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CLINICAL PAPER

Outcome of cardiopulmonary resuscitation in intensive care units in a university hospital☆

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Summary
Summary: The purpose of this study is to evaluate the demographic characteristics of patients who suffered cardiac arrest in our intensive care units (ICUs) as well as to identify those factors influencing outcome after resuscitation following cardiac arrest.
Methods: We reviewed the records of all patients who underwent cardiopulmonary resuscitation (CPR) in our ICUs at the Georg-August University Hospital, Goettingen, Germany, from January 1, 1999 to December 31, 2003.
Results: One hundred and sixty-nine patients underwent CPR. Severity of illness assessed by SAPS II score on admission was 51.8 ± 18.5 (predicted mortality 46.6%). The initially monitored rhythm at the time of arrest was asystole in 51 (30.2%) patients. Ventricular tachycardia/fibrillation (VT/VF) was recorded in 65 (38.5%) and pulseless electrical activity in 49 (29.0%) patients. Twenty (23.8%), 28 (33.3%) and 33 (39.3%) patients with initially recorded asystole, VT/VF and pulseless electrical activity (PEA) rhythms, respectively, survived to ICU discharge. Eighty of the 169 patients survived to hospital discharge giving a survival rate of 47.3%. The highest ICU mortality was seen in patients admitted for neurosurgery (80%) followed by major vascular surgery (77.8%), non-surgical patients (67.4%) and patients with severe sepsis (66.7%). The occurrence of cardiac arrest within the first 24 h was associated with a significantly lower ICU mortality compared to a later incident. At hospital discharge 66 patients (82.5% of the survivors) achieved good cerebral recovery, 12 patients (15.0%) were severely disabled (CPC 3) while 2 (2.5%) remained unconscious.
Conclusion: Several factors affect the outcome from CPR. However, quicker triage to ICU, closer monitoring along with prompt intervention might minimise the consequences of cardiac arrest and its complications.

☆ A Spanish translated version of the summary of this article appears as Appendix in the online version at doi:10.1016/j.resuscitation.2006.03.013.

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Introduction

Today, cardiac arrest is the third leading cause of coma, second only to trauma and drug overdose.[1] Over the past two decades, several publications have reported the outcome after cardiopulmonary resuscitation (CPR) for cardiac arrest in hospitalised patients.[2–11] However, a meaningful comparison and generalisation were impossible not only because the majority of these reports were from single institutions but also because of the non-uniformity of the data and varying definition of elements. In recent years, however, the International Liaison Committee on Resuscitation (ILCOR) produced guidelines in an attempt to ensure the comparability of data regarding in-hospital resuscitation events. In 1997, ILCOR published the Utstein style guidelines for reviewing, reporting and conducting research on in-hospital resuscitation based on internationally developed consensus views.[12] In addressing the limitations and difficulties of the 1997 guidelines, an ILCOR task force reviewed and revised the Utstein definition and reporting templates for in-hospital resuscitation in 2004.[14] The technique of CPR based on the international consensus on science has now become a standard in health professional training in many parts of the world.[13] Although guidelines about the conductance and research of CPR have been published, only few data concerning the outcome after cardiac arrest in intensive care units (ICUs) are available from Germany.

ICUs in health institutions serve as a locus of concentrated expertise in medical and nursing care, life sustaining technologies and treatment of complex multi-organ system derangement. Cardiac arrest is not uncommon in patients admitted into an ICU. In an optimally functioning ICU, all arrests should be monitored with immediate response to the arrest by the ICU staff. Electronic monitoring of cardiac rhythm and haemodynamic measurements facilitate this early recognition of cardiac arrest.

Despite the recognised value of the standardised techniques and advanced cardiac life support (ACLS) interventions in the ICU, the patients are disadvantaged by chronic co-existing diseases, severe current medical illnesses and multi-organ failure that may lead to a worse outcome after CPR compared to general ward patients.

Only few data are available concerning the initial CPR success rates and long-term survival in adult ICU and the small numbers of studies performed so far are inconclusive. Initial CPR success rates range from 16.8 to 44% and long-term survival to discharge from hospital ranges from 3.1 to 16.5%.[20–23] However, in the absence of chronic disease, the shorter duration of CPR, the initial rhythm of ventricular tachycardia (VT) or fibrillation (VF) in contrast to asystole and pulseless electrical activity (PEA) and early defibrillation may improve outcome after CPR. Severity of illness has been reported to have a significant predictive value on death after CPR in ICU patients.[4,20,21,24] It has been demonstrated that successful resuscitation depends on the initiation of early basic life support, early defibrillation and prompt institution of advanced cardiac life support. Although the rate of initially successful CPR in ICU patients may be high, long-term and hospital discharge rates have been reported to be unsatisfactory.[3,17]

The purpose of this study is to evaluate the demographic characteristics of patients who suffered cardiac arrest in our ICU as well as to identify those factors influencing outcome after resuscitation following cardiac arrest.

Material and methods

Clinical setting

The Georg-August University Hospital, Goettingen, Germany, is a tertiary hospital with approximately 1400 beds serving a local population of 120,000 and a regional population in the southern part of Lower Saxony of 560,000.

The Department of Anaesthesiology, Emergency and Intensive Care Medicine of this hospital has two intensive care units with a total number of 42 beds. These ICUs not only provide perioperative care but also primary ICU care for all neurosurgical, trauma, cardiothoracic, orthopaedic, obstetric and gynaecological patients. In addition, patients from other departments (e.g. internal medicine, neurology and psychiatry) are occasionally admitted to these ICUs.

There is an established cardiac arrest team (CAT) in the hospital made up of anaesthesiologists and intensive care nurses. This team is available 24 h and can be activated in case of a severe emergency within the hospital. The nurses and doctors are advanced life support (ALS) trained. The CAT is usually not activated when a cardiac arrest occurs within the ICU. Cardiac arrests in these ICUs are jointly managed by on-duty anaesthesiologists, surgical (cardiothoracic/neurosurgical) residents and the nursing staff. The indication for CPR is cardiac arrest confirmed by the ICU staff on duty. This team provides ALS to patients according to a protocol based on the ERC CPR guidelines. The hospital policy is to always initiate CPR in the case of cardiac arrest unless a 'do not attempt resuscitation' (DNAR) order is present in the patients'