Predictors of survival in cardiac arrest

Akademisk avhandling

Som för avläggande av medicindoktorsexamen vid Sahlgrenska akademin, Göteborgsuniversitet kommer att offentligen försvaras i **Hjärtats Aula, Sahlgrenska Universitetssjukhuset**, Vita stråket 12, 413 45 Göteborg, den 01-11- 2021, klockan 09:00.

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Avhandlingen baseras på följande delarbeten:

I. Al-Dury N, Rawshani A, Israelsson J, Strömsöe A, Aune S, Agerström J, Karlsson T, Ravn-Fischer A, Herlitz J. Characteristics and outcome among 14,933 adult cases of in-hospital cardiac arrest: A nationwide study with the emphasis on gender and age. The American Journal of Emergency Medicine, 2017 Dec;35(12):1839-1844. doi: 10.1016/j.ajem.2017.06.012.

II. Al-Dury N, Rawshani A, Hirlekar G, Hollenberg J, Israelsson J, Nordberg P, Herlitz J, Ravn-Fischer A. In-hospital cardiac arrest: A machine learning study with focus on predictors of survival. *Manuscript*.

III. Al-Dury N, Rawshani A, Karlsson T, Herlitz J, Ravn-Fischer A. The influence of age and gender on delay to treatment and its association with survival after out of hospital cardiac arrest. The American Journal of Emergency Medicine, 2021 Apr;42:198-202. doi: 10.1016/j.ajem.2020.11.033.

IV. Al-Dury N, Ravn-Fischer A, Hollenberg J, Israelsson J, Nordberg P, Strömsöe A, Axelsson C, Herlitz J, Rawshani A. Identifying the relative importance of predictors of survival in out of hospital cardiac arrest: a machine learning study. Scandinavian Journal of Trauma, Resuscitation, & Emergency Medicine, 2020 Jun 25;28(1):60. doi: 10.1186/s13049-020-00742-9.

INSTITUTIONEN FÖR MEDICIN

Predictors of survival in cardiac arrest

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Abstract

Cardiac arrest (CA) refers to the cessation of cardiac function. Survival is around 30% for in-hospital cardiac arrest (IHCA), and 10% for out-of-hospital cardiac arrest (OHCA). Many factors influence survival, ranging from the patient's age, gender and comorbidities, to the conditions surrounding the arrest, to the emergency medical service (EMS) response time, to post-arrest treatment strategies.

In study I, the characteristics and outcome of ca 15,000 cases of IHCA were studied from a national perspective. We found men to have a 10% lower chance than women of surviving to 30 days. Older individuals were managed less aggressively, and had a lower 30-day survival, but a similar cerebral function among survivors compared with younger patients.

In study II, machine learning (ML) was used to rank the most important predictors of survival in ca 5,000 cases of IHCA. A shockable presenting rhythm was by far the strongest predictor of survival, followed by the location and the cause of CA, the presence of hypoxia within one hour before the arrest, and then age. The delays to start of CPR and to defibrillation were short in the majority of patients, which may explain why delay was not the most important factor for outcome. Gender did not seem important when using ML.

Study III examines ca 22,000 bystander-witnessed cases of OHCA to determine the influence of age and gender on the delays to treatment, and on the association between delay and survival. Patients aged >70 years had a longer delay from collapse to start of CPR after OHCA. The decrease in survival with increasing delay to CPR was more marked in men than in women, whereas the decrease in survival with increasing delay to treatment was similar between older and younger patients.

Study IV utilizes machine learning to rank the most important predictors of survival in ca 45,000 cases of OHCA. The top five predictors appear to be: initial rhythm, age, early CPR, EMS response time, and place of CA. Gender did not seem important when using ML.