Out-of-hospital circulatory arrest: factors determining the outcome Amsterdam resuscitation study (ARREST) 2 and 3
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Citation for published version (APA):
Chapter 2

Amsterdam Resuscitation Study 2 and 3 (ARREST 2 and 3).
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2.1. The Amsterdam Resuscitation studies

The Academic Medical Center in Amsterdam performed a number of resuscitation studies with different objectives. The ARREST 1 focused on all aspects of resuscitation efforts for patients with an in-hospital cardiac arrest. This study (ARREST 2), analyzed the patients who had their cardiac arrest outside the hospital. From the survivors in the ARREST 2 we also analyzed their quality of life, ARREST 3. Also new studies are initiated: ARREST 4, the use of automatic external defibrillator (AED) by the police and the fire brigade; ARREST 5, the recognition of a cardiac arrest from an emergency call by the dispatchers; ARREST 6, the optimum energy levels for the defibrillators with biphasic waveforms.

![Map of the study area](image)

Figure 2. The boundary of the study area is marked with a black line.

2.2. The study population

The study was performed in Amsterdam and its surrounding areas (Figure 2) consisted of 17 municipalities and covered by the Amsterdam dispatch center. This region encompasses 1030 square kilometers, with urban, suburban and rural areas and a population of nearly 1.3 million inhabitants. The distribution of age in this population is shown in Figure 3.
2.3. Emergency medical service system

The Dutch EMS system is a one tiered system. That means that after an emergency call the first professional responder is equipped to perform defibrillation and advanced CPR procedures. There is a national emergency telephone number 112, connected to the regional dispatch center. The dispatch center of the Amsterdam (CPA) is manned by nurses. They dispatch seven different ambulance services with nine ambulance posts distributed over this region. Telephone CPR is not routinely instructed. All ambulances are manned with a paramedic and a driver. This team is qualified to perform Advanced Cardiac Life Support (ACLS), including defibrillation, endotracheal intubation, intravenous access and administration of medication, according to a protocol comparable with the ERC guidelines for ACLS.\textsuperscript{7,8} In case the police is also dispatched and arrive before EMS personnel they can start basic CPR procedures.

2.4. Data collection

From a pilot study\textsuperscript{9} we learned that the information from EMS personnel, by collecting ambulance forms, was insufficient for scientific purposes. As was already stated before, collecting data in the prehospital setting is since there is often a lack of objective information.\textsuperscript{10,11} During the resuscitation efforts the attention of EMS personnel is focussed on the treatment of the patient and not on collecting information. Another problem is that collecting data by those involved caries the inevitable risk of bias. Therefore to secure accurate data collection we designed a prospective study, performed by specially trained research personnel. Data collection was done by an experienced physician supported by trained medical students who served as data collectors on the scene during or immediately after the resuscitation efforts. The research
personnel worked in shifts, covering 24 hours a day, seven days a week. Immediately after the dispatch of EMS personnel on an emergency call, one of the researchers was also notified by mobile telephone. They responded immediately to the call and in most instances arrived on the scene with ongoing resuscitation efforts. Much attention was paid to integrate all information from family members, bystanders and EMS personnel with the emphasis on accurate time estimation. In case a patient was brought to the hospital the researchers followed the patient into the emergency room where the registration was continued. From patients who were admitted to the hospital the medical records were studied in a later stage and after discharge. Also, information from the general practitioner, about medical history and medication was collected.

The registration was done by using a standardized registration form according to the Utstein recommendations. A combined task force of the American Heart Association, the European Resuscitation Council, and Heart and Stroke Foundation of Canada, and the Australian Resuscitation Council recommended guidelines for uniform reporting of data from out-of-hospital cardiac arrest. All this work was prepared in a Norwegian abbey named ‘Utstein’ and therefore these recommendations for data collection were called: The Utstein style.12

2.5. Time analysis

The clock of the dispatch center served as the time standard, the watches of all research personnel were synchronized on this clock. The computer of the dispatch center recorded times of: the call, ambulance departure, ambulance stop, departure to the hospital, and stop at the hospital. All defibrillators were equipped with a clock, therefore all timed events during resuscitation could be registered. The times of defibrillation and external pacing were automatically registered, other events had to be marked manually on the defibrillator. After resuscitation a print out from the defibrillator was made containing registered heart rhythm and marked resuscitation events with the corresponding times. The difference in time indicated by the defibrillator and the watch of the research personnel was also registered. Time correction was done according to the time standard.

2.6. ARREST 3 (quality of life analysis)

The quality of life was analyzed for all patients from the ARREST 2 database who survive at least three months after hospital discharge. Quality of life was evaluated by physical, psychological and social functioning. Questionnaires were selected by their psychometric properties and were already used in ARREST 1.4 Quality of life was measured with the 136-item self-reporting Sickness Impact Profile (SIP). Cognitive functioning was assessed with the 30-item Mini Mental State Examination (MMSE). Following the Utstein recommendations, patients were also classified according the Overall and Cerebral Performance Categories (OPC and CPC).

References
