

Patient Safety in the Operating Room

Focus on Infection Control and Prevention

Akademisk avhandling

för avläggande av filosofie doktorsexamen
vid Sahlgrenska Akademin vid Göteborgs universitet.

Avhandlingen kommer offentligen att försvaras
fredagen den 3 maj 2013 kl 9.00

i hörsalen 2118

Institutionen för Vårdvetenskap och hälsa,
Arvid Wallgrens Backe, hus 2

av

Annette Erichsen Andersson

Fakultetsopponent:

Professor Gunnar Németh
Karolinska institutet

Avhandlingen baseras på följande delarbeten:

- I. Andersson EA, Bergh I, Karlsson J, Nilsson K. **Patients' experiences of acquiring a deep surgical site infection: An interview study.** American Journal of Infection Control. 2010 Nov;38(9):711-7.
- II. Andersson EA, Bergh I, Karlsson J, Eriksson BI, Nilsson K. **Traffic-flow in the operating room – an explorative and descriptive study on air quality during orthopedic trauma implant surgery.** American Journal of Infection Control. 2012 Oct;40(8):750-5
- III. Andersson EA, Bergh I, Karlsson J, Eriksson BI, Nilsson K. **The application of evidence-based measures to reduce surgical site infections during orthopedic surgery - report of a single-center experience in Sweden.** Patient Safety in Surgery. 2012 Jun 14;6(1):11
- IV. Andersson EA, Bergh I, Karlsson J, Eriksson BI, Nilsson K. **Exploring the protective ability of parallel airflow systems** (in manuscript).

Patient Safety in the Operating Room Focus on Infection Control and Prevention

Annette Erichsen Andersson

Institute of Health and Care Sciences, The Sahlgrenska Academy
at the University of Gothenburg, Göteborg, Sweden

ABSTRACT

Aims: The overall purpose of this thesis was, in the light of patients' experiences of acquiring a deep SSI, to explore the air quality during orthopedic implant surgery and the application of intraoperative measures to reduce risk factors associated with SSI.

Methods: In Paper I, 14 patients were interviewed using a qualitative approach. In Papers II and IV, during elective and fracture implant operations, 284 active air samples were taken in displacement and laminar (unidirectional) airflow-ventilated operating rooms. Door openings and other events occurring during surgery were recorded. In Paper III, to obtain data on the application of infection-prevention measures, structured and participant observations were carried out during 69 surgical procedures.

Results: Paper I, revealed that developing a deep infection after surgery was seen as a life-changing event, negatively affecting all parts of life. Feelings of pain and not being taken seriously by the health-care providers dominated the experiences. Paper II found that the mean levels of CFU/m³ in displacement-ventilated ORs exceeded the recommended levels for implant surgery (m=15.9). A strong correlation was found between door-opening rates (m=17.4) and CFU levels ($r=0.74$, $p=0.001$). Every door opening resulted in an increase in CFU/m³ of 5.3. Sixty-eight percent of the variance in CFU/m³ could be explained by: length of surgery, door openings and the number of people present in the OR. Paper IV showed that the laminar airflow system observed in this study offered high air quality with very low levels of CFU/m³ during surgery (md=1.0). No significant relationship between door openings and CFU/m³ was observed, but the median door-opening rate was found to be low (md=8). Paper III revealed that evidence-based measures, such as the correct timing of prophylactic antibiotics and normothermia to reduce the risk of postoperative infections, were not sufficiently implemented. The overall adherence to hand hygiene guidelines was 10.3%.

Conclusions: Every unnecessary door opening and failure to implement protective measures during surgery potentially enables the development of an SSI that could result in serious consequences for the patient. Using patients' narratives as a diagnostic tool could reduce the risk of delayed treatment. Finally, without a display in every OR that shows the current airflow and pressure gradient, the safety of patients cannot be guaranteed.

Keywords: Patients' experiences, Patient safety, Surgical site infections, Orthopedics, Air sampling, Operating room, Nursing, Surgery, Complexity, Culture