

Community onset sepsis in Sweden

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentlig försvaras i lokal Tore Ahnhoff, Medicinaregatan 16A, 41390, Göteborg, fredagen den 8 december 2017, klockan 13.00,

av

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Avhandlingen baseras på följande delarbeten:

- I. Ljungström L, Andersson R, Jacobsson G. (2017). **The epidemiology and outcome of severe sepsis and septic shock in Skaraborg, Sweden. A population based study.** Manuscript.
- II. Ljungström L, Enroth H, Claesson BE, Oveymyr I, Karlsson J, Fröberg B, Bordin AK, Pernestid AK, Jacobsson G, Andersson R, Karlsson D. (2015). **Clinical evaluation of commercial nucleic acid amplification tests in patients with suspected sepsis.** *BMC Infectious Diseases*, 15(1), 199.
- III. Ljungström LR, Jacobsson G, Claesson BE, Andersson R, & Enroth H. (2017). **Respiratory viral infections are underdiagnosed in patients with suspected sepsis.** *European Journal of Clinical Microbiology & Infectious Diseases*, 36(10), 1767-1776. DOI 10.1007/s10096-017-2990-z
- IV. Ljungström L, Pernestig AK, Jacobsson G, Andersson R, Usener B, & Tilevik D. (2017). **Diagnostic accuracy of procalcitonin, neutrophil-lymphocyte count ratio, C-reactive protein, and lactate in patients with suspected bacterial sepsis.** *PLoS One*, 12(7), e0181704.
- V. Edman-Wallér J, Ljungström L, Jacobsson G, Andersson R, & Werner M. (2016). **Systemic symptoms predict presence or development of severe sepsis and septic shock.** *Infectious Diseases*, 48(3), 209-214.

**SAHLGRENKA AKADEMIN
INSTITUTIONEN FÖR BIOMEDICIN**



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Abstract

Sepsis and previously “severe sepsis” are concepts used for denoting organ dysfunction caused by acute infection. Organ dysfunction correlates to increased case fatality rates. Sepsis is a common cause of hospitalization. Currently, sepsis is estimated to annually cause 30 million cases and 6 million deaths worldwide.

The aims of this study were to explore the epidemiology, characteristics, and outcome of community onset severe sepsis in the adult population in Skaraborg, western Sweden. During a 9-month period, Sept. 2011 – June 2012, 2,462 consecutive episodes in 2,196 patients admitted to Skaraborg Hospital and treated with intravenous antibiotics, were evaluated per protocol.

The incidence of severe sepsis was 276/100,000. Age ≥ 85 years, cardiovascular disease, and diabetes mellitus were risk factors for acquiring severe sepsis. In 429 patients with severe sepsis, the 28-day case fatality rate was 25%, versus 4% in 1,767 with non-severe sepsis or no sepsis. Risk factors for 28-day case fatality were age ≥ 85 years, renal-, respiratory-, and cerebral dysfunction. The respiratory tract was the most common focus of infection, seen in 41%. Applying the new sepsis definition launched in 2016 to this study population, the incidence of sepsis was 876/100,000 and the 28-day case fatality rate was 12%.

During six weeks of the study, samples from 383 consecutive episodes of suspected sepsis in the emergency department were analyzed by multiplex polymerase chain reaction (PCR) for rapid detection of pathogenic bacteria in blood. We found that the multiplex PCR added some diagnostic value by detecting clinically relevant bacteria not identified by blood culture.

During winter 2012, 432 nasopharyngeal samples were examined for respiratory viruses using multiplex PCR. We noted that viral infections or co-infections with bacteria were underestimated in patients with suspected sepsis, especially Influenza A virus, human metapneumovirus and respiratory syncytial virus.

Commonly used biomarkers for sepsis identification, lactate, C-reactive protein, procalcitonin and the neutrophil to lymphocyte count ratio (NLCR), were evaluated in 1,572 episodes of suspected sepsis. The combination of three or four biomarkers could improve the diagnosis of severe sepsis, having a sensitivity of 85%. In patients with proven bacterial infection of any severity, the neutrophil to lymphocyte count ratio or procalcitonin exhibited equivalent performance.

Six defined symptoms of sepsis; fever, dyspnea, acute change of mental status, severe pain, vomiting/diarrhea and muscle weakness were evaluated for early detection sepsis patients. Occurrence of ≥ 3 of these symptoms significantly predicted the presence or development of severe sepsis or septic shock, especially acute change of mental status and dyspnea.

Keywords: bacteremia, biomarkers, epidemiology, organ dysfunction, outcome, PCR, severe sepsis, Sepsis-3, symptoms.