Development of a Prehospital Decision Support Tool Optimisation of the prehospital triage of patients with chest pain

Akademisk avhandling

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Avhandlingen baseras på följande delarbeten

I.   Wibring K, Herlitz J, Christensson L, Lingman M, Bång A. **Prehospital factors associated with an acute life-threatening condition in non-traumatic chest pain patients - A systematic review.** Int J Cardiol. 2016 Sep 15; 219:373-9. doi: 10.1016/j.ijcard.2016.06.066. Epub 2016 Jun 21.

II. Wibring K, Herlitz J, Lingman M, Bång A. **Symptom description in patients with chest pain—A qualitative analysis of emergency medical calls involving high-risk conditions**. J Clin Nurs. 2019 Aug;28(15-16):2844-2857. doi: 10.1111/jocn.14867. Epub 2019 Apr 21.

III. Wibring K, Lingman M, Herlitz J, Amin S, Bång A. **Prehospital stratification in acute chest pain patient into high risk and low risk by emergency medical service - a prospective cohort study.** BMJ Open. 2021 Apr 15:11(4) doi: 10.1136/bmjopen-2020-044938.

IV. Wibring K, Lingman M, Herlitz J, Ashfaq A, Bång A. **Development of a prehospital prediction model for risk stratification of patients with chest pain.** Manuscript.

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Abstract

Background: Chest pain is one of the most common symptoms in patients contacting the emergency medical services (EMS). This large group consists of patients with disorders of various causes and severity. Prehospital risk stratification of these patients is warranted in order to identify which patients are in need of prompt advanced hospital care and which could be cared for by for example primary healthcare. Previous research has called for a tool to support EMS personnel in their assessments and decisions when caring for this group of patients.

Aim: To develop a decision support tool for prehospital risk stratification of patients with chest pain.

Methods: Several different methods have been used in this thesis. Paper I is a systematic literature review with semi-quantitative data analysis. It identifies factors associated with a high-risk condition in prehospital patients with chest pain. In Paper II, a content analysis of emergency medical calls is conducted. It explores which symptoms patients with chest pain due to a high-risk condition experience and how these symptoms are described. Paper III uses a quantitative design analysing prospectively collected data. It examines possible associations between prehospitally available variables and outcome in terms of the occurrence of a high- or low-risk condition. In Paper IV, the data collected in Paper III were analysed further. Models were constructed to predict whether the patient's chest pain is due to a low- or a high-risk condition.

Results: Paper I establishes that previous prehospital research is sparse on outcome predictors in EMS patients with chest pain. The level of evidence varies for different predictors. Age, sex, ST-deviation on ECG and vital signs reflecting a compromised circulation are the predictors with the highest level of evidence. In Paper II it was found that patients with chest pain due to high-risk conditions experience a wide range of symptoms which are described in many different ways. Paper III concludes that about 2/3 of all EMS patients with chest pain have a low-risk condition while 16 % have a high-risk condition. There are numerous variables accessible in the EMS setting that predict either low- or high-risk conditions. Several variables were predictive for both low- and high-risk conditions. ST-deviation on ECG, age and Troponin T (TnT) were the strongest predictors for both low- and high-risk conditions. In Paper IV, a few prediction models were developed. The final combined model using nine different variables to predict both low- and high-risk conditions had an ROC-AUC of 0.79 when predicting high-risk conditions and 0.75 when predicting low-risk conditions.

Conclusions: Prehospital research on predictive variables is sparse when assessing EMS patients with chest pain, and more is warranted. EMS patients are a heterogeneous group experiencing a wide range of symptoms. Most patients have a low-risk condition. Without medical risk, they could be referred to less resource-intensive alternatives than transport by ambulance to the emergency department. A decision support tool guiding the EMS in their risk-stratification of patients with chest pain is achievable, using variables readily accessible in the EMS setting. ST-deviation on ECG, age and TnT remain the strongest predictive variables when trying to identify patients with both low- and high-risk conditions. Symptomology has minor value when discriminating patients with low-risk conditions from those with high-risk conditions.

Keywords: Chest Pain, Emergency Medical Services, Signs and Symptoms, Risk Assessment, Triage, Prediction Models