THE EPIDEMIOLOGY OF CARDIAC ARREST
IN-HOSPITAL RISK ASSESSMENT, TREATMENT AND OUTCOME

Akademisk avhandling

Som för avläggande av medicine doktorsexamen vid Sahlgrenska Akademin,
Göteborgs Universitet, kommer att offentligen försvaras i Hjärtats aula,
Sahlgrenska Universitetssjukhuset, Vita stråket 12, Göteborg,
fredagen den 6 november, 2020, klockan 09:00

Anna Adielsson

Fakultetsopponent: Docent Max Bell,
Karolinska Institutet, Stockholm

Avhandlingen baseras på följande delarbeten:

I. Adielsson A, Hollenberg J, Karlsson T, Lindqvist J, Lundin S, Silfverstolpe J, Svensson L, Herlitz J. **Increase in survival and bystander CPR in out-of-hospital shockable arrhythmia: bystander CPR and female gender are predictors of improved outcome - Experiences from Sweden in an 18-year perspective**
Heart 2011; 97:1391-1396

II. Adielsson A, Karlsson T, Aune S, Lundin S, Hirlekar G, Herlitz J, Ravn-Fischer A. **A 20-year perspective of in hospital cardiac arrest - Experiences from a university hospital with focus on wards with and without monitoring facilities**
International Journal of Cardiology 2016; 216:194–199

III. Adielsson A, Djärv T, Rawshani A, Lundin S, Herlitz J. **Changes over time in 30-day survival and the incidence of shockable rhythms after in-hospital cardiac arrest - A population-based registry study of nearly 24,000 cases**
Manuscript submitted, 2020

IV. Adielsson A, Danielsson C, Forkman P, Karlsson T, Pettersson L, Herlitz J, Lundin S. **Risk factors for 30-day mortality in medical emergency team patients - A retrospective cohort study**
Manuscript submitted, 2020

SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR KLINISKA VETENSKAPER

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THE EPIDEMIOLOGY OF CARDIAC ARREST
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Göteborgs Universitet, 2020

ABSTRACT

Aim: To describe and analyse sudden cardiac arrest, both in hospital and out of hospital, from an epidemiological perspective, by early prediction, by comparing changes over time in relation to aetiology, characteristics, treatment, survival or mortality and by identifying factors associated with outcome.

Methods: This thesis is based on four observational studies, including patient information from the Swedish Registry for Cardiopulmonary Resuscitation, in and out of hospital, and from a local registry on medical emergency team assessment at Sahlgrenska University Hospital.

Results: In *Paper I*, the 30-day survival after out-of-hospital cardiac arrest in Sweden among patients found in a shockable rhythm increased from 12% in 1992 to 23% in 2009. Strong predictors of survival were a short interval from collapse to defibrillation, bystander cardiopulmonary resuscitation, female gender and out-of-hospital cardiac arrest outside home. In *Paper II*, in Sahlgrenska University Hospital, the 30-day survival after an in-hospital cardiac arrest, on monitoring wards, increased significantly from 43.5% in 1994 to 55.6% in 2013. There was a significant reduction in the delay from collapse to the start of cardiopulmonary resuscitation and an increase in the proportion of patients defibrillated before the cardiac arrest team arrived. On the non-monitoring wards, there were no significant changes in survival; there was nonetheless a significant decrease in the proportion of patients found in shockable rhythms, from 46% in 1994 to 26% in 2013. In *Paper III*, adjusted trends indicated an overall increase in 30-day survival after in-hospital cardiac arrest in Sweden, from 24.7% in 2008 to 32.5% in 2018 (monitoring wards, 32.5% to 43.1%, and non-monitoring wards, 17.6% to 23.1%). The proportion of patients found in shockable rhythms decreased in overall terms from 31.6% in 2008 to 23.6% in 2018 (monitoring ward 42.5% to 35.8%, and non-monitoring wards, 20.1% to 12.9%). In *Paper IV*, the overall 30-day mortality among patients assessed by a medical emergency team in Sahlgrenska University Hospital was high (29.0%) and almost twice as high on medical wards as on surgical wards (37.1% vs 19.8%). Factors associated with increased 30-day mortality were reflected in age, type of ward, vital parameters, laboratory findings, previous medical history and acute medical condition.

Conclusions: Over the past few decades, the overall survival after a sudden cardiac arrest has increased, both in and out of hospital, despite a declining trend in the proportion of shockable cardiac arrests. Part of the reason appears to be a shorter delay from collapse to treatment. Several factors associated with an increased risk of dying of a sudden cardiac arrest have been identified and, if appropriately risk stratified and immediately treated, the fatal outcome may be averted.

Keywords: cardiac arrest; CPR; defibrillation; medical emergency team; rapid response system;

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