

Ethical aspects of resuscitation

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The current technique of cardiopulmonary resuscitation (CPR), applying expired air ventilation and closed chest cardiac massage, was developed at the beginning of the 1960s. It was an easy-to-learn method which was soon disseminated: "Anyone, anywhere, can now initiate cardiac resuscitative procedures. All that is needed are two hands".³⁵ Originally developed for the treatment of sudden and unexpected cardiac arrest in supposedly healthy persons, after the first successes this treatment was extended to cardiopulmonary arrest of any origin. CPR is now considered a routine emergency treatment but the reflex-like initiation of CPR has also entailed criticism. In 1985 an editorial in the *Journal of the American Medical Association* stated: "In some way we have wandered from treating sudden unexpected death to practising universal resuscitation".²⁸ Despite all attempts and modern measures, the majority of resuscitative efforts remain unsuccessful, and only a small minority of patients are returned to their previous health status. Therefore, the appropriateness of CPR procedures has been questioned, especially with respect to individual outcome and patient preference.^{3 12 36}

Ethical reasoning in resuscitation

It may be argued that the nature of a resuscitation attempt, demanding immediate and often irreversible interventions, makes ethical deliberation impossible. Even though CPR is an emergency measure, its practice—just as that of any other medical procedure—must be guided by general ethical principles. Beauchamp and Childress have listed four aspects of bioethics to be considered⁷: (1) ethical theories; (2) principles; (3) rules; and (4) particular judgements and actions.

The decision to start CPR is based on a medical judgement that a person is suffering from circulatory arrest. The decision to resuscitate is justified by the moral rule that the victim of a cardiac arrest has the right to be given the opportunity to survive and to receive CPR. The obligation to give aid also belongs to the generally accepted moral rules.

Moral rules are based on ethical principles. Beauchamp and Childress suggest four principles for acceptance as action guides in medicine⁷:

- the principle of beneficence;
- the principle of nonmaleficence;
- the principle of respect for autonomy;
- the principle of justice.

The precise distinction between rules and principles is controversial. Principles are characterized as general and fundamental, and serve to justify moral rules.⁷ Rules are related to specific contexts and more restricted in scope. Principles are conceived as binding, but not absolutely binding. This permits each basic principle to have weight without the determination of a ranking.⁷ Which principle applies in a case of conflict depends on the unique emergency situation.

Ethical theories represent the integration of principles and rules, depending on individual beliefs and customs.⁷ Diverse scientific, metaphysical and religious beliefs may determine the interpretation of a situation and the ethical theory. Ethical theories may serve to justify the principle, the rule and the particular judgement, but they are abstract in nature and may be inapplicable in clinical practice. How might the ethical principles be taken into consideration in clinical resuscitation practice and what might be their consequences?

BENEFICENCE

The principle of beneficence encompasses the fundamental goals of medicine, which are⁴⁵:

- preservation of life;
- restoration of health;
- relief of suffering;
- restoration or maintenance of function.

Modern resuscitation procedures, training of lay persons in basic life support and expansion of effective emergency cardiac care systems have saved many victims from pre-hospital and in-hospital sudden death. The success and beneficence of standardized resuscitation procedures is emphasized by the American Heart Association at the beginning of the Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiac Care: "In the past 30 years, since the introduction of modern

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techniques of CPR, there have been dramatic advances in emergency cardiac care of victims with profound circulatory collapse and cardiac arrest. These techniques have restored the lives of many people when breathing has ceased and the heart has stopped beating".² Attempts have been made to identify factors indicating a favourable prognosis after resuscitation in the pre-hospital setting in order to provide criteria to facilitate the decision whether to initiate, withhold or discontinue resuscitation attempts.^{13,25} The highest survival rate after cardiac arrest occurs when the collapse is observed, when circulatory arrest is caused primarily by cardiac failure with ventricular fibrillation, when lay persons have already applied bystander resuscitation and when professional support arrives at the scene within a very short time.²⁵

However, the overall long-term survival rate of 70% reported in the historical article by Kouwenhoven, Jude and Knickerbocker³⁵ has not been reproduced in more recent investigations. Comparison of different publications on outcome of resuscitation attempts shows an initial resuscitation success in terms of restoration of the circulation of up to 50% (table 1). The proportion of patients who survive after a cardiac arrest to discharge from hospital ranges from 0 to 20%. The results of studies vary, depending on differences in cause and location of circulatory arrest (in-hospital *vs* pre-hospital) and the varying effectiveness of emergency care.

Interviews with survivors of cardiac arrest show that resuscitation and survival are evaluated positively by the majority of patients. Bedell and colleagues¹⁰ interviewed 38 mentally competent survivors of circulatory arrest at the time of discharge from hospital; 21 (55%) said that they would choose to be resuscitated in the future. Follow-up of 28 survivors of cardiac arrest, interviewed 19–43 months after hospital discharge, showed that 89% felt positive about the resuscitation, and 67% would consent to another resuscitation attempt.⁴²

NONMALEVOLENCE

Nonmaleficence incorporates the principle of "above all do not harm, or *primum non nocere*"! Nonmaleficence implies avoiding anything that might have negative consequences, whereas

beneficence means the performance of positive acts to promote good.⁷

In the event of circulatory arrest, the patient is in danger of dying within minutes. Any resuscitation attempt aims at averting death (maleficence) and saving life (beneficence). Can further damage be inflicted by a resuscitation attempt?

Resuscitative efforts are unsuccessful in the majority of cases. In at least 50% of cardiac arrests, the action of the heart cannot be restored (table 1); another 30% die in hospital after successful restoration of the circulation. For these patients, resuscitation means an extension of the process of dying by hours or days, often without regaining consciousness and accompanied by the concomitants of intensive care treatment, such as tracheal intubation and artificial respiration. This means considerable suffering for the patient and relatives, and is a heavy burden for those involved, including the hospital staff. Of those who survive, approximately 20–50% suffer from neurological disabilities,²³ ranging from slight disturbances of cognitive functions to the "ultimate tragedy" of resuscitation⁵—severe hypoxic brain damage (persistent vegetative state).

Evaluation of survivors of cardiac arrest revealed a decrease in functional status caused by the fear of another cardiac arrest.¹⁰ Others reported that 35% of survivors had a reduced capacity to perform activities in everyday life.⁴⁶ These disabilities often resulted in physical dependence on other people (nursing homes); only a small percentage were able to return to work. Altered social contacts were common after the cardiac arrest, with 42% of patients complaining of social isolation.⁴⁶

High survival rates after cardiopulmonary arrest are the exception rather than the rule.⁸ Centres reporting their results may indicate a particular interest in emergency cardiac care in these locations. Therefore, these centres might not be representative of all communities or hospitals. Overall survival rates in the USA have been estimated to be only 3–5%.⁸

CPR after trauma is associated with a very poor outcome, with a survival rate close to zero.^{15,43} These discouraging results are independent of differences in patient selection and levels of trauma care. Even in physician-staffed pre-hospital trauma care systems, the chance of surviving a post-traumatic cardiac arrest is minimal. The poor results are very

Table 1 Outcome of pre-hospital and in-hospital cardiopulmonary resuscitation in the adult

				No. of CPR attempts	Initially successful (%)	Discharged alive (%)
Westfal ⁵⁰	New York	1996	Pre-hosp.	481	17.9	1.5
Schultz ⁴⁴	Washington	1996	In-hosp.	266	28.2	9.0
Gaul ²⁷	Vienna	1996	Pre-hosp.	249	43.8	10.8
Valentin ⁴⁷	Vienna	1995	In-hosp.	253	55.7	19.8
Wuerz ⁵¹	Hershey	1995	Pre-hosp.	532	17.1	5.3
Kass ³¹	Albany	1994	Pre-hosp.	599	32.2	6.0
Beuret ¹¹	Lausanne	1993	In-hosp.	181	29.8	12.7
Juchems ³⁰	Aschaffenburg	1993	In-hosp.	574	46.7	20.2
Kellermann ³³	Memphis	1993	Pre-hosp.	1068	29.0	8.0
Kettler ³⁴	Göttingen	1992	Pre-hosp.	429	43.1	17.9
Total			Pre-hosp.	3358	29.1	7.7
			In-hosp.	1274	42.2	16.7
				4632	32.7	10.2

disappointing considering the generally young age of the victims and the high expenditure which is often required for rescue operations associated with accidents.¹⁵

The poor survival rates after a traumatic cardiac arrest have led to discussion of futility in resuscitation. Initiation of CPR is obviously not indicated when there are signs of death, such as post-mortem lividity, rigor mortis or decomposition. Nevertheless, even if these signs are absent, the efficacy of a resuscitation attempt may be in doubt and the aspect of futility has to be considered. For a treatment to be judged futile it must be ascertained that it has no benefit. The benefit of a treatment depends on the outcome of the intervention, the probability of that outcome and the patient's perception of that outcome.²¹ There are some situations where efforts to resuscitate appear to be futile with regard to the expected physiological outcome. Unilateral decisions by physicians to withhold or terminate resuscitation based on a medical judgement of futility may be justified²:

- in conditions where scientific investigations have demonstrated the ineffectiveness of resuscitative efforts;
- in patients suffering cardiac arrest despite optimal treatment to maintain vital functions (e.g. in progressive cardiogenic shock);
- in patients where appropriate resuscitative efforts have been attempted without restoration of circulation.

These circumstances represent the recommendations of the 1992 American Heart Association conference panel on ethical issues in adult resuscitation. It was the consensus that futility should be strictly defined and that it should represent zero benefit.²¹ Using the term futility more loosely involves value judgements which need to be discussed with the patient or his surrogate.²

PATIENT AUTONOMY

Physicians do not have the right to treat patients without their consent: *Voluntas aegroti suprema lex*. The right to consent or to refuse is based on the principle of respect for autonomy.⁷ Physicians must obtain informed consent from patients before undertaking procedures. The following elements have been proposed as the components of informed consent⁷: (1) competence; (2) disclosure of information; (3) understanding of information; (4) voluntariness; and (5) authorization

The process of informed consent from a competent patient involves adequate disclosure and understanding of information concerning the consequences of the intervention and the potential alternatives so that a voluntary decision to authorize or refuse a medical procedure can be made. In bioethical contexts *competence* implies the ability to make a decision as to whether or not a therapeutic or diagnostic procedure should be undertaken.⁷ The patient's decision should reflect rational considerations based on information given by the physician. The process of *disclosure* includes information on the nature of the disease, prognosis and risks and

benefits of the various options. However, there seems to be a considerable lack of *understanding* by patients of the procedure of resuscitation and the prognostic implications. For example, it has been demonstrated that providing knowledge about CPR and survival rate can lead to a marked decrease in consent to resuscitation in the elderly.³⁹ A high percentage (41%) of ambulatory patients interviewed in a geriatric practice said they would opt for CPR if they had a cardiac arrest during an acute illness. In the case of cardiac arrest during a chronic illness (life expectancy less than 1 yr), the number of patients choosing CPR decreased considerably (11%). There was a further reduction in acceptance of resuscitation attempts after additional information was disclosed as to the probable rate of survival in both conditions: now only 22% would still opt for CPR during an acute illness, and only 5% of the elderly patients would choose to undergo CPR during a chronic disease. These results emphasize the essential need for prognostic information for the patient to make an informed decision concerning CPR.³⁹

Patient's autonomy in resuscitation

Voluntariness means "being free to act", a vital precondition for autonomous *authorization* of a diagnostic or therapeutic intervention.⁷ However, within seconds after cardiac arrest the patient loses consciousness, and thus his decision-making capacity. He is incapable of communicating his treatment preferences, or his right to accept or reject treatment. Thus the decision to perform CPR in sudden cardiac arrest is usually made without the patient's involvement. Consent to administer CPR is presumed. Physicians (and all others involved) have an obligation to serve as the patient's advocate by attempting to avoid undue harm. Such behaviour might be judged a "paternalistic" approach in medical practice, but we believe it should be considered primarily as an attempt to do what is assumed to be in the patient's best interests. Those who want to make an independent decision as to whether or not resuscitation attempts should be started must express their wishes in advance or through a surrogate.

Do-not-resuscitate orders

The patient's wish not to be resuscitated has been recognized as a potential criterion for withholding CPR.² Do-not-resuscitate (DNR) orders written by patients or their physicians have been established to provide a mechanism for withholding specific resuscitative therapies in the event of cardiac arrest. DNR orders mean that no measures are undertaken to restore spontaneous cardiac rhythm and respiration.³²

Patients may write DNR orders to express their preferences in advance, at a time when they are capable of making informed decisions. These decisions are often made with regard to quality of life statements. The patient's perception of whether or not it is worthwhile to survive is based on his

individual value judgements which may be influenced by religious views. Patients having lived nearly their full lifespan, living entirely dependent on others, or those with a severe underlying disease and a poor prognosis may choose to refuse life-prolonging treatment.⁴¹ Others do not want to undergo the risk of a "nearly successful" resuscitation, with long-term intensive care treatment and without restoration of their previous health. Nevertheless, being chronically ill does not inevitably imply that the patient may refuse CPR.⁴¹ It has been reported that even those elderly people who are severely ill or disabled opt for CPR.¹⁷ An individual patient's expectation of CPR might not be *restitutio ad integrum*, but merely to extend his lifespan to allow participation in a forthcoming family event. Therefore physicians should assess carefully the factors which influence the patient's decision. The risk of provoking anxiety by discussing the appropriateness of resuscitation seems to be negligible.³⁷

Physicians' attitudes

Respect for patient autonomy may be irrelevant when CPR has no potential benefit.¹² While patients may write a DNR order, physicians may also make a unilateral decision to withhold resuscitative attempts in a patient near death who is unable to communicate his preferences. In the patient suffering from a terminal disease, the physician's normal commitment to preserving life is not in accord with the patient's interests, if futile suffering is to be avoided. Restoring the circulation only prolongs the process of dying. If, because of the underlying disease, the patient is incapable of understanding the nature of a DNR decision and did not express preferences in advance, the options should, if appropriate, be discussed with the patient's relatives. Although the right of proxies to withhold or terminate life-sustaining treatment is not generally accepted, in the incompetent patient the physician often has to rely on the views of family members regarding the patient's potential wishes. In addition, family members may play an important role in the care of terminally ill patients, in particular if the patient is going to die at home. Relatives should be informed about the expected process of dying, possible events and their own reactions and behaviour. Patients and their relatives should be assured that any care necessary to relieve suffering will be given or continued, as withholding CPR does not mean withholding all medical treatment.⁶

In clinical practice the question arises to what extent patient preference is taken into account. Some resuscitation attempts may be performed on cardiac arrest patients who have a terminal disease and do not want the procedure. In a retrospective review, Dull and colleagues attempted to determine the percentage of resuscitation attempts which were unwanted or were undertaken in pre-hospital patients suffering conditions associated with poor survival rates.²² Unwanted resuscitation was assumed if there was a living will, other advance directives or corresponding statements by family

members or by the patient's private physician. One-third of all resuscitative attempts occurred in chronically ill patients (25%) or patients who did not want CPR (7%). The hospital discharge rate in both groups was lower than the discharge rate (16%) for cardiac arrest patients overall: 8% of patients suffering from chronic diseases and 2% who did not want to be resuscitated survived to hospital discharge.²² These findings demonstrate the difficulties in elucidating pre-arrest conditions with poor prognoses and the limitations in honouring living wills and DNR orders in the field. Sometimes family members may panic in the face of death and call the emergency medical service, leading to unwanted resuscitation attempts.

On the other hand, the absence of a DNR order does not necessarily mean that any patient suffering from cardiac arrest receives full resuscitative efforts. The duration and intensity of advanced cardiac life support may vary depending on the physician's perception of the likelihood of benefit to the individual patient.²⁶ One factor associated with short resuscitative attempts in hospitalized patients was age more than 75 yr.²⁶ This finding and the results of a recently published survey of emergency physicians³⁸ support the hypothesis that age plays an important role in the decision to terminate unsuccessful CPR, although it is widely accepted that not age, but other factors such as co-morbidity and pre-arrest functional status are more important determinants of outcome.^{30 48 49 51}

Clemency and Thompson surveyed anaesthetists to determine their opinions regarding DNR orders in the perioperative period.¹⁸ Almost two-thirds of 190 responding anaesthetists assumed DNR-suspension and only 50% discussed this assumption with the patient.¹⁸ If a patient with a DNR order suffers intra-operative arrest because of the underlying disease, 34% of anaesthetists interviewed said they would resuscitate; 68% would perform CPR if the patient had an iatrogenic-induced arrest during surgery.¹⁶ The withholding and withdrawing of life support by critical care physicians had been analysed to determine current practice in adult intensive care medicine.⁴ One-third of physicians were reported to have refused patients' or surrogates' wishes to discontinue treatment. Many physicians also reported the unilateral decision to withhold (83%) or withdraw (82%) life-sustaining treatment which they had judged to be futile, some of these decisions being made without the patient's knowledge and consent, and some despite their objections.⁴ Often patients are not involved in discussions about their DNR status, or physicians write DNR orders at a time when the majority of patients are considered incompetent.¹⁰ Even among seriously ill hospitalized patients, only a minority (29%) said they had discussed their CPR preferences with their physician.⁴¹

JUSTICE

This principle affects priorities in the allocation of health-care resources. Justice may be defined as giving to each person that which is due, and which can be claimed legitimately.⁷

CPR should be allocated throughout the community and within the hospital at a comparable level. It is a matter of justice to ensure some degree of equitable distribution of medical resources to all citizens.² Performing CPR which is inappropriate or futile may delay or prevent emergency treatment in other patients with a better chance of survival. This conflict is not restricted to CPR efforts or to the use of expensive and scarce resources, such as intensive care units and helicopters. In times when the demands on the health care system are competing heavily because of cutbacks in available public funds, it is increasingly important to provide fairness by common agreement.

Every citizen has the right to receive CPR. However, differences in survival of pre-hospital cardiac arrest patients related to race and socio-economic status have been identified.^{9,29} In Chicago, Blacks were significantly less likely to undergo initially successful resuscitation, to be admitted to hospital or to survive until the time of discharge.⁹ In Seattle, a higher socio-economic status was associated with a higher rate of survival.²⁹ Possible explanations include better access to health care and better state of general health. Witnessed cardiac arrests and bystander CPR were less frequent in Blacks,⁹ whereas there were no differences in emergency service system response times and proportion of cases receiving advanced cardiac life support.^{9,20} Interviews with emergency service system personnel in Oslo demonstrated that the social status of the patient did not influence the decision of whether or not to start CPR.⁴⁰

Taking into account the serious shortage of organs suitable for transplantation, the use of expensive medical emergency resources in pre-hospital trauma management might be justified if it provided a source of organs. Young trauma victims with isolated, mortal head injury might be excellent candidates for organ donation if their vital functions can be maintained long enough to undergo organ evaluation.¹⁹ The appropriateness of initiating or continuing life-sustaining therapies solely for the aim of organ procurement has to be questioned. The decision to resuscitate should be based primarily on each individual's chance to survive, taking the aspects of beneficence and nonmaleficence into consideration. Therefore, the aspect of organ procurement in resuscitation is an area of considerable sensitivity requiring further discussion.²

Conclusions

The question of the ranking between the different ethical principles is still a matter of discussion. Autonomy has been emphasized as the primary principle from which all others derive.²⁴ However, respect for autonomy is not the only principle and should not be overvalued if it conflicts with other aspects. In the clinical situation of cardiac arrest, the weight of respect for autonomy may be minimal while the weight of nonmaleficence and beneficence may be maximal.⁷

Physicians have an obligation to consider the therapeutic efficacy of CPR. The optimal solution

would be to start resuscitation only in those patients with the potential for long-term survival (beneficence), but this can rarely be determined at an early stage.¹⁴ In otherwise healthy individuals the standard of care remains prompt initiation of CPR. The time frame in cardiac arrest requires medical decision-making within seconds. Failure to administer prompt CPR would result in the patient's death.

Chronic or terminally ill patients should be encouraged to determine in advance whether resuscitative efforts should be initiated in the case of cardiac arrest. In these patients cardiac arrest is not a sudden event, but the end of the process of dying and therefore might be anticipated. Patients' preferences have to be assessed carefully in a compassionate way. Some patients may feel uncomfortable making life-or-death decisions, while others want to participate in the decision-making process. The in-hospital use of DNR orders seems to be increasingly common in several countries, whereas its acceptance in the pre-hospital setting is still a matter of debate.¹ Medical guidelines, ethical policies and legal conditions have to be developed to allow emergency service system personnel to respect the patient's autonomy in the field by honouring advance directives, without the fear of legal action. There is a clear need to discuss these issues in a public forum. We do not feel that it should be mandatory for every citizen to write advance directives, but public information and education should increase the number of people doing so voluntarily.

We feel that, in some instances, to save the patient's life might not be the *final* goal. Decisions taking into account the potential futility of treatment should consider the patient's perception of quality of life by respecting his individual hierarchy of values. To survive without restoration of pre-arrest health status may be of only limited benefit to the patient with serious advanced disease. Survival with physical or mental impairment may be strenuous. Sometimes resuscitative efforts save only to prolong the dying process, whereas sudden death from cardiac arrest could seem like a release.

If there is any doubt about the appropriateness of withholding resuscitative attempts, CPR should be initiated. Life-sustaining therapies can be withdrawn at a later time when proper medical, legal and ethical considerations have been addressed more thoroughly.¹ Training programmes have to be integrated into academic education to enable physicians to analyse and deal with ethical conflicts. The physician's moral decision should be based on the knowledge of the relevant ethical principles, remembering what is expressed in the Hippocratic oath: "I will use treatment to help the sick according to my ability and judgement (beneficence), but I will never use it to injure or wrong them (nonmalevolence)".⁷

References

1. American College of Emergency Physicians. Guidelines for 'do not resuscitate' orders in the prehospital setting. *Annals of Emergency Medicine* 1988; 17: 1106-1108.

2. American Heart Association. Guidelines for cardiopulmonary resuscitation and emergency cardiac care. *Journal of the American Medical Association* 1992; **268**: 2171–2302.
3. Alpers A, Lo B. When is CPR futile? *Journal of the American Medical Association* 1995; **273**: 156–158.
4. Asch DA, Hansen-Flaschen J, Lanken PN. Decisions to limit or continue life-sustaining treatment by critical care physicians in the United States: Conflicts between physicians' practices and patients' wishes. *American Journal of Respiratory and Critical Care Medicine* 1995; **151**: 288–292.
5. Baskett PJF. Ethics in cardiopulmonary resuscitation. *Resuscitation* 1993; **95**: 1–8.
6. Baskett PJF. The ethics in cardiopulmonary resuscitation. A statement by the chairman of the European Resuscitation Council. Reproduced from Evans TR, Colquhoun M, Handley AJ, eds. *The ABC of Resuscitation*, 3rd Edn. London: British Medical Association, 1994.
7. Beauchamp TL, Childress JF. *Principles of Biomedical Ethics*, 4th Edn. New York: Oxford University Press, 1994.
8. Becker LB. The epidemiology of sudden death. In: Paradis NA, Halperin HR, Nowak RM, eds. *Cardiac Arrest: the Science and Practice of Resuscitation Medicine*. Baltimore: Williams and Wilkins, 1996; 28–47.
9. Becker LB, Han BH, Meyer PM, Weight FA, Rhodes KV, Smith DW, Barrett J and the CPR Chicago Project. Racial differences in the incidence of cardiac arrest and subsequent survival. *New England Journal of Medicine* 1993; **329**: 600–606.
10. Bedell SE, Delbanco TL, Cook EF, Epstein FH. Survival after cardiopulmonary resuscitation in the hospital. *New England Journal of Medicine* 1983; **309**: 569–576.
11. Beuret P, Feihl F, Vogt P, Perret A, Romand JA, Perret C. Cardiac arrest: prognostic factors and outcome at one year. *Resuscitation* 1993; **25**: 171–179.
12. Blackhall LJ. Must we always use CPR? *New England Journal of Medicine* 1987; **317**: 1281–1285.
13. Bonin MJ, Pepe PE, Kimball KT, Clark PS. Distinct criteria for termination of resuscitation in the out-of-hospital setting. *Journal of the American Medical Association* 1993; **270**: 1457–1462.
14. Bossaert L. Ethical issues in resuscitation. In: Vincent JL, ed. *Yearbook of Intensive Care and Emergency Medicine*. Berlin: Springer, 1995: 408–415.
15. Bouillon B, Walther T, Krämer M, Neugebauer E. Trauma und Herzkreislaufstillstand. *Anaesthesist* 1994; **43**: 786–790.
16. Boyd G, Boudreaux A. DNR orders in the operating room: A survey of anesthesiologists' opinions and concerns. *Anesthesiology* 1991; **75**: A900.
17. Bruce-Jones P, Roberts H, Bowker L, Cooney V. Resuscitating the elderly: what do the patients want? *Journal of Medical Ethics* 1996; **22**: 154–159.
18. Clemency MV, Thompson NJ. 'Do not resuscitate' (DNR) orders and the anesthesiologist: A survey. *Anesthesia and Analgesia* 1993; **76**: 394–401.
19. Cocanour CS, Ursic C, Fischer RP. Does the potential for organ donation justify scene flights for gunshot wounds to the head? *Journal of Trauma* 1995; **39**: 968–970.
20. Cowie MR, Fahrenbruch CE, Cobb LA, Hallstrom AP. Out-of-hospital cardiac arrest: racial differences in outcome in Seattle. *American Journal of Public Health* 1993; **83**: 955–959.
21. Crimmins TJ. Ethical issues in adult resuscitation. *Annals of Emergency Medicine* 1993; **22**: 495–501.
22. Dull SM, Graves JR, Larsen MP, Cummins RO. Expected death and unwanted resuscitation in the prehospital setting. *Annals of Emergency Medicine* 1994; **23**: 997–1002.
23. Eleff SM, Hanley DF. Postresuscitation prognostication and declaration of brain death. In: Paradis NA, Halperin HR, Nowak RM, eds. *Cardiac Arrest: the Science and Practice of Resuscitation Medicine*. Baltimore: Williams and Wilkins, 1996; 910–922.
24. Engelhardt HT Jr. *The Foundations of Bioethics*. New York: Oxford University Press, 1996.
25. Eisenberg M, Cummins R, Larsen M. Numerators, denominators and survival rates: reporting survival from out-of-hospital cardiac arrest. *American Journal of Emergency Medicine* 1991; **9**: 544–546.
26. Fried TR, Miller MA, Stein MD, Wachtel TJ. The association between age of hospitalized patients and the delivery of advanced cardiac life support. *Journal of General Internal Medicine* 1996; **11**: 257–261.
27. Gaul GB, Gruska M, Titscher G, Blazek G, Havelec L, Marktl W, Muellner W, Kaff A. Prediction of survival after out-of-hospital cardiac arrest: results of a community-based study in Vienna. *Resuscitation* 1996; **32**: 169–176.
28. Haynes BE, Niemann JT. Letting go: DNR orders in pre-hospital care. *Journal of the American Medical Association* 1985; **254**: 532–533.
29. Hallstrom A, Boutin P, Cobb L, Johnson E. Socioeconomic status and prediction of ventricular fibrillation survival. *American Journal of Public Health* 1993; **83**: 245–248.
30. Juchems R, Wahlig G, Frese W. Influence of age on the survival rate of out-of-hospital and in-hospital resuscitation. *Resuscitation* 1993; **26**: 23–29.
31. Kass LE, Eitel DR, Sabulsky NK, Ogden CS, Hess DR, Peters KL. One-year survival after prehospital cardiac arrest: the Utstein style applied to a rural-suburban system. *American Journal of Emergency Medicine* 1994; **12**: 17–20.
32. Keffer MJ, Keffer HL. Do-not-resuscitate in the operating room: Moral obligations of anesthesiologists. *Anesthesia and Analgesia* 1992; **74**: 901–905.
33. Kellerman AL, Hackman BB, Somes G. Predicting the outcome of unsuccessful prehospital advanced cardiac life support. *Journal of the American Medical Association* 1993; **270**: 1433–1436.
34. Kettler D, Bahr J, Busse C, Mantzaris A. Effekt der Ersthelfer- (Laien-)Reanimation auf die kardiopulmonale Wiederbelebung. *Anaesthesiologie Intensivmedizin Notfallmedizin Schmerztherapie* 1992; **27**: 244–247.
35. Kouwenhoven WB, Jude JR, Knickerbocker GG. Closed-chest cardiac massage. *Journal of the American Medical Association* 1960; **173**: 1064–1067.
36. Lo B, Steinbrook RL. Deciding whether to resuscitate. *Archives of Internal Medicine* 1983; **143**: 1561–1563.
37. Morgan R, King D, Prajapati C, Rowe J. Views of elderly patients and their relatives on cardiopulmonary resuscitation. *British Medical Journal* 1994; **308**: 1677–1678.
38. Mohr M, Bahr J, Schmid J, Panzer W, Kettler D. The decision to terminate resuscitative efforts: results of a questionnaire. *Resuscitation* 1997; **34**: 51–55.
39. Murphy DJ, Burrows D, Santilli S, Kemp AW, Tenner S, Kreiling B, Teno J. The influence of the probability of survival on patients' preferences regarding cardiopulmonary resuscitation. *New England Journal of Medicine* 1994; **330**: 545–549.
40. Naess AC, Steen E, Steen PA. Ethics in treatment decisions during out-of-hospital resuscitation. *Resuscitation* 1997; **33**: 245–256.
41. Phillips RS, Wenger NS, Teno J, Oye RK, Youngner S, Califf R, Layde P, Desbiens N, Connors AF, Lynn J for the SUPPORT Investigators. Choices of seriously ill patients about cardiopulmonary resuscitation: correlates and outcomes. *American Journal of Medicine* 1996; **100**: 128–137.
42. Röwer N, Klöss T, Püschel K. Langzeiterfolg und Lebensqualität nach präklinischer kardiopulmonaler Reanimation. *Anaesthesiologie Intensivmedizin Notfallmedizin Schmerztherapie* 1985; **20**: 244–250.
43. Rosemurgy AS, Norris PA, Olson SM, Hurst JM, Albrink MH. Prehospital traumatic cardiac arrest: the cost of futility. *Journal of Trauma* 1993; **35**: 468–473.
44. Schultz SC, Cullinane DC, Pasquale MD, Magnant C, Evans SRT. Predicting in-hospital mortality during cardiopulmonary resuscitation. *Resuscitation* 1996; **33**: 13–17.
45. Snider GL. The do-not-resuscitate order. Ethical and legal imperative or medical decision? *American Review of Respiratory Disease* 1991; **143**: 665–674.
46. Sunnerhagen KS, Johansson O, Herlitz J, Grimby G. Life after cardiac arrest; a retrospective study. *Resuscitation* 1996; **31**: 135–140.
47. Valentin A, Karnik R, Donath P, Winkler WB, Slany J. Outcome of cardiopulmonary resuscitation in hospitalized patients. *Resuscitation* 1995; **30**: 217–221.
48. Van Hoeyweghen RJ, Bossaert LL, Mullie A, Martens P, Delooy HH, Buylaert WA, Calle PA, Corne L. Survival after

- out-of-hospital cardiac arrest in elderly patients. Belgian Cerebral Resuscitation Study Group. *Annals of Emergency Medicine* 1992; **21**: 1179–1184.
49. Varon J, Fromm RE. In-hospital resuscitation among the elderly: Substantial survival to hospital discharge. *American Journal of Emergency Medicine* 1996; **14**: 130–132.
 50. Westfal RE, Reissman S, Doering G. Out-of-hospital cardiac arrest: an 8-year New York City experience. *American Journal of Emergency Medicine* 1996; **14**: 364–368.
 51. Wuerz RC, Holliman CJ, Meador SA, Swope GE, Balogh R. Effect of age on prehospital cardiac resuscitation outcome. *American Journal of Emergency Medicine* 1995; **13**: 389–391.