Department of Physiology and Pharmacology

Section for Anaesthesiology, Surgery and Intensive Care Medicine

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Hospital-acquired pneumonia in intensive care patients

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Petra Hyllienmark

Leg. Sjuksköterska

Huvudhandledare:
Med. Dr. Johan Petersson
Karolinska Institutet
Inst. för Fysiologi och Farmakologi

Bihandledare:
Docent Claes-Roland Martling
Karolinska Institutet
Inst. för Fysiologi och Farmakologi

Docent Johan Struwe
Karolinska Institutet
Inst. för Medicin medicin

Fakultetsopponent:
Docent Lars Berggren
Örebro Universitet
Inst. för Hälsovetenskap och Medicin

Betygsnämnd:
Docent Jonas Hedlund
Karolinska Institutet
Inst. för Medicin

Docent Anders Öwall
Karolinska Institutet
Inst. för molekylär Medicin och Kirurgi

Professor Anders Larsson
Uppsala Universitet
Inst. för Kirurgiska Vetenskaper

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ABSTRACT

The present thesis describes the incidence and risk factors for pneumonia and especially ventilator-associated pneumonia (VAP) among Intensive Care Unit (ICU) patients. Bacteria in samples from the lower respiratory tract of patients receiving mechanical ventilation are reported, including the duration of treatment prior to the first occurrence of different pathogens. The frequency of VAP using Swedish criteria (Swedish Intensive Registry, SIR) was compared with the VAP rate measured with international criteria (US Centre for Disease Control, CDC).

Data were extracted from a local infection surveillance database (Paper I-IV) and a trauma registry (Paper II). In paper I the incidence and risk factors for pneumonia and associated death over a two-year period was studied in 221 patients on mechanical ventilation. In Paper II pre-hospital and hospital parameters associated with pneumonia within 10 days of ICU admission were evaluated in 322 ICU-treated trauma patients. Paper III focus on 443 bacterial isolates from the lower respiratory tract of 346 mechanically ventilated ICU patients. The occurrence of different pathogens was correlated with duration of hospital stay and time on mechanical ventilation at the time of sampling. In paper IV patients with (n=112) and without (n=224) a new lung infiltrate after ≥48 hours of mechanical ventilation were studied to evaluate the proportion of patients meeting different criteria used to define VAP according to CDC and SIR, respectively. Paper I shows that 15% of patients developed VAP, corresponding to a rate of 29 VAP/1000 ventilator days. Risk factors were aspiration, recent surgery and trauma. The 28-day mortality in patients with VAP was 33% as compared to 16% in those without ICU-acquired pneumonia. In Paper II risk factors for pneumonia were intubation at the site of injury, shock, an initial Glasgow Coma Scale (GCS) of ≤8, major surgery within 24 h of admission to hospital, massive transfusion of blood and ISS > 24. *Enterobacteriacae* and *Stafylocoocus aureus* were the most common pathogens. Paper III shows that duration of hospital care and mechanical ventilation prior to sampling was ≤2 days for *Streptococcus pneumoniae, beta-streptococci* and *Haemophilus influenzae*. With the exception of *Stenotrophomonas maltophilia* and *Pseudomonas aeruginosa*, the median duration of time on mechanical ventilation was short and similar for most bacteria. In samples taken on the first day of mechanical ventilation, the rate of pathogens expected to be resistant to cefotaxime was 23%. In Paper IV the SIR and CDC criteria for VAP was met in 84% and 93%, respectively, in 112 situations with a new infiltrate when applying a ± 48 hours time frame for the other criteria in relation to the occurrence of the lung infiltrate.

It is concluded that VAP is a common complication in the ICU, especially among trauma patients. The most important risk factor for VAP in a general ICU patient is aspiration and for a trauma patient an initial GCS of <8. *Staphylococcus aureus* and *Enterobacteriacae* are the most common bacteria in samples from the lower respiratory tract in both general ICU patients and in a trauma population. Occurrence of pathogens resistant to common antibiotics increases with the duration of hospital care and mechanical ventilation. The diagnosis of VAP should rely on presence of lung infiltrate and microbiological samples from the lower respiratory tract; clinical criteria add little value.

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