

Design Information for Ventilation Systems in Operating Rooms

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Many countries suffer high surgical site infection (SSI) rates in their hospitals. The incidence of SSI depends on many variables, including the type of surgery performed and the type of operating room (OR) ventilation system.

There are two common problems concerning the use of ventilation systems in ORs. First, economic reasons may determine which ventilation system is chosen. This may result in the choice of a poorer ventilation system than possible within the economic constraint. Second, once the ventilation system is fixed in the OR, the surgical team needs to adhere to the set-up of the OR (to obtain the best results). However, this is not always possible.

The aim of the ongoing research is to develop a general performance assessment methodology for ventilation systems for ORs, focussing on the improvement of infection control, thermal comfort conditions for the surgical team and the patient (hypothermia), encompassing cost aspects. The methodology should be applicable to assess new ventilation systems resulting from future developments in the medical and heating, ventilation and air-conditioning (HVAC) area. The focus of the research will be on indoor environment quality (IEQ) in order to help designers make an optimal system within the constraints given (e.g. financial, space, etc). The performance assessment methodology needs to be useful to apply for the new ventilation systems in according to future development in the medical and HVAC areas. The performance indicators used to evaluate different types of ventilation system include the thermal comfort for the surgical team, the running and investment costs, and the security aspects with respect to infection control, which may be included preventing pollutants from outside the OR from entering it and protecting the operating table and table of instruments from unwanted pollutants.

The performance assessment methodology for ventilation systems in ORs must ensure applicability for different types of ventilations systems and of surgery, and with characteristics of applicability in various countries. This will provide knowledge about the advantages and disadvantages of some types of ventilation system in terms on the needs of the patient and the surgical team, and of the cost-benefits in the choice of one system or another. The design information will also give a view of all involved in the process, and other aspects one should consider when choosing a ventilation system.

The research methodology consists of literature review, interviewing experts, observations in OR, critical analysis of existing ventilation systems and system analysis with numerical simulation using experimentally verified models. This will allow the development of the assessment methodology.

In the literature review the requirements for the patient and surgical team, current standards for assessing ventilation systems, types of surgeries, investment cost and types of ventilation systems will be investigated.

The interviews will be conducted with heating, ventilation and air-conditioning (HVAC) consultants and designers, researchers and academics, as well as with medical practitioners, and other stake holders such as health insurance and hospital management.

Computational simulation will be one of the tools to assess, e.g. the performance of the HVAC system, the behaviour of the temperature and relative humidity in the OR, the energy consumption and other parameters.