Clinical decision making in cardiopulmonary resuscitation

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Citation for published version (APA):
de Vos, R. (1999). Clinical decision making in cardiopulmonary resuscitation

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Chapter 1

Introduction

The central objective of medical care is the preservation of life. Medical care should be treated to such an extent that it benefits the patient, and in this sense, it must be able to be found between the potential benefits and the potential harm related to a specific treatment. Harm may be fortuitous or of the risk of loss of dignity, a poor quality of life, or death. As benefiting may sometimes be worse than death, withholding a treatment may be more beneficial than initiating or maintaining treatment, and preservation of life is thus not the only goal in medicine.

As long as they are legally competent, it is the right of patients to refuse treatment. Patients should be encouraged to decide upon treatment. If they can only make a well-considered choice, it is advisable that a consultation is given.

In medicine, highest medical urgency have to be treated first. The financial cost of treating a single patient should not deprive many others from treatment. Urgency and cost concern the choice between patients and are, well considered, not directly part of the individual relationship between patient and doctor, but rather involve choices at a level of collective health care policies.

The principle of the preservation of life is well established and patients may rely on the life-saving efforts of doctors and nurses. A cardiac arrest is the highest urgency situation in medicine where, more than in any other treatment, the life of a patient is at stake. In order to resuscitate the heart and circulation, doctors and nurses will apply cardiopulmonary resuscitation. This not mainly includes basic life support measures, such as external chest compressions and artificial ventilation, but also advanced measures such as endotracheal intubation, intravenous cannulation, and frequent defibrillation. Prolonged life support measures are taken for patients who require spontaneous blood circulation after resuscitation, and these measures include intensive care admission and frequent mechanical ventilation. The prevalence of resuscitation in Dutch hospitals is about 1.7%, this converts 15,000 to 20,000 patients per year.

Cardiopulmonary resuscitation is one of the few medical interventions which may and must be performed by anyone without direct participation of the medical physician. Also the lay public is trained to perform basic life support measures. Such efforts are justified because patients can only survive in good health if resuscitation is initiated within a few minutes after onset of the cardiac arrest. If resuscitation is delayed, patients may be harmed. That is, they may either have serious neurologic impairments due to perioperative oxygen deprivation following the cardiac arrest or die. The commonly feared complication of resuscitation is a vegetative state, a permanent condition in which the patient has a breathing heart and spontaneous respiration without the possibility to feel, know, smell, see, talk, be or also totally depends on caregivers.
An essential objective of medicine is the preservation of life. Still, doctors and nurses should treat patients in such a way that benefits them most, and in this strive a balance has to be found between the potential benefits and the potential harms related to a specific treatment.\(^1\) Harm may be formulated as the risk of loss of dignity, a poor quality of life, or death. As suffering may sometimes be worse than death, withholding a treatment may be more beneficial than initiating or maintaining treatment, and preservation of life is thus not the only goal in medicine.

As long as they are mentally competent, it is the right of patients to refuse treatment, or parts of that treatment. Patients should be encouraged to decide upon treatment themselves, but they can only make a well considered choice if adequate and truthful information is given.

In medicine, similar patients should be treated equally, and those with the highest medical urgency have to be treated first. The financial costs of treating a single patient should not deprive many others from treatment. Urgency and costs concern the choice between patients and are, well considered, not directly part of the individual relationship between patient and doctor, but rather involve choices at a level of collective health care policies.

The principle of the preservation of life is well established and patients may rely on the life-saving efforts of doctors and nurses. A cardiac arrest is the highest emergency situation in medicine where, more than in any other treatment, the life of a patient is at stake. In order to restart the heart and respiration, doctors and nurses will apply cardiopulmonary resuscitation. This not only includes basic life support measures, such as external chest compressions and artificial ventilation, but also advanced measures as endotracheal intubation, intravenous cannulation and frequent electric shocks (defibrillation). Prolonged life support measures are taken for patients who regain spontaneous blood circulation after resuscitation, and these measures include intensive care admission and frequent mechanical ventilation. The prevalence of resuscitation in Dutch hospitals is about 1.2%, this concerns 18,000 to 25,000 patients per year.\(^2,3\)

Cardiopulmonary resuscitation is one of the few medical interventions, which may (and must) be performed by nurses without direct permission of the treating physician; also the lay public is trained to perform basic life support measures.\(^4\) Such efforts are justified because patients can only survive in good health if resuscitation is initiated within a few minutes after onset of the cardiac arrest. If resuscitation is delayed, patients may be harmed. That is, they may either have serious neurologic impairments due to postanoxic encephalopathy following the cardiac arrest or die.\(^5\) The commonly feared complication of resuscitation is a vegetative state, a permanent condition in which the patient has a beating heart and a spontaneous respiration without the possibility to feel, hear, smell, see, talk he or she totally depends on caregivers.
for fluids, food and comfort. Not only a delayed resuscitation is associated with neurologic impairments, in fact every resuscitation carries this risk in various degrees. The prevalence of neurologic impairments can be as high as 50% in survivors, although most authors report a lower and variable percentage. In view of the possible range of outcomes, resuscitation can thus only be considered successful if the patient survives and has an acceptable quality of life. Finally, since life always ends with cardiac arrest, this does not mean that resuscitation is routinely initiated. At the end of life, when the time has come that a person will die soon, disturbing a patient’s death-bed with resuscitation is not very sensible and conflicts with human dignity.

This introduction on resuscitation suggests that there are many risks and only remote benefits. The ultimate gain is of course survival in good health. Survival after in-hospital resuscitation up to discharge varies from 3 to 28%, with a characteristic survival rate of 15%. Considering that death is the alternative, many find it reasonable to take this chance.

Doctors, nurses, patients and partners
Today, the policy of most hospitals is to always initiate resuscitation unless there is a do-not-attempt resuscitation order. Decisions about resuscitation are not only a matter between doctors and patients. Of course, doctors have to consider the indication for resuscitation. If no survival is expected the patients have no choice. Whether or not resuscitation will be applied, they are expected to die in case of a cardiac arrest. If there is a chance of survival, doctors and patients have to balance the potential benefits of resuscitation with the potential burdens after survival. In this respect, it is sensible to realize what the prospects are for a patient without the occurrence of a cardiac arrest. The patients may decide for themselves, but can share their decision also with their doctor or their partner. When patients are not capable to express their preferences, partners become important advisors of the doctor and in some countries even substituted decision makers for the patient. Nurses have a special role in these matters. They are nearly always the first to witness a cardiac arrest and have to start the resuscitation attempt. Nurses are more often in the neighborhood of patients than doctors, and can have other information about the patient’s preferences, they are also likely to see other signs of the patient’s suffering. Nurses can initiate a discussion about a do-not-attempt-resuscitation order with the patient or the doctor. They can also be important advisors of doctors and patients. However, they will never carry the responsibility for a do-not attempt-to-resuscitate order. This remains a matter of doctors and patients.

Historical overview of resuscitation
In the early days of resuscitation, people attempted to restore only spontaneous respiration. One of the first resuscitation attempts can be found in the Bible.
where the prophet Elijah successfully resuscitated a child with the help of God.\textsuperscript{12} From the 15th to the 18th century, various experiments are known with airway management, mouth-to-mouth respiration and positive pressure ventilation. In the late 19th century and early 20th century, successful open chest cardiac massage was achieved, first in animals, later in men. In that same period experiments of successful open chest defibrillation were reported in animals.\textsuperscript{13}

Modern resuscitation dates from the 1950s when airway management was further developed and endotracheal intubation became an established therapy.\textsuperscript{14} In that period, Zoll and Linenthal successfully treated patients with external defibrillation.\textsuperscript{15} A landmark was an article in the JAMA by Kouwenhoven and colleagues in 1960,\textsuperscript{16} who reported a 70\% survival rate in patients in whom they performed external chest compression. The authors encouraged the clinical application of chest compressions: all that was needed were two hands. This suggestion to universally apply resuscitation was further elaborated by Safar et al., who developed a treatment protocol for airway management (A), rescue breathing (B) and external chest compressions (C).\textsuperscript{17} The well-known ABC-algorithm. Since then numerous lives have been saved by resuscitation. Survival was not the only outcome of resuscitation, also reported was the neurologic outcome,\textsuperscript{18} which was considered synonymous to quality of survival.\textsuperscript{19}

Limitations of resuscitation were recognized in the early seventies.\textsuperscript{20} However, it lasted some 10 years before a universal application of resuscitation was challenged. It was discussed that the range of indications for resuscitation had expanded, but survival had decreased. Illustrative are the titles in medical journals: ‘In-hospital resuscitation 25 years later: why has survival decreased?’,\textsuperscript{21} ‘Why outcome of cardiopulmonary resuscitation on general wards is so poor’,\textsuperscript{22} and ‘Must we always use resuscitation?\textsuperscript{23} Reports followed on do-not-resuscitate decisions and their incidence, implications, and outcomes.\textsuperscript{24} Also ethics in cardiopulmonary resuscitation,\textsuperscript{25} choices\textsuperscript{26} and value judgements\textsuperscript{27} received ample attention.

The last section of the guidelines on resuscitation of the American Heart Association (AHA) in 1986, dealt with medico-legal aspects of cardiopulmonary resuscitation.\textsuperscript{28} Withholding resuscitation and do-not-attempt-resuscitation orders were at that time primarily considered in their legal context, and fear for liability. In 1992, the new guidelines of the AHA included a section on ethical considerations in resuscitation with statements about when to withhold or terminate resuscitation, as unilaterally decided by doctors on the basis of futility.\textsuperscript{29} ‘Futility’ was strictly defined as an expected zero survival when resuscitation was attempted. A less stringent description, in terms of a low survival but not zero, was rejected. This because under these circumstances the physicians would have to make value judgements about the
degree of probability of survival as indication for a resuscitation attempt. The strict definition of futility was opposed by arguing that a zero survival could not be established in scientific studies. Furthermore, opponents of the AHA standpoint argued that futility had still another aspect, namely quality of life. Decisions whether or not to resuscitate were said also to be addressed through this qualitative perspective, and would concern by nature even more value judgements.

A European perspective in resuscitation emerged with the foundation of the European Resuscitation Council. Their standpoint with regard to withholding resuscitation was more liberal than that of the AHA. The Council stated that there could be no rules about withholding resuscitation. One should consider the quality of life prior to the patients’ illness and expected quality of life, as well as the likelihood of successful resuscitation. An interesting statement of the European Resuscitation Council was that if, at any time, patients or relatives requested a resuscitation attempt—contrary to the medical opinion—this should be carried out. This statement is in contrast to the opinion that doctors have no obligation to provide futile care.

Parallel to this discussion, new treatment modalities were studied to improve the survival of patients after resuscitation. Approaches were tried like abdominal counter pulsation, active chest compression and decompression techniques, pneumatic vests, and external defibrillation with semi-automated devices. In the mid-nineties, the general rule to always initiate a resuscitation attempt was maintained, unless there was a do-not-resuscitate order. (These orders are relatively frequent established: 90,800 per year in Dutch Hospitals) At that time, there was still no consensus when resuscitation should be considered futile. Decisions to terminate or withhold resuscitation were left to the judgement of doctors and/or their patients.

Objective of the thesis
The aim of this thesis was to study the influence of three aspects of medical decisions to terminate and to withhold cardiopulmonary resuscitation in hospitals: survival probability and quality of life after cardiac arrest followed by a resuscitation attempt, and the patients’ prospects without cardiac arrest, in terms of expected life time and quality of life.

Structure of the thesis
First a look is given into daily clinical practice. In Chapter 2, the resuscitation team of the Academic Medical Center was monitored about their decisions to terminate resuscitation in patients with a cardiac arrest. We compared the use of decision criteria by the resuscitation team with the existing guidelines of the American Heart Association and European Resuscitation Council to terminate resuscitation. The chapter gives background information about
patients without a do-not-resuscitate order. The considerations for such an order are presented in the next chapter.

In Chapter 3, we studied determinants of do-not-resuscitate orders in our hospital. Particular of interest was the relative influence of survival probability after resuscitation and prospects without cardiac arrest (expected life time and quality of life) on decisions to withhold resuscitation. We reviewed medical records of the departments of cardiology, internal medicine, neurology, neurosurgery and general surgery. Estimates of survival probability after resuscitation were calculated according to two existing pre-arrest morbidity scores: the Pre-arrest Morbidity score (PAM) and Prognosis after Resuscitation score (PAR). Estimates of the prospects without cardiac arrest were given by doctors.

Chapter 4 addresses the predictability of survival after resuscitation, the quantitative aspect of futility. We evaluated the dynamics of morbidity in the clinical course of a group of patients, and distinguished between morbidities present upon admission and new morbidities emerging during admission. Such a distinction is clinically relevant because medical decisions to withhold resuscitation should ideally be discussed upon admission of the patients and adjusted if clinically relevant health changes occur over time.

In Chapter 5, the qualitative aspect of futility is highlighted. Generally, in patient care, the concept of quality of life is rather loosely used, whereas in resuscitation mainly one aspect of quality of life is stressed: the neurologic outcome. We discuss the concept of quality of life and formal instruments for measuring the generic, domain-specific and disease-specific life domains. The outcomes of quality of life after resuscitation are presented in the next chapter.

In Chapter 6, we present information about the long-term survival and quality of life of patients who survived resuscitation. Quality of life was measured by formal instruments. Patient characteristics before, during and after cardiac arrest were related to the main dimensions of quality of life, the neurologic domain included. Furthermore, we asked survivors after resuscitation to rate their perceived quality of life.

In a previous chapter, we could determine the relative influence of survival probability after resuscitation and the prospects without cardiac arrest on a do-not-attempt-resuscitation order (Chapter 3). Whether preferences of the participants in resuscitation decisions were differently influenced by these aspects remained unknown.

In Chapter 7, we therefore investigated the influence of prospects without resuscitation on the decision to withhold the intervention, and also considered the perception of the probability of survival after resuscitation. Respondents were not only patients, but also doctors, nurses and partners of patients. The latter two parties were included since they play an important role in shared or substituted decision making.
In Chapter 8, a general discussion of the findings is presented, implications for patient care are discussed and suggestions are made for future research.

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