23 MACHINE LEARNING MODEL SURPASSING MEDICAL DISPATCHERS RECOGNITION OF OUT-OF-HOSPITAL CARDIAC ARREST

¹SN Blomberg*, ¹F Folke, ²AK Ersbøll, ¹FK Lippert. ¹Emergency Medical Services Copenhagen, University of Copenhagen, Denmark; ²National Institute of Public Health, University of Southern Denmark, Denmark

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Aim The chance of surviving Out-of-Hospital Cardiac Arrest (OHCA) is highly correlated with medical dispatchers' recognition of the condition during emergency calls.^{1,2} We investigated if machine learning (ML) could surpass medical dispatchers by applying ML directly on the realtime dialogue between the caller and the dispatcher.

Method We retrieved all 1 61 650 emergency calls recorded for 2014 to the Emergency Medical Dispatch Centre Copenhagen (EMDC). From the Danish Cardiac Arrest Register (DCAR) and audit of call recordings where resuscitative efforts were begun, we extracted information on all OHCA in 2014. Emergency medical services (EMS) witnessed cardiac arrests and damaged audiofiles/recordings were excluded. The data-set for analysis contained henceforth 1 58 330 non-OHCA calls and 2,157 OHCA calls. Each OHCA could span several calls from multiple callers. Time-to-recognition by the ML-Model was calculated for each call and for the dispatchers found by auditing all OHCA calls.

Results The ML-Model reached a sensitivity of 93.1% (95% CI: 91.9 to 94.1) and a specificity of 98.0%. (95% CI: 97.9 to 98.1) on OHCA-calls. Sensitivity of the dispatchers was 72.9% (95% CI: 70.0 to 75.6). Specificity is unknown for dispatchers, as false positives are not registered. Time-to-recognition was significantly shorter for the ML-model (mean time-to-recognition 00:48 mm:ss, 95% CI: 00:46 to 00:50) compared to dispatchers (mean time-to-recognition 01:19 mm:ss, 95% CI: 01:13 to 01:25) ($p < 0.0001$).

Conclusion In recordings of 1 61 650 calls to EMDC a ML-model could recognise a higher proportion of OHCA, compared to medical dispatchers. Furthermore, we found that the ML-model was significantly faster in recognising OHCA.

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24 INJURIES FOLLOWING MECHANICAL CARDIAC MASSAGE WITH A PISTON-TYPE DEVICE

^{1,2}L Milling*, ¹BS Astrup, ¹S Mikkelsen. ¹Mobile Emergency Care Unit, Department of Anesthesiology and Intensive Care, Odense University Hospital, Denmark; ²Institute of Forensic Medicine Odense, University of Southern Denmark, Denmark

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Aim Chest injuries and abdominal injuries as a result of vigorous cardiac compression have caused concern ever since

manual cardiopulmonary resuscitation was introduced.¹ The same concerns have now been expressed in relation to mech-CPR.^{2,3} The aim of this study was to investigate injury patterns related to mech-CPR in comparison to manual CPR.

Method During a study period of 15 months, a convenience sample of all patients treated with chest compressions (CC) by the Odense MECU as well as all patients in the Region of Southern Denmark treated with mech-CPR was assessed. Pre-hospital discharge reports, in-hospital records, and autopsy reports were manually reviewed for indications of injuries related to CC.

Results We included 75 patients receiving mech-CPR and 234 patients receiving manual CPR. The crude analysis showed that mech-CPR posed a significantly higher risk of injuries than manual CPR ($p < 0.001$, Odds-Ratio 3.31, CI: 1.91 to 5.74). When adjusted for duration of CPR this difference waned. Mech-CPR significantly increased the likelihood of soft tissue injuries compared with manual CPR alone. This difference was significant both in a crude analysis and adjusted for duration, age, gender, BMI and anticoagulant therapy (Odds-Ratio 31.87 (CI: 5.82 to 172.83 ($p < 0.001$)). Furthermore, the occurrence of injuries was associated with duration of CC regardless of mech-CPR or manual CPR (Odds-Ratio 1.02 (CI: 1.00 to 1.04 ($p = 0.02$)).

Conclusion Mech-CPR was strongly associated with soft tissue injuries. Prolonged duration of CPR was associated with increased prevalence of injuries. This finding may have implications for future on-scene treatment of patients in cardiac arrest.

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25 EFFECT OF INSTRUCTOR'S REAL-TIME FEEDBACK USING QCPR-CLASSROOM DEVICE DURING LAYPERSON CARDIOPULMONARY RESUSCITATION (CPR) TRAINING ON QUALITY OF CPR PERFORMANCES: A PROSPECTIVE CLUSTER-RANDOMISED TRIAL

¹SY Kong*, ^{1,2}SD Shin, ^{1,2}KJ Song, ¹YS Ro, ^{1,3}KJ Hong, ¹JH Park, ³TH Kim, ⁴T Birkenes, ⁴H Myklebust. ¹Laboratory of Emergency Medical Services, Seoul National University Hospital, Seoul, Korea; ²Department of Emergency Medicine, Seoul National University College of Medicine and Hospital, Seoul, Korea; ³Department of Emergency Medicine, Seoul National University Boramae Medical Centre, Seoul, Korea; ⁴Laerdal Medical, Stavanger, Norway

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Aim The evidence supporting delivery of quality cardiopulmonary resuscitation (CPR) is growing and significant attention has been focused on improving CPR education among laypersons perform bystander CPR. The aim of this randomised trial was to assess the effectiveness of instructor's real-time objective feedback during CPR training compared to conventional feedback in terms of trainee's CPR quality.

Method We performed a cluster randomised trial of community CPR training classes at Nowon District Health Community Centre in Seoul. CPR training classes were randomised into either intervention (instructor's objective real-time feedback based on the QCPR Classroom device or control (conventional, instructor's judgement-based feedback) group. Laerdal QCPR Classroom software is a real-time feedback device, which monitors quality of real-time CPR performances of multiple trainees simultaneously. During each training session, trainees practiced CPR five times. The primary outcome was the total CPR score, which is an overall measure of chest compression quality. Secondary outcomes were individual CPR performance parameters, including average number of compressions, average compression depth, percent adequate depth and percent acceptable release. Generalised linear mixed models were used to analyse the outcome data, accounting for both cluster- (random effect) and individual-(fixed effect) level factors. : A total of 149 training sessions (2613 trainees) were randomised into 70 intervention (1262 trainees) and 79 control (1351 trainees) groups. During the training, trainees in the QCPR feedback group significantly increased overall CPR score performance compared with those in the conventional feedback group (model-based mean Δ increment from baseline to session 5: 11.2 (95% CI: 9.2 to 13.2) and 8.0 (6.0–9.9), respectively) with statistically significant between group difference ($p=0.02$). Individual parameters of compression depth and release also showed higher improvement among trainees in QCPR group with marginal significance ($p<0.08$ for both).

Results In this randomised trial, QCPR-Classroom based feedback during the CPR training session resulted in improved overall CPR quality. In this randomised trial, QCPR-Classroom based feedback during the CPR training session resulted in improved overall CPR quality. This suggests beneficial effect of instructor's real-time objective feedback on the quality of layperson's CPR performance.

Conclusion The training equipment used in this study (QCPR Classroom) was supported by the Laerdal Medical, but had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data.

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THE INFLUENCE OF AGONAL BREATHING ON CALL-TAKER RECOGNITION OF OUT-OF-HOSPITAL CARDIAC ARREST

¹S Ball*, ¹M Riou, ¹S Gallant, ^{1,2}A Whiteside, ^{1,2,3}P Bailey, ^{1,2,4,5}J Finn, On behalf of investigators of the NHMRC Partnership Project 'Improving ambulance dispatch to time-critical emergencies'. ¹Prehospital, Resuscitation and Emergency Care Research Unit (PRECRU), Curtin University, WA, Australia; ²St John Ambulance Western Australia, WA, Australia; ³St John of God Hospital Murdoch, WA, Australia; ⁴Department of Epidemiology and Preventive Medicine, Monash University, Victoria, Australia; ⁵Division of Emergency Medicine, The University of Western Australia, WA, Australia

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Aim Call-taker recognition of out-of-hospital cardiac arrest (OHCA) contributes significantly to patient survival, through reduced response time and dispatch-assisted cardiopulmonary resuscitation. A potential barrier to OHCA recognition is agonal breathing, whereby patients are often described as

breathing. Our aim was to determine the role of agonal breathing in non-recognition, and delayed recognition, of OHCA.

Method We analysed cases of non-traumatic OHCA where paramedics performed resuscitation, in Perth, Australia in 2014–2015. Calls in this system were processed using the Medical Priority Dispatch System. We excluded cases where the patient was clearly alive during the call. Listening to calls, we categorised answers to the question 'Is s/he breathing?' as 'No', 'Agonal/Ineffective', 'Unsure' or 'Yes'. These data were compared to OHCA recognition, as determined from computer aided dispatch data.

Results Among 902 OHCA cases, 87% (782/902) were recognised as OHCA by call-takers. In total, 21% of calls (193/902) had answers consistent with agonal breathing (e.g. 'gasp-ing', 'only just'). However, such calls comprised 38% (46/120) of the cases not recognised as OHCA, and 45% (112/250) of the cases of delayed recognition (recognised after initial ambulance dispatch). Only 18% (35/193) of cases with agonal descriptions were recognised as OHCA at initial dispatch.

Conclusion Calls with descriptions of agonal breathing comprise a large proportion of cases that are either not recognised as OHCA or have delayed recognition. Call-taker response to caller descriptions of agonal breathing remains a major opportunity for improved OHCA recognition.

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LAY RESPONDER POST ARREST SUPPORT MODEL: METHODOLOGY & CONCEPTUAL DESIGN

¹P Snobelen*, ²J Pellegrino, ¹G Nevils, ^{3,4}KN Dainty. ¹Peel Regional Paramedic Services; ²Aultman College; ³North York General Hospital; ⁴University of Toronto

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Aim As early as 1993, consideration of the psychological effect of providing CPR on bystanders emerged as an under-appreciated concern. One consideration is the ethics of asking people to respond to such emergencies without proper support.

Method The Lay Responder Support Model (LRS) emerged from the analysis of the data collected after debriefings with 64 lay-responders that participated in an out-of-hospital cardiac arrest. During the first conversations, participants identified the effects of mental trauma, which led to formalise the debriefing process and data collection tools. The program now involves 3 stages: Identifying and Engaging, Debriefing and Follow-up, and Referral for Professional Support.

Results Almost all the cases, lay-responders communicated effects in their daily life, including a wide range of acute physical and/or psychological reactions post event. For some individuals, acute stress reactions caused enough distress to interfere with everyday activities. These findings resulted in the application of Psychological First Aid principles: identifying and facilitating them toward mental health support to promote recovery has wide spread application in traumatic events