product, including for instance the willingness among clinicians to change their current standard approaches.
- performing measurements on actual persons (in (semi)clinical settings)
- perform measurements in clinical environments during current standard treatments
- explore alternative uses of this study, e.g. an application for anaesthesiologists in the operating theatre, where similar masks are used for adults. In this case, released aerosols contain higher concentrations of the actual drug that is administered, while the anaesthesiologist is situations relatively nearby and potentially inhales the drug.

Deliverable

- The methods are formulated in SOPs (Standard Operating Procedures), such that they can be repeated by others after the project ends.

- Introduction with background literature, methods, results, discussion and conclusions are delivered in a written report. In agreement with the departmental requirements, they may also be orally presented and defended.
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Cooperation and guidance

The student will be part of Team VERO, an interdisciplinary team of students and alumni from the TU/e and other universities across the Netherlands. This team started a challenge provided by the problem-owner, Dr. Hettie Janssens paediatric pulmonologist at Erasmus MC/Sophia Children's Hospital, working on enhancing the quality of nebulization therapy.

In addition, it is the responsibility for the student to find a departmental supervisor, to ensure the disciplinary requirements are met. This supervisor will finally grade the student. It is advised to inform the departmental exam committee beforehand of the nature of the project.

Contact

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