Clinical decision making in cardiopulmonary resuscitation

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Summary

In the introduction (Chapter 1), in-hospital resuscitation is placed in the context of the medical goal of preservation of life and medical ethics. The role of doctors, nurses, patients, and their partners in the decision-making about resuscitation is outlined. Next, an overview is given of the history of resuscitation and the recurring discussion around the concept of futile care. We investigated the influence of these aspects of medical decisions to terminate and to withhold cardiopulmonary resuscitation in hospitals on survival probability and (b) quality of life after cardiac arrest followed by a resuscitation attempt, and in the patient's prospects without cardiac arrest, in terms of expected life time and quality-of-life.

Chapter 2 focuses on the termination of resuscitation in patients with a cardiac arrest. We studied patients who were resuscitated in the Academic Medical Centre (AMC) in Amsterdam and analysed factors which could influence resuscitation to terminate resuscitation or not in the criteria to which these patients were exposed. We also assessed the adequacy of the criteria of the European Resuscitation Council and the American Heart Association in terminating resuscitation. For this purpose, we reviewed the mid-stages of resuscitation attempts by the AMC resuscitation team. The study group concerned 80 patients (47 men and 33 women, mean age 61 years). 13 patients were resuscitated on inhospital wards and 67 were resuscitated on the emergency area (mean post-hospital circulatory arrest. The median time to terminate resuscitation was 30 minutes (range 0.0 – 61 minutes). Results from multiple linear regression showed three factors to be independently associated with a
Summary
Cardiac arrest is the highest emergency situation in medicine where, more than in any other treatment, the life is at stake. Doctors and nurses will apply cardiopulmonary resuscitation in order to restart the heart and the respiration of the patient. This not only includes basic life support measures, i.e. external chest compressions and artificial ventilation, but also advanced measures such as endotracheal intubation, intravenous cannulation and often electric shocks (defibrillation). Prolonged life support measures are taken for patients who regain spontaneous blood circulation after resuscitation and this means admission to the intensive care and often mechanical ventilation. A relatively small percentage survives after resuscitation (10 - 20%). Survivors may have serious neurological impairments due to postanoxic encephalopathy or still die after a little while. Historically, the policy of most hospitals is to always initiate resuscitation in case of a cardiac arrest, unless there is a do-not-attempt resuscitation order. However, resuscitation should only be applied if it is effective, useful and not harmful. Doctors, nurses, patients and partners may have different opinions about the conditions among which resuscitation should no longer be applied.

In the Introduction (Chapter 1), in-hospital resuscitation is placed in the context of the medical goal of preservation of life and medical ethics. The role of doctors, nurses, patients and their partners in the decision making about resuscitation is outlined. Next, an overview is given of the history of resuscitation and the ongoing discussion around the concept of futile care. We investigated the influence of three aspects of medical decisions to terminate and to withhold cardiopulmonary resuscitation in hospitals: (a) survival probability and (b) quality of life after cardiac arrest followed by a resuscitation attempt, and (c) the patient’s prospects without cardiac arrest, in terms of expected life time and quality of life.

Chapter 2 focuses on the termination of resuscitation in patients with a cardiac arrest. We studied patients who were resuscitated in the Academic Medical Center (AMC) in Amsterdam and analysed factors which could influence the time to terminate resuscitation, as well as the criteria on which those decisions were based. We also assessed the adequacy of the criteria of the European Resuscitation Council and the American Heart Association to terminate resuscitation. For this purpose, we reviewed the audiotapes of resuscitation attempts by the AMC resuscitation team. The study group concerned 36 patients (27 men and 9 women, mean age 64 years), 19 patients were resuscitated on general wards, and 17 were resuscitated on the emergency room after an out-of-hospital circulatory arrest. The median time to terminate resuscitation was 33 minutes (range 8 - 81 minutes). Results from multiple linear regression showed three factors to be independently associated with a
later time of terminating resuscitation. These factors were (a) more than 5 minutes delay in first order measures (ECG, endotracheal intubation, administration of epinephrine), (b) drawing a biochemistry blood sample and (c) response of the patient with spontaneous circulation. The criteria of the European Resuscitation Council and the American Heart Association did not sufficiently cover all the termination decisions.

Conclusions: to support the decision-making during resuscitation, we recommend to revise the current guidelines with special attention to differences in resuscitation on the wards and the emergency room. Special training is essential for the implementation of these guidelines.

In Chapter 3, we studied determinants of do-not-attempt resuscitation orders in clinical practice. The potential determinants were: expected survival probability after resuscitation, the patient's prospects without cardiac arrest, and the patient's autonomous decision to want no resuscitation. In an open population of hospitalized patients, we reviewed the medical records of the AMC departments of cardiology, internal medicine, neurology, neurosurgery and general surgery. Estimates of survival probability were calculated according to the Pre-arrest Morbidity Score (PAM) and Prognosis after Resuscitation score (PAR). The prospects of the patient's condition was expressed in life expectancy and quality of life (dependency, pain or shortness of breath).

Fifty-eight (12%) of the 470 included patients had a do-not-resuscitate order. Thirty-two (7%) had a PAM of ≥ 5 and 82 patients (17%) had a PAR of ≥ 8. This indicates a low survival probability. The prospects without cardiac arrest and age proved to be independently associated with the presence of a do-not-attempt resuscitation order. The odds ratio (OR) for the presence of such an order increased with a decrease in life expectancy to an OR of 37 for a life time of < 3 months, and an OR of 13 for a dependent life in a nursing home. The odds ratio for a do-not resuscitate order also increased with age to an OR of 4 for patients > 80 years. Survival probability, estimated by PAM and PAR, was not associated with a do-not-attempt resuscitation order. We found indications that PAM and PAR are no ideal predictions scores.

Conclusions: The patient's prospect without cardiac arrest is the main determinant of do-not attempt resuscitation orders in clinical practice, and not the survival probability as indicated by PAM and PAR.

In Chapter 4, we concentrated on the survival probability after resuscitation. Our objective was to identify risk factors for poor survival in relation to the dynamics of pre-arrest morbidities. The medical records of resuscitation patients were reviewed and pre-arrest morbidity was established by categorizing the medical diagnoses according to three functional time frames: before admission, upon admission and during admission. Significant independent
indicators of survival were identified through a logistic regression model. A total of 553 patients were included in the study and 22% survived up to hospital discharge.

Independent indicators for lower survival rates were (a) age ≥ 70 years (OR 0.6), (b) stroke (OR 0.3) and (c) renal failure before admission (OR 0.3), and (d) congestive heart failure during admission (OR 0.4). Indicators for relatively high survival rates were angina pectoris before admission (OR 2.1) and ventricular dysrhythmia as diagnosis upon admission (OR 11). Based on the logistic regression model, about one-fifth of our resuscitation patients could be identified as a high risk group for a poor outcome (≤ 10% survival).

Conclusion: Patients with an increased risk for a poor survival can be identified upon or during admission, when we consider the different prognostic value of morbidities at different time points. Survival or death, however, can not be predicted with absolute certainty.

In Chapter 5, we focus on the quality of life of the survivors. Survival after resuscitation is associated with various degrees of neurological sequelae, and the most favourable outcome is regarded as a life without neurological impairment, the worst outcome is a vegetative state. Although neurological impairments may affect the patients’ quality of life, the two parameters are not synonymous; quality of life plays an essential role in the decision making about resuscitation. We elaborated on the concept of quality of life, the International Classification of Impairments, Disabilities and Handicaps (ICIDH), and the current state of measuring health outcomes after resuscitation. In particular, we discussed the use of the generally advised Glasgow-Pittsburgh Outcome Categories and Overall Performance Categories to evaluate the outcome after resuscitation.

The conclusions are that although these measures seem attractive by their simplicity and practicality, it should be realized that CPC and OPC scores are only crude handicap scales, which rely on clinical judgement and give superficial but not in-depth information. Moreover, at the time of the study, little was known about the quality of life after resuscitation.

In Chapter 6, the long-term survival after resuscitation was assessed and the quality of life of survivors was measured. We determined the impact of patient characteristics before, during and after resuscitation on quality of life, and compared the results with those of others.

In a cohort study of 90 survivors after in-hospital resuscitation, we assessed the various quality of life domains, including cognitive functioning, depression and level of dependence. The used instruments were: Sickness Impact Profile, Mini Mental Status Examination, Center for Epidemiologic Studies-
Depression scale, Rankin Scale, and a Visual Analog Scale to measure the perceived quality of life (range 1 to 10). Most survivors were independent in daily life (75%), 17% of them suffered from cognitive impairments, 16% had depressive symptoms. The mean (SD) score for perceived quality of life was 7 (2). Multivariate regression analysis showed that both impaired quality of life and cognitive dysfunction were partly determined by two factors which were known before resuscitation: a noncardiac reason of admission and older age of the patient. Factors during and after resuscitation, such as prolonged cardiac arrest and coma, did not importantly determine the quality of life or the cognitive functioning of survivors. The quality of life of our patients who survived was worse compared to a reference group of elderly, but better than a reference group of stroke patients. Quality of life did not importantly differ between the compared studies of resuscitation survivors.

Based on these results, we conclude that (a) resuscitation is frequently not successful, but if the patient survives, a relatively good quality of life can be expected; and (b) that quality of life after resuscitation is mostly determined by factors known before resuscitation. These findings may be helpful when informing patients and taking decisions about resuscitation.

In Chapter 7, we concentrate on the patients’ prospects without cardiac arrest in terms of expected life time and quality of life, because doctors, nurses, patients and partners may have different opinions about the conditions among which resuscitation should not be applied.

We also investigated the influence of beliefs of the four groups about the general survival probability after resuscitation on the preference for resuscitation. In a policy analysis, doctors, nurses, patients and their partners evaluated 16 case descriptions, representing fictitious patients with different prospects without cardiac arrest. The prospects consisted of six characteristics: life expectancy, age, physical condition, emotional condition, level of self care and social situation. The respondents rated their preference for resuscitation after each case. A total of 448 persons participated in this study (122 doctors, 173 nurses, 106 patients and 47 partners); 37% of the doctors, 20% of the nurses, 9% of the patients and 11% of the partners realistically expected the survival probability after resuscitation to be 10 - 20%. Expectations of survival significantly influenced the preference for resuscitation. In case of a short life expectancy without cardiac arrest (< 3 months), doctors were more inclined towards no resuscitation than patients, whereas depression and social isolation were more important for patients and their partners. The preference score of the four groups was similarly influenced by aspects of physical condition and self care.

Conclusion: Participants in resuscitation decisions have unrealistic expectations about the survival probability and make complex judgements about
the prospects without cardiac arrest. To make well-balanced decisions, we recommend to educate the participants in do-not-resuscitate decisions about the true outcomes after resuscitation (Chapter 4 and 6). This approach may not prevent a misinterpretation of the patient’s preference by the others. Therefore, we also recommend discussions with the patients in an early stage of hospital admission.

In Chapter 8 we discuss the essential aspects of decisions to terminate and to withhold cardiopulmonary resuscitation in hospitals. These aspects are: the survival probability and quality of life after resuscitation, and the patient’s prospects without cardiac arrest, in terms of expected life time and quality of life. Furthermore, we shortly address the issue of costs and expand on discussing resuscitation with patients and some aspects of decision making. Finally, some suggestions are made for future research.
In Chapter 7, we presented on the patients’ prospects without cardiac arrests by comparing expected life time and quality of life, because doctors, nurses, patients and partners may have different ideas about the conditions among which resuscitation should not be applied.

We also investigated the influence of beliefs of the four groups about the general approval probability after resuscitation on the preference for resuscitation. In a panel analysis, doctors, nurses, patients and their partners evaluated 10 case descriptions, representing fictitious patients with different prospects without cardiac arrest. The prospects consisted of six characteristics: age, sex, organ failure, severity condition, level of self-care and social situation. The respondents rated their approval for resuscitation in each case. A total of 254 persons participated in this study; 127 doctors, 61 nurses, 68 patients and 57 partners. 22% of the doctors, 20% of the nurses, 9% of the patients and 11% of the partners generally expect the survival probability after resuscitation to be 10 - 20%. Expectations of survival significantly influenced the preference for resuscitation. In case of a short life expectancy without cardiac arrest (67 months), doctors, nurses and patients expected no resuscitation for these patients, whereas depression and social isolation were more important for patients and their partners. The preference scores of the four groups were multiple influenced by aspects of physical condition and life now.

Conclusion. Participants in resuscitation decisions have unrealistic expectations about event survival probability and make complex judgments about