

# Decisions on cardiopulmonary resuscitation

## Medical-ethical guidelines and recommendations

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The German text is the authentic version.

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The Central Committee of the Swiss Professional Association for Nurses (SBK/ASI) has taken note of these guidelines and recommends that its members and all nurses should abide by them.

# Decisions on cardiopulmonary resuscitation

## Medical-ethical guidelines and recommendations

### I. Preamble

About 60,000 people die each year in Switzerland. The majority of these deaths are due to cardiac arrest resulting from a serious pre-existing condition. However, in around 6000 cases (precise statistics are not available) sudden cardiac arrest occurs without any previous signs of disease giving cause for alarm, often outside the hospital setting. Thanks to modern resuscitative measures, some of these patients (currently less than 10% in Switzerland) can be saved. Success depends crucially on the immediate availability and the quality of (rapidly initiated) resuscitative measures.

In theory, resuscitation can be attempted in every situation in which cardiac arrest occurs. However, fundamental questions inevitably arise – the question of the chances of success and the appropriateness of resuscitation efforts in the individual case, and whether in a given situation attempted resuscitation is actually in accordance with the wishes of the patient concerned.

The success or failure of resuscitative measures depends on the pre-arrest state of health and the circumstances in which the cardiac arrest occurs. These factors cannot be reliably assessed either in advance or in the acute situation. The public's perception of the circumstances and outcome of resuscitation efforts is often distorted and overly optimistic. As a result of social expectations regarding what is medically possible, physicians and other professionals – especially emergency medical services – increasingly feel obliged to initiate resuscitative measures immediately for every patient in cardiac arrest. However, such measures are not medically indicated in every case, nor are they desired by all patients.

Decisions about resuscitation often involve considerable emotional stress for all concerned. For physicians and other professionals, in particular, dilemmas may arise from the duty to save life, to do no harm and to respect the patient's wishes.

Because there is no time for an evaluation of interests when cardiac arrest occurs, the topic of resuscitation should be discussed early on. By defining the procedure in advance, it is possible to include the patient in the decision-making process. The decision on whether resuscitation is to be attempted must be transparent and readily comprehensible. It must respect the patient's dignity, right to life and autonomy, and it must not be influenced by external value systems or by economic considerations.

The present guidelines are mainly concerned with advance decisions regarding resuscitative measures in the event of cardiac arrest. The guidelines are designed to support the decision-making process and offer guidance for discussions about resuscitation attempts. They also contain advice on decision-making in the cardiac arrest situation.

## II. Guidelines

### 1. Scope

The present guidelines are addressed primarily to physicians<sup>1</sup> and healthcare professionals, and especially to nurses and paramedics, both within and outside healthcare institutions. They deal first with the decision on whether or not cardiopulmonary resuscitation<sup>2</sup> measures are to be provided in the event of respiratory or cardiac arrest<sup>3</sup> in adults or children. They focus on the process leading up to this decision. Although the guidelines are intended for institutions in particular, they are also broadly applicable to the general practice setting. Also included is advice on the procedure to be followed in the event of sudden cardiac arrest occurring in or out of an institution.

The decision not to attempt CPR in a given situation (DNAR<sup>4</sup> decision) must not affect any other aspect of the patient's medical treatment and care, including measures designed to prevent cardiac arrest. Accordingly, these guidelines do not cover decisions regarding diagnostic and therapeutic measures which are not directly associated with acute cardiac arrest, e.g. intensive and palliative care<sup>5</sup>.

CPR in newborns is a separate issue and is not dealt with in these guidelines<sup>6</sup>.

### 2. CPR decision

#### 2.1. Ethical considerations

CPR decisions are based on three principles of medical ethics which may conflict in specific situations, namely the principles of beneficence and non-maleficence and the duty to respect patient autonomy. The principle of beneficence involves a duty to preserve the patient's life if possible and underpins the initiation of CPR efforts in an emergency with no advance knowledge. The duty to do no harm underpins the withholding of CPR measures if they would impose an unnecessary burden on the patient. Finally, the duty to respect patient autonomy requires that, if the patient so wishes, CPR should not be attempted.

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<sup>1</sup> On being incorporated into the Code of the Swiss Medical Association (FMH), the guidelines become binding for all members of the FMH.

<sup>2</sup> For simplicity, the term "resuscitation" or "CPR" is used hereafter.

<sup>3</sup> Referred to hereafter as "cardiac arrest". Cardiac arrest is characterized by the lack of mechanical heart activity, diagnosed clinically on the basis of unconsciousness, apnoea or gasping respiration and absence of pulse.

<sup>4</sup> Do Not Attempt Resuscitation.

<sup>5</sup> Cf. the following medical-ethical guidelines of the SAMS: "Borderline questions in intensive-care medicine", "Palliative care" and "Care of patients in the end of life".

<sup>6</sup> Guidelines prepared by a working group of the Swiss Society of Neonatology are already available on this topic. See: "Empfehlungen zur Betreuung von Frühgeborenen an der Grenze der Lebensfähigkeit (Gestationsalter 22–26 SSW)" (Guidelines for the care of infants born at the limit of viability [gestational age 22–26 weeks]), Swiss Medical Journal (SÄZ) 2002;83:1598-5 and "Die Betreuung und Reanimation des Neugeborenen" (The care and resuscitation of newborns), Paediatrica 2007;18:36-45.

The CPR decision calls for a careful evaluation, giving due consideration to these principles.

## **2.2. Medical assessment**

The most important medical criteria for the decision as to whether or not CPR measures are indicated are the immediate and longer-term chances of survival and the expected health status after CPR (see Appendix). The pre-arrest status is crucial. It is a matter of importance whether a cardiac arrest occurs as a natural end-of-life event resulting from a serious illness, or unexpectedly in a previously "healthy" individual.

If there is a chance that a patient may survive cardiac arrest without severe neurological impairment, a CPR attempt is indicated from the medical point of view. In patients at the end of life<sup>7</sup>, on the other hand, CPR measures are not appropriate. Assessment is more difficult in the case of patients with an incurable, progressive disease which may persist for months or even years. In such situations, the patient's wishes, or presumed wishes, are the key factor in decision-making.

## **2.3. Right to self-determination<sup>8</sup>**

The right to self-determination means that every person with capacity is entitled to state his or her preferences regarding CPR. This means that a person may refuse CPR even if such measures would be indicated according to the medical assessment. In these cases, the patient's wishes must be respected. However, the right to self-determination does not extend to cases where the patient demands the "impossible", i.e. treatments that have no chance of success and are therefore not medically indicated.

### **2.3.1. Capacity**

Mental capacity is a prerequisite if an expression of wishes is to be binding. It must be assessed in the overall context of the specific situation and in relation to the decision to be made. Capacity with regard to CPR means that the person concerned is capable of grasping the implications of a CPR decision and of formulating and expressing preferences without any external pressure. In general, adults and adolescents are presumed to have such capacity.

If in a particular case there are serious doubts with regard to a patient's capacity, thorough assessment by a specialist is recommended, possibly involving consultation with people close to the patient or third parties. A contradiction between a patient's current and past preferences does not in itself justify a presumption of incapacity.

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<sup>7</sup> I.e. cases where the physician concludes, on the basis of clinical signs, that a process has started which can be expected to lead to death within a matter of days or weeks. See "Care of patients in the end of life", medical-ethical guidelines of the SAMS.

<sup>8</sup> For further details, see "Patients' right to self-determination", medical-ethical principles of the SAMS (available in French/German/Italian).

### 2.3.2. Patients lacking capacity

If a person no longer has mental capacity, any preferences expressed in an advance directive with regard to this situation are applicable.

Legal representatives (e.g. parents, guardian) or a representative appointed by the patient in an advance directive<sup>9</sup> must be involved in the decision-making process. They will be guided by any wishes expressed by the patient in an advance directive.

In the absence of a written advance directive, the patient's presumed wishes must be determined. Important indications are provided by previously stated preferences, the patient's ideas regarding death and dying, and his/her acceptance of limited quality of life. What is important is what patients themselves would decide were they capable of doing so (presumed individual wishes). In cases where a patient has never had capacity and in situations where the patient's presumed wishes cannot be determined, the patient's best interests are to be pursued.

## 2.4. Discussion of CPR<sup>10</sup>

### 2.4.1. Adults

Discussions with patients concerning their illness, prognosis and expectations with regard to treatment and care should if possible include the topic of cardiac arrest and CPR. As this may cause anxiety, it should be carefully determined to what extent the patient wishes to confront this topic.

For practical reasons, however, it is not possible to discuss cardiac arrest and CPR with all patients. Nor, in many cases, is it appropriate to do so.

Inpatients should be informed, by means of the general information brochure issued by the hospital, that in the event of unexpected cardiac arrest, CPR measures are routinely initiated unless arrangements to the contrary have been made in advance. They must also be informed that if they are opposed to this, they should raise the matter with the responsible physician.

In situations where CPR attempts would not be medically indicated (see Section 2.2.), the responsible physician<sup>11</sup> must discuss this with the patient<sup>12</sup>. The matter should be discussed with the necessary sensitivity, focusing not on the question of CPR but on the possibilities of and limits to medical treatment, and on the patient's expectations and wishes.

<sup>9</sup> Depending on cantonal regulations, other persons (e.g. spouse) may be authorized to represent the patient.

<sup>10</sup> Cf. the article by Ghelli R., Gerber A.U. "Wiederbelebung – ja oder nein: Was sagt der Patient dazu?" ("Resuscitation – yes or no: what does the patient want?"), Swiss Medical Journal (SÄZ) 2008;89:39, 1667–1669

<sup>11</sup> Who the "responsible physician" is must be defined within the institution.

<sup>12</sup> See also Section 2.4.6.

Discussion of CPR is challenging. The physician must inform the patient of the results of the medical assessment (cf. Section 2.2.). The patient should also be informed, as objectively and realistically as possible, about treatment options and limits, the prognosis and the potential harm or benefits which could arise from CPR measures. Any concerns expressed by the patient or relatives must be taken seriously. In particular, it must also be made clear that a DNAR decision does not affect any other treatment decisions.

#### **2.4.2. Children and adolescents**

For most children and adolescents admitted to hospital, discussion of CPR is not necessary, since the risk of cardiac arrest is very low and in most cases there is no underlying disease which would make CPR appear to be not medically indicated. However, the question does need to be discussed in cases where it is foreseeable that CPR would not be successful or the potential harm arising from CPR would outweigh the benefits for the patient.

Older children and adolescents must be appropriately involved in discussions of medical measures and are entitled to have their wishes taken into account. This also applies to CPR decisions. When assessing the extent to which the children or adolescents concerned should be involved in such discussions as well as their parents, it is important to consider both the child's maturity and individual ability to cope with the stresses involved.

In most cases it is possible to reach a consensus, but often a series of discussions will be required. If agreement cannot be reached, even with professional support, the responsible supervisory authority should be consulted.

#### **2.4.3. Patients under cardiovascular monitoring**

In cardiac patients who are under close cardiovascular monitoring, e.g. during a surgical procedure, in the cardiac catheterization laboratory, or in cardiac or cardiosurgical intensive care, the probability of successful CPR is above average at around 70%. By contrast, CPR measures are often unsuccessful in cases where the primary problem is not of a cardiac nature, since here cardiac arrest typically occurs as the culmination of serious systemic events (see Appendix).

If a DNAR decision exists for a patient who intends to undergo a diagnostic or therapeutic intervention, this decision must be reviewed when the patient is informed about the procedure, and the risk of cardiac arrest must also be discussed. The patient should be informed about the greater likelihood of a successful outcome in this specific situation. If the patient still refuses CPR, these wishes must be respected. A situation may then arise in which the patient dies in "monitored cardiac arrest". It is therefore important that the patient's wishes should be clearly documented in the form of a DNAR decision (with reasons stated) in the patient's records, and communicated to the intervention team. If the planned intervention is an elective procedure, the physician may refuse to perform it on conscientious grounds.

#### **2.4.4. People with disabilities**

For people with disabilities, it may be more difficult to assess the expected state of health after CPR on account of the existing impairment. Here, it should be borne in mind that healthy people often judge the quality of life differently than the people concerned themselves. This is particularly relevant when third parties have to make decisions on behalf of a patient who lacks capacity. In discussions with the people who care for incapacitated patients with disabilities, efforts should be made to obtain as clear a picture as possible of the patient's quality of life in the context of the care received and, on this basis, to determine the patient's best interests. On no account should the personal views of the healthcare professionals concerned regarding quality of life be the decisive factor in CPR decisions. Particular care is required if CPR is considered inappropriate on the basis of the medical assessment.

If the presumed wishes of the person concerned are known, they must be taken into account. For patients who have always lacked capacity, the evaluation should be carried out on the basis of the principles of beneficence and non-maleficence, in the best interests of the patient concerned, and in consultation with the relatives and especially the legal representative.

#### **2.4.5. Elderly patients in long-term care institutions<sup>13</sup>**

In general, the procedure to be followed in the event of a cardiac arrest should also be discussed with elderly patients in need of care who are admitted to a long-term care institution, and their preferences should be ascertained. If the institution lacks the capability to perform CPR, newly admitted patients and (if these patients lack capacity) the people close to them must be informed accordingly.

In all cases, i.e. also for patients who refuse CPR, it should be ensured that potentially treatable emergencies with clinical manifestations similar to acute cardiac arrest (e.g. foreign-body airway obstruction) are treated immediately with all due care.

#### **2.4.6. Patients at the end of life**

In patients at the end of life<sup>14</sup> the emphasis is placed on palliative care.<sup>15</sup> Emotional and psychological factors often make it difficult for patients, relatives and members of the care team<sup>16</sup> to recognize and accept that the end of life is approaching. Discussions within the care team can facilitate this process. Equally important is sensitive discussion of expectations, wishes and fears with patients and relatives.

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<sup>13</sup> Cf. "Treatment and care of elderly persons who are in need of care", medical-ethical guidelines and recommendations of the SAMS.

<sup>14</sup> For a definition of "patients at the end of life", see Footnote 7.

<sup>15</sup> Cf. "Palliative care", medical-ethical guidelines of the SAMS.

<sup>16</sup> I.e. the interdisciplinary and interprofessional team caring for the patient.

## 2.5. Decision-making

The CPR decision should generally be discussed within the care team. If a patient with capacity explicitly refuses CPR, this must be respected by all concerned. For patients who lack capacity and whose presumed wishes need to be ascertained, the CPR decision must never be delegated to the relatives. The decision should, as far as possible, be based on consensus within the care team and supported by the relatives. Ultimately, however, responsibility rests with the attending physician.

## 2.6. Documentation

The CPR decision must be clearly indicated as "Resuscitation: Yes" or "Resuscitation: No" (or "DNAR") in the patient's medical and nursing records. The DNAR decision means exclusively that electromechanical cardiopulmonary resuscitation is not to be attempted in the event of a documented cardiac arrest. On the basis of his definition reduced CPR measures<sup>17</sup> are to be rejected. For patients under continuous cardiovascular monitoring (e.g. in an intensive care unit), special rules must be developed which take individual situations into account.

The attending physician must sign and date the entry in the patient's records, also indicating whether a binding statement of the patient's wishes is available. In complex situations, the reasons for the decision should be stated in more detail in both the nursing and medical records (for outpatients, in the GP's records).<sup>18</sup>

## 2.7. Review

The CPR decision must be reviewed at regular intervals. This also applies in particular to outpatients suffering from a chronic progressive disease. Reassessment of the CPR decision is often required in view of the course of the disease, the need for surgical procedures, response or non-response to treatment and adverse effects, and the occurrence of complications and sequelae. Patients' preferences may well change as they grapple with the disease. Even if a previous decision remains valid, it should be regularly updated and communicated. In the hospital, reviews should be conducted regularly, especially whenever patients are moved from one ward to another, and more frequently in accordance with the situation of critically ill patients. The updated entry must be signed and dated by the attending physician. If a new care team assumes responsibility for a patient and there is any uncertainty regarding the CPR decision, it should consult the previous care team. In cases of doubt, the decision should once again be appropriately discussed with the patient – or with representatives or relatives if the patient lacks capacity.

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<sup>17</sup> At certain hospitals, the CPR decision is not only specified in terms of "Yes" or "No", but includes further intermediate options, e.g. "electromechanical resuscitation without intubation", "pharmacological resuscitation only" and "no mechanical resuscitation".

<sup>18</sup> Cf. the documentation form proposed in: Ghelli R., Gerber A.U.: "Wiederbelebung – ja oder nein: Was sagt der Patient dazu?" (Resuscitation – Yes or No: what does the patient want?) Swiss Medical Journal (SÄZ) 2008;89:39, p. 1669

If the patient is to be transferred, the ambulance team must be informed of any existing DNAR decision (including the reasons for it). If such a decision is based on the patient's preferences, it is also binding for the ambulance team.

## **2.8. Conflicts**

Patients or relatives sometimes request CPR even in situations where it is not medically indicated. It may also happen that relatives do not accept a patient's refusal of CPR. Such situations indicate an increased need for information. Often it is a question of resolving misunderstandings and, in a series of discussions, explaining to the patient and relatives the limits of curative medicine and the possibilities of palliative care.

In the event of differences of opinion within the care team, the reasons need to be carefully explored. Different value systems and possible courses of action should be discussed. In cases of conflict, professional support should be sought.

## **3. Procedure in the event of cardiac arrest**

Cardiac arrest is always an emergency calling for rapid decision-making and action. Especially in cases where someone suffers a cardiac arrest in a public place, no evidence of pre-existing conditions or the patient's preferences is generally available. In a hospital, however, it should be immediately apparent from the patient's records whether or not CPR measures should be initiated (see Section 2).

A basic precondition for the implementation of CPR measures is a clinically correct diagnosis of cardiac arrest. Given the urgency, the decision must be made in a matter of seconds; any delay caused by further investigations would make the prognosis worse. If there is any doubt, appropriate CPR measures must therefore be initiated immediately.

### **3.1. Legal framework**

Under applicable law,<sup>19</sup> there is a general duty to provide assistance in an emergency. Here, given their specialist knowledge, greater demands are placed on physicians and healthcare professionals than on medical lay people.

If in an emergency the wishes of the person concerned are not known and his/her presumed wishes cannot be ascertained in a timely manner, it must be assumed that the patient wishes to live.

However, even in an emergency, the patient's wishes are binding for anyone providing treatment. If there is clear evidence that a person is opposed to CPR attempts, such measures must not be taken. If this only becomes evident in the course of CPR efforts, e.g. on the basis of an advance directive, CPR must be terminated.

In the case of cardiac arrest due to attempted suicide, it should not generally be concluded purely on the basis of the suicidal act that the person concerned would refuse

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<sup>19</sup> The duty to provide emergency assistance is based on Article 128 of the Swiss Penal Code: "Anyone who fails to help a person whose life is in immediate danger, although he can be reasonably expected to do so in the circumstances, shall be liable to punishment by imprisonment or a fine."

CPR. The antecedents and method of suicide, the duration of suicidality, and the individual's capacity call for careful evaluation. However, since this is generally not possible in an emergency, CPR should be attempted if there is any doubt.

### 3.2. Prognostic factors

In assessing the chances of successful resuscitation, the following prognostic factors are relevant.<sup>20</sup> However, these can only be estimated in advance to a limited extent.

Favourable prognostic factors:

- short interval between the onset of cardiac arrest and the start of CPR and initial defibrillation (witnessed collapse, cardiac arrest in the course of a diagnostic or therapeutic procedure, etc.);
- tachydysrhythmia (ventricular tachycardia, ventricular fibrillation);
- good previous state of health.

Unfavourable prognostic factors:

- clear evidence of cardiac arrest, without effective CPR, for more than 10 minutes (after exclusion of hypothermia and with no evidence of intoxication);
- absence of cardiac electrical activity (asystole);
- pulseless electrical activity (PEA);
- severe concomitant disease and poor pre-arrest state of health;
- known pre-existing, life-threatening, non-treatable disease;
- special circumstances of cardiac arrest (e.g. multiple trauma).

The prognostic factors listed above are also relevant for children and adolescents. Especially in young children, cardiac arrest is often preceded by respiratory arrest. In this situation, the chances of successful CPR are good if appropriate measures (assisted or artificial respiration) are taken before the onset of cardiac arrest (see Appendix).

### 3.3. Termination of CPR

In addition to the patient's wishes (see Section 3.1.) and unfavourable prognostic factors (see Section 3.2.), failure of CPR constitutes another reason for terminating resuscitative efforts. Such efforts are considered unsuccessful if, despite CPR being carried out correctly and without interruption for 20 minutes, return of spontaneous circulation is not achieved and the patient shows clinical signs of death (absence of pulse, coma, etc.). If spontaneous, perfusing cardiac activity is temporarily restored during CPR, the 20-minute limit for CPR begins anew.<sup>21</sup> In special circumstances (pre-arrest hypothermia, suspected poisoning or metabolic derangement, children with recurrent or sustained ventricular fibrillation), prolonged CPR efforts are appropriate.

The decision to terminate CPR should if possible be made by a physician. It should be taken in a respectful manner, showing due consideration for the emotional stress experienced by everyone involved in the CPR attempt.

<sup>20</sup> 2005 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. *Circulation* 2005; 112 (Suppl. IV): IV2-IV11.

<sup>21</sup> Cf. "The Determination of Death in the Context of Organ Transplantation", medical-ethical guidelines of the SAMS.

After an unsuccessful CPR attempt outside an institution, the question of transport of the deceased arises. To ease the burden on relatives, the option of transport by ambulance should be favourably considered.

### **3.4. Interaction with relatives**

Although attention is focused on the patient during CPR, the patient's close relatives are also affected. Appropriate support should be provided for relatives who are present during CPR or who wish to say goodbye to their loved one after unsuccessful CPR. In this situation, it is particularly important to take into account the cultural and religious background of the patient and family members.

### **3.5. Team debriefing**

CPR situations are stressful for all concerned and especially also for the care team in or outside an institution. Sometimes team members may be left with a sense of failure. As a result of emotional stress, people may be inclined to apportion blame. In such situations, a debriefing (case review) can be helpful. This should consider not only the quality of the medical services provided, but also the decision-making process, communication between physicians, nurses and any other healthcare professionals involved, care of the patient's relatives, the emotional stress experienced by the emergency team, and ways of coping with death and dying.

### **III. Recommendations**

Listed below are recommendations addressed to various parties and designed to support the implementation of these guidelines:

- 1. To people responsible for training and continuing education of medical and nursing personnel**
  - Provision of periodic courses and training in current CPR measures.
  - Instruction and training in communication with patients and relatives, including:
    - discussions to determine the patient's expectations of physicians and nurses (clarification of the patient's wishes with regard to CPR) and to explain the possibilities and limits of medicine and CPR measures in particular;
    - fundamentals of patients' rights, including advance directives.
  - Promotion of decision-making skills with regard to indications for and termination of CPR, at interdisciplinary events.
  
- 2. To healthcare institutions (emergency services, casualty departments, acute hospitals, elderly and nursing homes, etc.)**
  - Drawing-up of internal, institution-specific directives to supplement these guidelines.
  - Provision of information in hospital brochures or in general literature issued by elderly and nursing homes.
  - Inclusion of a "CPR decision" section in patient records.
  - Promotion of interdisciplinary and interprofessional dialogue through active involvement of all parties in the decision-making process and institutionalization of case reviews.
  
- 3. To political authorities and sources of funding**
  - Provision of the option of an elderly or nursing home with a CPR capability.

## **IV. Appendix**

### **1. Outcome of CPR in adults**

#### **1.1. Basic principles**

A sound knowledge of the possibilities and limits of CPR provides the medical basis for the formulation of CPR decisions. However, lay people and many professionals know little about the actual outcomes obtained with CPR. This also applies to the factors which ultimately determine the success or failure of such measures. But knowledge of the relevant success factors in different situations is an essential prerequisite for appropriate decision-making.

In general, analysis of CPR outcomes needs to take the specific circumstances into account – the location (out-of-hospital, in-hospital or in an intensive care unit), the cause of the cardiac arrest (cardiac or non-cardiac etiology), the first monitored rhythm (ventricular tachycardia/fibrillation, asystole or other), whether the cardiac arrest is witnessed, the time to initiation of appropriate CPR measures, and whether or not the first people providing assistance are conversant with CPR.

As well as the circumstances, the cause of the cardiac arrest is a crucial factor in many cases: cardiac arrest due to cardiac dysrhythmia has a somewhat more favourable prognosis, while cardiac arrest resulting from haemorrhagic shock (e.g. after trauma) or associated with progressive deterioration of general health (e.g. wasting disease, sequential multiple organ failure in the intensive care unit) cannot generally be successfully resolved.

#### **1.2. Outcomes**

A positive outcome of CPR is generally defined in terms of discharge from hospital, with the patient's neurological status being specified. Success involves survival of cardiac arrest without any significant neurological impairment. Severe disability, coma and vegetative state are considered to be negative outcomes.

##### **1.2.1. Out-of-hospital CPR**

European data on out-of-hospital CPR attempts and outcomes are recorded and analysed according to the Utstein Style (1). For 2005, the results are as follows (see Table): Between 34% and 98% (mean 67%, Switzerland 71%) of patients in cardiac arrest were resuscitated by emergency medical services (EMS). Between 48% and 92% (mean 75%, Switzerland 71%) of patients suffered an arrest of cardiac etiology, and the arrest was witnessed by laypersons in 46–89% of cases (mean 67%, Switzerland 69%). The first monitored rhythm was ventricular fibrillation in 16–57% of cases (mean 34%, Switzerland 41%). In patients with witnessed arrest, CPR led to return of spontaneous circulation in 31–65% of cases (mean 38%, Switzerland 31%), with 0–23% of patients (mean 7.4%,

Switzerland 3.4%) being discharged from hospital alive. After 1 year, only 0–16% (mean 5.1%, Switzerland 0.3%) of patients were still alive. In this evaluation, no data are available on neurological impairment (2).

	Europe	Switzerland
	Mean and 95% CI (%)	Mean (%)
Resuscitation attempt by Emergency Medical Service (EMS) personnel	67 (34–98)	71
Arrest of cardiac etiology	75 (48–92)	71
Witnessed arrest	67 (46–89)	69
Outcomes for patients with witnessed arrest and resuscitation attempt by EMS personnel		
Return of spontaneous circulation	38 (31–65)	31
Survival to hospital discharge	7.4 (0–23)	3.4
Survival at 1 year	5.1 (0–16)	0.3

### 1.2.2. In-hospital CPR

On average, survival rates are higher after in-hospital than after out-of-hospital CPR. But even in hospital, time factors and site of arrest are of crucial importance both for 1-month survival and for neurologically intact survival. Thus, hospital survival rates of over 70% have been reported in particular for CPR in the catheterization laboratory and in cardiac monitoring units, especially in myocardial infarction patients with ventricular fibrillation without left ventricular failure (3,4) and in cardiosurgical intensive care units (5). On the other hand, non-cardiac patients in an intensive care unit – despite monitoring and immediate CPR measures – are unlikely to survive a cardiac arrest unharmed. This is particularly true in cases of deteriorating physiological functions or progressive multiple organ failure (survival rates between 0% and 2%) (6–9).

The first monitored rhythm is also a key factor. Thus, data from the US National Registry of Cardiopulmonary Resuscitation show return of spontaneous circulation in 44% of patients (with a hospital discharge rate of 34%) if the initial rhythm was ventricular fibrillation, and in 10% if it was asystole or pulseless electrical activity (10).

### 1.3. Comments

We estimate that the annual incidence of out-of-hospital cardiac arrest of cardiac etiology is 0.5–1 cases per thousand. The survival rate worldwide, and also in Switzerland, is less than 5%. Higher survival rates are achieved by specialised Emergency Medicine Systems, such as that developed in Seattle. The difference between the generally low survival rates worldwide and the maximum rates attainable reflects the effectiveness of the "Chain of Survival"<sup>22</sup> and the quality of the CPR measures carried out. This also applies to

<sup>22</sup> The Chain of Survival comprises the following links:

1. Early access
2. Early CPR

outcomes obtained in the hospital. However, it should be borne in mind that the health status of hospital patients (e.g. in an intensive care unit) differs markedly from that of out-of-hospital patients, which often adversely affects the prognosis.

The goal of successful CPR is not simply survival, but neurologically intact, good-quality survival. Poor neurological outcomes are a result of cerebral hypoxia. This is due not only to concomitant illnesses, but especially to delayed and/or inadequate CPR. Unfortunately, the data available on this topic are scant, and mostly obtained only from small populations. Survivors often show a good neurological recovery. However, after initially successful resuscitation (in terms of return of spontaneous circulation), a significant number of patients are left with moderate to severe neurological impairment.

This situation could be improved. In Switzerland, for example, there is a need to optimize the Chain of Survival and CPR training and quality. In addition, neurological outcomes after CPR can be further improved by increased use of new methods of cerebral resuscitation (e.g. mild therapeutic hypothermia).

The "ideal cardiac arrest patient" meets the following criteria: he/she is initially in good health, suffers a witnessed cardiac arrest due to ventricular tachycardia or ventricular fibrillation, is immediately resuscitated (bystander CPR) and correctly defibrillated, with adequate spontaneous circulation being restored as quickly as possible (within 10 minutes at most). If neurological recovery does not occur within a few minutes, the patient is sedated and artificially ventilated for a limited period under mild hypothermia (24 hours).

## **2. Outcome of CPR in children**

### **2.1. Basic principles**

Among newborns and children, compared with adults, there are marked differences in the epidemiology, etiology and prognosis of cardiac arrest. Sudden cardiac arrest due to a primary dysrhythmia is rare in children; cardiac arrest is generally the terminal event of progressive respiratory failure, sudden respiratory arrest or decompensated shock (also known as asphyxial arrest) (1–3). This explains why the success rate for CPR in children suffering respiratory arrest with continued cardiac activity is high (neurologically intact survival >70%) (4–6), whereas when cardiac arrest has already occurred the chances of neurologically intact survival are unfortunately very low (<10%) (7–12). As with adults, the outcome of CPR is significantly influenced by the external circumstances (witnessed versus unwitnessed, in-hospital versus out-of-hospital event).

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3. Early defibrillation
  4. Early advanced care

## 2.2. Outcomes

### 2.2.1. Out-of-hospital CPR

In an analysis of 41 studies published between 1964 and 2004, Donoghue et al. described 5368 paediatric patients with preclinical (out-of-hospital) cardiac arrest (13). The main causes were sudden infant death syndrome (SIDS, or apparent life-threatening event), trauma, airway obstruction and drowning (14). The most common initial cardiac rhythm was asystole (79% of cases), followed by pulseless electrical activity (13%) and ventricular fibrillation or pulseless ventricular tachycardia (8%). Overall, 12.1% of patients survived to hospital discharge and 4% were neurologically intact. The chances of survival were comparatively better in the drowning subgroup (survival rate 23%, neurologically intact 6%), with accidents involving very cold water standing out in particular (favourable prognosis possible even after prolonged CPR) (14,15). By contrast, the prognosis was considerably poorer for paediatric patients with cardiac arrest following trauma (survival rate 1.1%, neurologically intact 0.3%). As with adults, CPR outcomes are better in situations where the event is witnessed and CPR is started without delay.

### 2.2.2. In-hospital CPR

If cardiac arrest occurs in a child in hospital, the prognosis varies considerably depending on the underlying disease. In children's hospitals without paediatric cardiac surgery, severe respiratory disorders (61%) and shock (29%) are the main causes precipitating cardiac arrest, and asystole (55%) and bradycardia (33%) are the most common initial forms of dysrhythmia (16). In a mixed patient population, survival rates following CPR are between 16% and 25%, with reported rates of neurologically intact survival varying between 0% and 7% (16,17). If respiratory failure is the cause and bradycardia the initial cardiac rhythm, the survival rate is about 50%. At the opposite end of the spectrum is the prognosis for cardiac arrest caused by septic shock (survival rate 8%) (16). In hospitals with cardiac surgery facilities, primary dysrhythmias (ventricular fibrillation, ventricular tachycardia) are a relative frequent cause of cardiac arrest (27%) (18), and the success rate for CPR with primary ventricular arrhythmia in the intensive care unit is 35–40%. Of the children successfully resuscitated in this situation, 60–90% are free of any permanent severe neurological impairment (18,19).

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## Information on the preparation of these guidelines

<b>Mandate</b>	On 15 April 2005 the Central Ethical Committee of the SAMS appointed a sub-committee to draw up medical-ethical guidelines on CPR decisions.
<b>Responsible sub-committee</b>	<p>Professor Andreas U. Gerber, Burgdorf (Chairman)</p> <p>Dr Ruth Baumann-Hölzle, Zurich</p> <p>PD Dr Thomas M. Berger, Lucerne</p> <p>Lic. iur. Nathalie Brunner, Neuchâtel</p> <p>Dr Daniel Grob, Zurich</p> <p>Professor Urban T. Laffer, Biel</p> <p>Angelika Lehmann, Intensive-care BNS, Basel</p> <p>PD Dr Joseph Osterwalder, St. Gallen</p> <p>Professor Claude Regamey, President of the Central Ethical Committee, Fribourg</p> <p>Lic. iur., MAE, Michelle Salathé, SAMS, Basel</p> <p>Dr Martin Siegemund, Basel</p> <p>Professor Reto Stocker, Zurich</p> <p>Professor Peter Stulz, Lucerne</p> <p>Professor Martin von Planta, Basel</p> <p>Dr Philipp Weiss, Basel</p> <p>Dr Regula Zürcher Zenklusen, Neuchâtel</p>
<b>Expert consulted</b>	Dr Sven Staender, Männedorf
<b>Consultation</b>	On 20 May 2008 the Senate of the SAMS approved a draft version of these guidelines, to be submitted for consultation.
<b>Approval</b>	The final version of these guidelines was approved by the Senate of the SAMS on 27 November 2008.