MEDICAL ETHICAL GUIDE-LINES

Decisions on cardiopulmonary resuscitation

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Medical-ethical guidelines

Decisions on cardiopulmonary resuscitation

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The German text is the authentic version.

These guidelines are an integral part of the Code of the Swiss Medical Association (FMH).

Schweizer Berufsverband der Pflegefachfrauen und Pflegefachmänner

The Swiss Professional Association for Nurses (SBK/ASI) recommends that its members and all other nurses should abide by these guidelines.

I. PREAMBLE

CPR decisions and their consequences involve considerable burdens for all concerned. On average, the chances of surviving cardiac arrest, with a good outcome, remain low. While statistical information is available on specific patient groups, this often does not allow precise conclusions to be drawn about particular cases. It is therefore very difficult to assess the individual prognosis. In addition, outcomes vary between different regions and towns, and from one institution to another. Demographic characteristics (age, sex), prior health status and the site of the event are all significant factors. Also relevant are the circumstances of the event (witnessed/unwitnessed), first-responder resuscitation efforts, the type of initial cardiac rhythm, the availability of automated external defibrillators, and the quality of the emergency medical services and subsequent medical care structures (acute treatment, intensive care, rehabilitation).[1]

The interruption of the supply of oxygen to the brain in the acute cardiac arrest situation requires immediate action. In general, CPR is performed in all cases where it has not been rejected by a patient in a state of capacity and where there is a prospect of success. Frequently, however, in the acute situation, the patient's wishes are not available, not clear or not documented. As a result, for physicians, paramedics, nurses and other medical professionals, a conflict may arise between their duties to save life, to do no harm, and to respect the patient's autonomy. Third parties who have to decide on the patient's behalf may be confronted with a situation in which CPR is performed and it subsequently transpires that these measures were not appropriate or not desired. For this reason, it is important that, as part of advance care planning[2], patients' views and wishes concerning CPR should be openly discussed at an early stage, and that their wishes should be documented.

The present guidelines emphasise that, for (advance) DNAR decisions[3], consideration must be given to descriptive/empirical, ethical and legal aspects alike. They provide guidance for the medical evaluation and for discussions with patients. They offer recommendations as to the situations where CPR is appropriate and

1 Cf. Cochrane Switzerland. Evidence synthesis on prognostic factors after cardiopulmonary resuscitation for in-hospital or out-of-hospital cardiac arrest. Report to the Swiss Academy of Medical Sciences, 30 November 2018. See Section 4 of the Appendix to these guidelines

2 Advance care planning (ACP) is a tool enabling patients – with professional support – to formulate their expectations of medical treatment clearly and comprehensibly; cf. BAG & palliative ch (2018), Gesundheitliche Vorausplanung mit Schwerpunkt «Advance Care Planning», Nationales Rahmenkonzept für die Schweiz, www.bag.admin.ch/koordinierte-versorgung (available in French/German/Italian).

3 **D**o **N**ot **A**ttempt (cardiopulmonary) **R**esuscitation: the decision that CPR is not to be attempted in the event of cardiac arrest.

when such measures are not indicated. They include guidelines on the procedure to be adopted in the various (in- and out-of-hospital) situations where acute cardiac arrest occurs, and also on aftercare for resuscitated patients. They provide support for medical professionals discussing CPR with patients and relatives, and they include recommendations for documentation of the CPR decision in the advance directive and in the relevant patient records.

II. GUIDELINES

1. Scope

The guidelines are addressed to physicians[4], paramedics, nurses and other medical professionals who discuss CPR decisions with patients of all ages, relatives and authorised representatives, or who perform CPR. They are concerned exclusively with CPR performed after cardiac arrest. They supplement the guidelines "Intensive-care interventions" [5], which deal comprehensively with measures employed in the diagnosis, prevention and treatment of all forms of failure of vital functions in critically ill patients. In particular cases, however, the distinction may not be clear-cut.

Falling outside the scope of these guidelines are specific technical measures which may be applied in CPR (defibrillation, chest compression[6], medication, ventilation), as these are discussed in detail from a scientific perspective in the guidelines issued by various bodies (American Heart Association, European Resuscitation Council). Also excluded is the topic of CPR with regard to organ transplantation; for this, reference is made to the relevant SAMS guidelines and to the guidelines issued by professional associations.[7]

2. Legal framework

The requirement for explicit consent to treatment is essentially also applicable for CPR. As a patient suffering cardiac arrest lacks capacity[8], it is not possible to obtain informed consent at this point. In an urgent case of this kind, according to the Swiss Civil Code[9], the physician is entitled to carry out medical procedures in accordance with the presumed wishes and interests of the person lacking capacity. If the (presumed) wishes are known, all measures are to be guided thereby. If circumstances (time pressure, cardiac arrest site, etc.) so permit, the emergency medical team must look for any evidence that would indicate the patient's (presumed) wishes. If the person concerned rejects CPR, it must not be performed. If it is not possible to ascertain the patient's (presumed) wishes, his/her interests are the decisive factor and CPR is to be attempted, unless it offers little or no likelihood of benefit.

4 On being incorporated into the Code of the Swiss Medical Association (FMH), the guidelines become binding for all members of the FMH
5 Cf. SAMS Medical-ethical guidelines and recommendations "Intensive-care interventions" (2013, supplement issued in 2020).
6 Cf. European Resuscitation Council Guidelines for Resuscitation (https://cprguidelines.eu/); American Heart Association (www.heart.org); and Section 6.2.1.
7 Cf. SAMS Medical-ethical guidelines "Determination of death with regard to organ transplantation and preparations for organ removal" (2017); cf. the "Organ donation" section in ERC (2021b).
8 Cf. SAMS Medical-ethical guidelines "Assessment of capacity in medical practice" (2019).
9 Cf. Art. 379 SCC.

Advance directives and instructions for medical emergencies[10] which reject CPR are binding. Credible information from third parties is regarded as valid evidence of the patient's (presumed) wishes. More controversial, however, is the legal weight to be accorded to DNAR symbols of any kind, such as "No CPR" stamps or necklaces.[11] While these do not have the same legal force as an advance directive – lacking a date and signature – they still provide a strong indication of presumed wishes. In such a situation, the emergency medical team may be guided by this evidence of the patient's presumed wishes and withhold CPR. However, if there is evidence that a DNAR stamp has been improperly applied by a third party, or that a DNAR tattoo is no longer applicable (e.g. crossed out), then the symbol should be disregarded.

If it only becomes apparent after the initiation of CPR that this does not accord with the patient's (presumed) wishes – for example, in the light of an advance directive or credible information provided by authorised representatives and/or relatives – then the CPR efforts must be terminated. If, at this point, return of spontaneous circulation (ROSC) has already occurred, the measures already initiated (e.g. intubation, ventilation) may be continued until hospital admission, but no additional strictly resuscitative measures (e.g. administration of catecholamines, antiarrhythmics) are to be performed and, in the event of a renewed cardiac arrest, no further CPR is to be undertaken. If the patient then continues to require ventilation, this is to be terminated and the aim of treatment should be purely to alleviate symptoms (cf. Section 7.3).

In the prehospital situation, non-medical emergency service professionals are to act independently in accordance with the responsibilities assigned to them. Tasks are delegated by the medical head of the emergency service. The performance or non-performance of CPR is subject to the same regulations as are applicable for the medical profession.

10 This refers to instructions for medical emergencies formulated as part of advance care planning, which are always discussed with the patient and signed by the physician and patient. Cf. BAG & palliative ch (2018).

11 It is agreed that a "No CPR" stamp must be complied with if a signed advance directive is also available.

3. Ethical principles

The ethical questions arising in relation to CPR are essentially the same as for other medical interventions. However, the decision whether or not CPR should be attempted in the cardiac arrest situation is particularly consequential. For a patient suffering cardiac arrest, CPR offers the only chance of survival; withholding CPR almost always means certain death. However, the death in question is a rapid one, such as many people wish for. Conversely, CPR may entail significant burdens for the patient, for example, due to neurological sequelae. In addition, decisions on CPR often have to be made under uncertainty. The likelihood of survival and the subsequent quality of life are difficult to predict in the individual case. CPR decisions therefore call for not only medical but also careful ethical evaluation.

Each decision to perform or withhold CPR must be based on the fundamental ethical values of good medical practice, which include respect for human autonomy and respect for the principles of beneficence (promoting patient welfare) and non-maleficence. These entail a duty to preserve a patient's life if possible, but also to withhold CPR efforts if they offer little or no likelihood of benefit. This is the case if it is highly likely that CPR will fail, i.e. that the patient will die within a short period in spite of CPR and/or that CPR will impose an unnecessary burden, merely prolonging the dying process. A decision to withhold CPR without knowing the patient's wishes, or even contrary to the patient's expressed wishes, must be very well justified and documented. Finally, the duty to respect autonomy means that CPR must not be performed if it has been rejected by the patient – even if there appears to be a chance of restoring the patient's prior health status. Respect for autonomy demands that, even under time pressure, the patient's (presumed) wishes must if possible be ascertained and complied with. Ideally, the question of CPR will have been discussed in advance, and the patient's wishes documented. Here, careful explanation and shared decision-making are particularly important.

A decision to withhold CPR in the event of a future cardiac arrest must not adversely affect the patient's current treatment and care. This also applies in particular to measures designed to prevent cardiac arrest. In any case, it must be ensured that potentially treatable acute events are in fact treated.

Lastly, questions of justice are also relevant. This includes the principle of non-discrimination and considerations relating to the individual and social consequences of treatment and care following CPR. The decision to withhold CPR must be based on medical criteria and the patient's wishes, and not on external evaluations of whether a life is useful or worth living.

As, after successful CPR, many patients are left with neurological deficits which involve more or less severe dependence, and thus require a considerable commitment of human, personal and financial resources, the CPR decision also has far-reaching consequences for all those close to the person concerned. From an ethical perspective, these must also be taken into account.

4. Medical foundations

4.1. Preventive measures

It is essential that symptoms which could lead to cardiac arrest should be detected at an early stage and treated. For this purpose, increasing use is also being made of telemetry monitoring methods and systematic assessments (e.g. early warning scores). In addition, in the hospital setting, medical emergency teams (MET) or early intervention teams (EIT) can identify patients at serious risk and transfer them to suitable departments (ICU, observation ward).

4.2. Neurological status

All too often, CPR offers only a limited prospect of success, with the main problem being more or less severe neurological deficits, which are difficult to predict in the acute phase. Frequently, relatives caring for the patient at home will also be affected by the psychological, physical, occupational and economic consequences. Survival with substantially impaired quality of life is distressing for all concerned – for patients, who have to live with sometimes serious after effects of cardiac arrest, which they did not expect and for which they would not have accepted CPR, and for relatives, who express a wish for life-sustaining treatment during the acute phase, but then see how the patient is suffering from the consequences.

Neurological status is described using the Cerebral Performance Categories (CPC) classification[12] – a five-category scale ranging from good cerebral performance (CPC 1) to brain death (CPC 5). The CPC criteria do not encompass all possible late effects; this is particularly true of behavioural disorders, which may significantly impair social relations.

In the literature, CPC 1 and 2 are generally defined as CPR outcomes to be aimed for. It should, however, be borne in mind that, even with CPC 1, up to 50% of those who survive are left with (neuropsychological) disorders which, though not directly limiting, may potentially involve relevant impairments, and that general classifications do not necessarily correspond to the individual attitudes and preferences of the patients concerned. On the other hand, recent findings indicate that, in a subpopulation of survivors with a primary CPR outcome of CPC 3 who demonstrably show cognitive-motor dissociation, survival may be possible with a quality of life substantially superior to that of patients with minimal consciousness.[13]

12 See Section 2.1.1 of the Appendix.
13 Cf. Jöhr et al. (2020).

4.3. Quality of life

The quality of life remaining after initially "successful" CPR not only correlates closely with the neurological outcome, but also depends on highly personal factors. What is crucial is the patient's subjective experience and, in particular, satisfaction with his/her situation. Of relevance here are the various dimensions of quality of life (physical, emotional, intellectual, spiritual, social and economic) and how they are weighted by the patient. Quality of life, as subjectively experienced, may be over- or underestimated by external judges.

The quality of life to be expected for relatives – often closely linked to that of the patient – must be explicitly discussed and separately considered.

4.4. Outcome of CPR

Over the past ten years, the proportion of successful resuscitations, with a good neurological outcome, has increased both for in-hospital and out-of-hospital cardiac arrest. This is largely attributable to three factors: (1) improvements in the so-called chain of survival, (2) a better knowledge of unfavourable prognostic factors (with the result that CPR offering little or no likelihood of benefit is not attempted), and (3) the fact that the topic has become less of a taboo (determination and documentation of patients' wishes).

In most statistics on CPR outcomes, a distinction is made between out-of-hospital and in hospital settings. These differ not only in situational respects, but also with regard to the patients concerned:[14] out-of-hospital cardiac arrest (OHCA) patients are generally younger, less multimorbid and more likely to suffer so-called secondary cardiac death (ventricular fibrillation due to acute myocardial infarction). In this situation, a highly effective chain of survival is crucial. Largely as a result of improvements in the chain of survival and the increased use of automated external defibrillators, the average survival rate for OHCA patients receiving CPR has risen from 8.5% to up to 20%[15] and even, in patients with shockable initial cardiac rhythm, up to 40% in some cases[16].

For many years, in the resuscitation literature, outcomes were primarily reported on the basis of return of spontaneous circulation (ROSC) and survival to hospital discharge. Only in the past decade has the literature increasingly also included data on neurological outcomes and patients' quality of life following survival of the acute phase.

14 Cf. Section 4.4.1.
15 Cf. Shijiao et al. (2020); Virani et al. (2020); ERC (2021).
16 Cf. Hösslin et al. (2019).

To date, no consistent data (e.g. from registries) permitting a reliable prediction of CPR outcomes is available for Switzerland. For this reason, studies from other countries (e.g. the US, Australia, Germany) are used for guidance in this country. It needs to be borne in mind, however, that because conditions often differ in Switzerland (a country of short distances), such data is only applicable to a limited extent.

4.4.1. Adults

To predict the outcome of CPR, scoring systems are used to quantify pre-existing impairments and/or illnesses. Frequently used for this purpose are the Prognosis After Resuscitation (PAR) score, the Pre-Arrest Morbidity (PAM) score and the Cardiac Arrest Survival Postresuscitation In hospital (CASPRI) score.[17] In publications, the PAR and PAM scores are often used together, as they both have very high specificity (>90%) but low sensitivity.[18]

The following factors[19] show a statistically significant association with an unfavourable outcome of CPR after cardiac arrest:[20]
- active malignancy,[21]
- metastatic malignancy,[22]
- active haematologic malignancy,[23]
- anaemia (haematocrit <35%),[24]
- more than two active comorbid conditions,
- age, depending on the literature, from over 70 to over 80 years,
- impaired mental status (not related to a pre-existing disability),
- restrictions in activities of daily living (ADL), presence of specific impairments (not related to a pre existing disability),
- hypotension on admission,
- higher sequential organ failure assessment (SOFA) score,
- admission for pneumonia,
- trauma,
- medical, but no cardiac diagnosis.

Prognostically most unfavourable – as regards both survival and quality of life – are metastatic and active haematologic malignancies, followed by relevant re-

17 Cf. Section 2.1 of the Appendix.
18 Cf. Ohlsson et al. (2015).
19 This data is primarily available for the in-hospital setting, but it may also be applicable for the out-of-hospital setting.
20 Cf. Ebell & Afonso (2011); Cochrane Switzerland. Evidence synthesis on prognostic factors after cardiopulmonary resuscitation for in-hospital or out-of-hospital cardiac arrest. Report to the Swiss Academy of Medical Sciences, 30 November 2018.
21 Cf. Fernando et al. (2019).
22 In view of current developments in therapeutic options, changes may occur for individual oncology patients.
23 The same applies to haematologic disorders. Cf. also Kish Wallace et al. (2002).
24 Cf. Johnson et al. (2016).

strictions in ADL. If several of these factors are present, the risk of neurological impairment is additionally increased, as the prognosis for these patients is already poor owing to the pre-arrest health status. At the same time, for the factors listed above, the probability of survival to discharge was found – in some cases with additional support from the literature[25] – to be less than 3.5%.

In patients with *out-of-hospital* cardiac arrest, the following are predictors of an unfavourable outcome:
- comorbidities,
- cardiac arrest not due to arrhythmia,
- absence of myocardial infarction as a causal factor,
- neurological impairments at onset of cardiac arrest, and
- delay in time to first defibrillation after initiation of CPR (even if basic support measures are performed, the likelihood of neurologically intact survival is reduced by 3–4% per minute).

According to the literature[26], there are also significant predictive, in some cases essentially modifiable, sex-related differences: *women* who suffer out-of-hospital cardiac arrest are generally older than men and more frequently have comorbid conditions.[27] Cardiac arrest is more frequently the first manifestation of heart disease in women than in men.[28] As, at the time of cardiac arrest, women are more frequently in a private setting than men, the event is more rarely witnessed and time to first medical contact is consequently also longer.[29] The time between initial cardiac rhythm analysis and initiation of cardiac massage is also considerably longer in women than in men. When the ambulance arrives, women are more frequently found to have pulseless electrical activity or asystole (so-called non-shockable rhythm), while men are more frequently diagnosed with arrhythmias, which are amenable to electroshock therapy (shockable rhythm). In addition, women who suffer cardiac arrest in a public setting more rarely receive bystander CPR. While the data on sex differences in short-term survival after cardiac arrest is inconsistent, recent studies report poorer long-term survival and greater neurological deficits in women.[30] After cardiac arrest, women also undergo invasive diagnostic procedures, such as cardiac catheterisation, less frequently than men and also less often receive pharmacological treatments or ICU therapy.[31]

25 Cf. Ebell & Afonso (2011).
26 Other factors which reportedly may influence the outcome of CPR include, for example, ethnicity and social status (cf. also ERC 2021b, p. 419). For Switzerland, however, virtually no literature is available on this question.
27 Cf. Wigginton et al. (2002); Goodwin et al. (2018).
28 Cf. Reinier et al. (2020).
29 Cf. Safdar et al. (2014); Blom et al. (2019); Blewer et al. (2018).
30 Cf. Ahn et al. (2012); Blewer et al. (2018); Blom et al. (2019); Bougouin et al. (2017); Dicker et al. (2018); Goodwin et al. (2018); Herlitz et al. (2004); Krammel et al. (2018); Morrison et al. (2016); Mumma & Umarov (2016); Ng et al. (2016); Perers et al. (1999); Perman et al. (2019); Reinier et al. (2020); Safdar et al. (2014); Teodorescu et al. (2012); Wigginton et al. (2002); Winther-Jensen et al. (2015).
31 Cf. Goodwin et al. (2018); Bougouin et al. (2017).

In *patients with cancer* receiving modern immunotherapies and other personalised treatments, there is a very high risk of life-threatening complications (e.g. cytokine storm), which may include cardiac arrest. It has yet to be investigated whether patients who suffer cardiac arrest as a result of such treatments have a better prognosis than other cancer patients. As these therapeutic interventions are generally – at least initially – performed under close surveillance and the patients are either in or can be rapidly transferred to an ICU, the cardiac arrest is usually directly observed. In view of the curative potential of the therapy, it may be appropriate to initiate CPR in spite of advanced malignancy, if this is desired by the patient, having received detailed information about potentially severe adverse effects of the therapy. Prolonged CPR efforts (e.g. >20 minutes without ROSC[32]) should, however, be avoided in view of the poor prognosis.

4.4.2. Newborns, infants, children and adolescents

Sudden cardiac arrest is rare in the paediatric population.[33] However, as the causes and prognosis differ from adult medicine, they require separate consideration.

Among newborns, approx. 1% of live-born children require CPR. Considerably more frequently (in around 10% of cases), newborns require postnatal measures involving stimulation and manual bagging.[34] Underlying causes include, in particular, peri- and postnatal asphyxia, prematurity, severe infections and malformations. The prognosis depends on the severity of the condition. Thanks to registries and databases, the subsequent development of preterm infants and those with asphyxia can be particularly well monitored.

In paediatrics, the aetiology and prognosis of cardiac arrest are strongly age-dependent. In infants, a CPR situation generally arises as a result of so-called asphyxial cardiac arrest (i.e. cardiac arrest following respiratory arrest with prolonged hypoxia). In the first year of life, out-of-hospital cardiac arrest is primarily associated with sudden infant death syndrome (SIDS) – despite a marked decline in incidence over the past 20 years. Infants with malformations, either not yet diagnosed or already under treatment, can be affected by cardiac arrest. Also playing an important role in infants and young children are respiratory disorders (pneumonia, bronchiolitis, aspiration, obstructive respiratory disease) and infections (sepsis and meningitis). A more frequent cause of cardiac arrest, among young children and with increasing age, are accidents (road accidents, drowning). Less common are effects of malformations and primary cardiac causes (including arrhythmias). The latter are of greater importance in adolescents and young adults, especially in cases of undiagnosed congenital heart disease. Iatrogenic causes in connection with interventions may also lead to cardiac arrest in

32 Cf. Section 6.5.

33 In Switzerland, there have been six to eight cases of sudden cardiac death in childhood per year since 2015 (source: FSO Cause of death statistics).

34 Cf. Swiss Society of Neonatology (2017).

paediatric patients – as in adults. The prognosis is poorer if the arrest is preceded not by arrhythmia but by hypoxia (as is most frequently the case in infants and young children) and/or if it is unwitnessed. Here, a prime example is SIDS, which almost always occurs unwitnessed during the night and has a poor prognosis.

Recent data from the US and Canada indicates a survival rate of 8.4% for children with *out-of-hospital* cardiac arrest; this low rate has not changed over the years.[35] The survival rate reported for children with in-hospital cardiac arrest is around 24%.[36] Prevention, as well as rapid, appropriate treatment of a respiratory disorder or shock, is essential. Prevention campaigns in relation to SIDS and drowning accidents have led to a reduction in such events. Particularly for in-hospital cardiac arrest, various measures taken over the past 20 years (e.g. rapidly available CPR teams, specialised treatment teams and improved monitoring) seem to have led to an increase in survival rates, which are now over 40%.[37]

Also important, as well as the survival rate, is the extent of neurological sequelae (measured by the CPC score); especially in survivors of hypoxia-induced cardiac arrest, severe neurological sequelae are common.

Because of the smaller case numbers in paediatrics, conclusions on prognostic factors are based on considerably less evidence. Overall, the following factors indicate a better outcome: recovery of pupillary light reactivity within 24 hours after CPR, EEG recovery within the first 7 days, and <4 doses of adrenaline. Biomarkers[38] are of little prognostic relevance in paediatrics, and no broad-based studies are available. It is recommended that various parameters for prognostic assessment should be taken into account and evaluated in discussion with the parents/adolescents.

Children with a pre-existing severe impairment have a higher risk of suffering cardiac arrest in connection with serious infections or surgery, or after aspiration, for example. However, as a result of medical advances over the last two decades, more infants with severe underlying conditions now survive the first years of life, so that this patient group is becoming increasingly important and requires particular attention. This applies in particular with regard to the question of the possible post-CPR recovery, since further deterioration – especially of the neurological situation – is to be avoided.

35 Cf. Vega et al. (2020); Fink et al. (2016). As a registry for sudden cardiac death/resuscitation is currently still under development in Switzerland, the data on causes and CPR outcomes is mainly drawn from other countries (especially the US). Statistics on causes of death, including number of deaths per age group, are prepared by the FOPH. A Swiss registry on CPR outcomes would be desirable.
36 Cf. Vega et al. (2020).
37 Cf. Holmberg et al. (2019).
38 Cf. Section 7.3.

5. Decision on CPR

Every life ends with a cardiac arrest. As it cannot normally be predicted when this will occur, the question arises at what point one should consider whether or not CPR should be performed in a situation of this kind. Ideally, such an assessment should be carried out carefully and at an early stage, i.e. before the acute situation arises, and it should involve evaluation of the initial medical position (health status, likelihood of surviving CPR) and determination of the patient's wishes (values and expectations). As advanced age, comorbidity and frailty increase the likelihood of cardiac arrest, it is important at this point, if not earlier, to raise the question of and reach a decision on CPR, which should be documented in the patient's records. Whenever the initial situation changes, the decision should be reviewed and if necessary updated, especially in "transition situations", such as progression of severe chronic disease, diagnosis of a terminal illness, hospitalisation, or admission to a nursing home.

5.1. Medical evaluation

The medical evaluation of a CPR attempt, and the advice offered to the patient on this basis with regard to a CPR decision, needs to take into account not only psychosocial aspects and the current health status, but also the prognosis – particularly for (largely) neurologically intact survival, or a quality of life acceptable to the patient – and a risk-benefit assessment. It makes a difference whether cardiac arrest occurs as a natural event at the end of life, as a consequence of serious illness, or unexpectedly in a "healthy" individual.

For the risk-benefit assessment of a CPR attempt, it must be estimated – on the basis of scientific evidence, medical experience and the patient's individual situation – with what likelihood various outcomes of CPR are to be expected. Prognostic uncertainty must be discussed with the patient. It is important that the patient and relatives understand that this uncertainty makes the decision all the more difficult for everyone, including physicians.

If there is a chance that a patient can survive cardiac arrest without severe sequelae, then it is appropriate, from a medical perspective, to attempt CPR. CPR offers little or no likelihood of benefit[39] in cases where a short- or medium-term extension of life, with a tolerable quality of life, can almost certainly be ruled out. CPR in such a situation would merely prolong the patient's suffering. A rather different situation arises if, in spite of serious illness, there is a chance of the patient surviving with a quality of life which he or she would consider acceptable. Here, no clear recommendation can be made from a medical perspective, and the decision rests with the patient. In this situation, there is a need for intense, repeated and transparent deliberation, both within the treatment team and, above all, with the patient and relatives. Ethics support may be helpful.

39 Cf. SAMS Medical-ethical guidelines "Intensive-care interventions" (2013, supplement issued in 2020).

The CPR status is to be determined independently of the decision "Intensive care: Yes/No" and "Intubation: Yes/No". Consent to CPR generally leads, in the event of the procedure being performed, to intubation and an ICU stay.

5.2. Autonomy and shared decision-making

Patients can determine their wishes with or without professional support and record them in various forms. It is important that they understand the meaning of CPR, and that such measures can always only represent an attempt. For many patients, it is helpful to be able to weigh up the advantages and disadvantages of a CPR attempt in discussion with a professional. The CPR status will depend not only on prognostic considerations and on the general therapeutic goals attainable in the particular case, but also on the patient's preferences. These are often associated with fundamental individual conceptions of life and approaches to illness, dying and death.

The treatment goal[40] considered by the patient to be worth pursuing is the decisive factor. If the priority for the patient is to extend life – in spite of any burdens which may be involved – then the essential utility of CPR is to be evaluated differently than for a patient who attaches greater weight to a rapid, painless death. On the basis of the medical evaluation, the opportunities and risks of a CPR attempt, and the prognosis, can be discussed with the patient. Depending on the initial health status and the prognosis, the possible impacts of a high degree of post-CPR dependence and/or neurological impairments on relatives' quality of life may also need to be discussed. The use of evidence-based tools[41] can contribute to sound decision-making.

5.3. Discussion of CPR

Ideally, the measures to be taken in the event of cardiac arrest should be discussed as part of a guided advance care planning process – if necessary, in consultation with specially trained health professionals – and should be documented for emergency situations, hospitalisation or transfer to a nursing home. Whenever possible, patients should be helped to make a decision calmly, having reflected on their own preferences, with the aid of patient-specific information (prognosis), and in dialogue with those close to them. Discussions conducted in a crisis situation, or when patients are admitted to a hospital or nursing home, are not ideal for establishing whether CPR is in accordance with their considered wishes.

40 Cf. Goal-Concordant Care and Serious Illness Conversation Guide, www.ariadnelabs.org/resources; Lakin et al. (2017), Cooper et al. (2016); Denniss & Denniss (2017); Bowman & Meier (2018).

41 Cf., for example, the decision-making tools offered by palliative zh+sh (www.pallnetz.ch/entscheidungshilfen).

During a hospital stay, patients should be asked about their views on emergency treatment and whether an advance directive is available, and their preferences should be documented.[42] Although it is binding, this interview should not simply form part of the admission routine. Ideally, such discussions should begin with the communication of realistic information on the patient's current health status and the expected course of disease. As a second step, patients should be asked about their values and their expectations of the treatment team. The question of CPR will then usually arise automatically. During the discussion, the patient's wishes must also be checked against the content of any advance directive.

In the case of young, healthy persons, such discussions are less challenging – emotionally and in terms of communication – because cardiac arrest is unlikely to occur, and these patients will generally wish to have their lives extended and be prepared to accept the associated burdens. In the case of patients with chronic and severe (or terminal) illness, however, these discussions require particular sensitivity and experience. In special cases, this may mean that – despite its importance – the question of CPR is not addressed explicitly, but merely in the context of establishing the goal of treatment.

Discussions with patients and/or relatives or authorised representatives will always also be influenced by personal attitudes and preferences. To ensure that, as far as possible, communication is non-manipulative, it is essential to be self-critical and to be aware of and disclose one's own position. Here, even the choice of words can be of crucial importance. If a physician refers, for example, to "resuscitation" and "life-extending treatment", or even asks "Do you want us to do everything we can?", then this will be desired much more frequently – even by patients with a poor prognosis – than if a physician, in the same circumstances, uses the (often more appropriate) terms "resuscitation attempt" and "life-sustaining treatment".

To ensure a consistent approach, there is a need for effective interfaces between the emergency medical services, emergency room, ICU, intermediate care unit, general ward and everyone involved in treatment. The flow of information must be ensured at all times, which in turn requires continuously accessible documentation.

5.3.1. Newborns

The initial care of newborns is a special case, as the main considerations are the transition from fetal to neonatal circulation associated with adaptation and the priority of respiratory support. The mother, at this point, is subject to intense psychological and physical stress. Care is generally provided by specially trained professionals. For many professionals, the death of a newborn immediately after birth is an event which is difficult to accept. Nonetheless, studies indicate that resuscitation for longer than 20 minutes after birth without circulation be-

42 In some cantons (e.g. Zurich), this is required by law.

ing established is not appropriate. The guidelines of the Swiss Society of Neonatology recommend that unsuccessful resuscitation should be discontinued at 20 minutes after birth.[43] In the case of extremely preterm infants, generally delivered at perinatal centres, additional prematurity-related aspects need to be considered in the assessment of the overall situation and prognosis. This is discussed in separate guidelines.[44]

If abnormalities are detected in utero (e.g. malformation or genetic disorder) or if risk situations are anticipated (e.g. extreme prematurity), obstetricians and neonatologists must engage with the parents in good time before the birth, with other specialists (genetics, paediatric neurology, etc.) also being involved if necessary. After careful assessment of the implications of the findings for viability, and of any impairments to be expected, efforts should be made to reach a shared decision with the parents. These discussions, especially in situations involving the possibility of postnatal resuscitation, must be conducted with the parents on an interdisciplinary basis in advance, as it is much more difficult to do so directly after birth. Prenatal findings are sometimes uncertain. In such cases, efforts should be made to involve the father – and if possible the mother – at an early stage in the care of the newborn after birth.

5.3.2. Children and adolescents

In the case of previously healthy children and adolescents, there will generally be no advance discussions or advance directives. If the need arises, owing to relevant conditions or questions, adolescents should be appropriately involved in CPR decisions, in accordance with their developmental stage and taking their resilience into account. Like adults, adolescents with capacity[45] are entitled to have their wishes duly considered.

In cases of severe chronic illness, it is appropriate to conduct advance care planning with the adolescents and/or parents. The question of CPR is also to be dealt with in the care plan. It is possible to agree, for example, that in the event of respiratory arrest, which generally precedes cardiac arrest in paediatric patients, ventilation will be provided, but mechanical resuscitation will not be performed.[46] Carers and attending physicians are responsible for conducting these discussions with the patients and parents, and ensuring that they are appropriately documented in the care plans. If a decision is made in favour of CPR, the carers should be instructed in the relevant basic life support (BLS) measures.

43 Cf. Swiss Society of Neonatology. Support of Adaptation and Resuscitation of the Newborn Infant: Revised Recommendations (2017) (www.neonet.ch/recommendations/authored-ssn).

44 Cf. Swiss Society of Neonatology. Perinatal care at the limit of viability between 22 and 26 completed weeks of gestation in Switzerland – 2011 Revision of the Swiss recommendations (www.neonet.ch/recommendations/authored-ssn).

45 Cf., for a detailed discussion of the assessment of capacity in adolescents, Section 3.3 of the SAMS Medical-ethical guidelines "Assessment of capacity in medical practice" (2019).

46 This is sometimes referred to as "limited resuscitation".

In the case of children and adolescents with severe disabilities and chronic illnesses, a particularly close emotional and caregiving relationship often exists between parent and child, regardless of the latter's age. This may lead to a refusal to consider the question of the appropriateness of treatments or interventions, and possibly to a – generally unconscious – "instrumentalisation" of the child. This issue should be addressed with the requisite caution in discussions with the parents. The parents should be supported in making a decision which recognises the interests of the child. Psychological support or an ethical case conference may be helpful.[47]

5.3.3. Patients awaiting medical interventions[48]

During a therapeutic or diagnostic intervention, a cardiac arrest may occur which necessitates CPR. In general, such situations should be discussed in advance with patients (or with the parents in the case of children), and their wishes documented. If a possible CPR is refused by the patient, it may be that the treatment team is not prepared to proceed with the intervention. If the withholding of CPR is a justified treatment option, the institution must either ensure that the intervention is carried out by a treatment team which is prepared to respect the patient's wishes, or transfer the patient to another institution. The decision to withhold CPR in this situation must be carefully discussed and documented.

5.3.4. Patients with disabilities

A disability is not in itself a factor of prognostic relevance; in patients with disabilities, however, there may be impairments and comorbidities which are directly associated with the disability and which complicate resuscitation, or which may be substantially exacerbated by resuscitative measures. This is also true of significant mental and neurological impairments.

Patients with severe or multiple disabilities generally receive care over a number of years from a GP, in consultation with the relevant specialists. This care also involves discussion and determination of the procedure to be adopted in the event of cardiac arrest. Such discussions are demanding and should be conducted by specially trained professionals. At an early stage in the course of disease, it is possible to explore the question of CPR, cautiously and in a series of discussions. Well-conducted discussions on the appropriateness of CPR enhance the quality of the relationship. If this question remains unanswered, it will have to be discussed without any preparation, or remain unresolved, in a crisis situation.

For patients with severe or multiple disabilities, the CPR decision is an important component of advance care planning, which should be as comprehensive as possible. The involvement of a palliative care team will allow the discussion to focus on what measures are appropriate.

47 Cf. Garten et al. (2020); Hein et al (2020); Orkin et al. (2020).
48 See also Sections 1 and 6.2.1.

The situation is particularly challenging if patients with severe or multiple disabilities also have severe cognitive impairments (CPC 5 – CPC 3). There is a risk of additional neurological impairments. Moreover, these patients generally cannot express their wishes independently or without support. In such a situation, CPR is rarely an appropriate measure in the context of the patient's welfare. For relatives, tackling the question of "letting the patient die" is generally a major challenge. Possible reasons for this include feelings of guilt, but also instrumentalisation of the patient (who "must not die"). Ethical discussions within the interdisciplinary treatment team, but also with the involvement of relatives, can be an important instrument for resolving this dilemma. Such discussions should be led by experienced physicians, possibly with the aid of ethics support.

5.3.5. Very elderly persons

In discussions with very elderly persons (generally aged over 80), or with their authorised representatives, to determine the CPR status, it is important to consider the clinical context and bear in mind the individual goals of treatment. Such discussions should include, in particular, empathetic explanation of the risks and benefits of attempting, and the consequences of withholding, CPR. It is important not to undermine patients' confidence: they should not feel that they are being abandoned or will not receive sufficient medical care if CPR is withheld. For this reason, such discussions are extremely demanding and call for specific communication skills.[49]

Discussions with very elderly persons or their authorised representatives should be based on a realistic assessment of the prognosis in the individual situation. Studies show that CPR can be successful in very elderly hospitalised patients (approx. 10% neurologically intact survival even in patients aged over 90, according to a Swedish registry study analysing over 10,000 cases of in hospital cardiac arrest in patients aged over 70)[50]. On the other hand, a number of studies[51] show that CPR is associated with a poor prognosis in very elderly persons who are frail. Among the various tools available for the assessment of frailty, the Clinical Frailty Scale (CFS; see Annex, Section 2.1.6) is particularly widely used. According to currently available studies, CPR offers virtually no prospect of success in patients with a CFS score ≥5 on hospital admission.[52]

Based on this empirical evidence, efforts should be made to ensure that CPR is not attempted in situations where there is little or no likelihood of benefit, by providing persons who are very elderly and frail with realistic information, in an empathetic manner. Studies also show that most people at the end of life would prefer to receive palliative measures.[53]

49 Cf. Goal-Concordant Care, Serious Illness Conversation Guide, www.ariadnelabs.org/resources
50 Cf. Hirlekar et al. (2017).
51 Cf. Andrew et al. (2018); Druwé et al. (2020); Pape et al. (2018).
52 Cf., for example, Fernando et al. (2020); Ibitoye et al. (2021); Wharton et al. (2019).
53 Cf., for example, Borrat-Besson et al. (2020); Druwé et al. (2020); Graf et al. (2014); Stettler et al. (2018).

5.3.6. End-of-life and severely ill patients

Many patients approaching the end of life will be apprehensive about death and dying. Early support provided by a palliative care team can help to alleviate anxieties. For the patient and relatives, it can be reassuring to talk about what may happen in the last days and hours of life and to know that cardiac arrest is part of the normal process of dying.[54] It should be explained that the patient will not be abandoned and that every effort will be made to relieve pain. With the necessary empathy, it can be explained that attempting CPR would merely prolong the inexorable dying process, and it should be explained what measures will be taken to ensure good end-of-life care. Attention should be focused not on possible resuscitative efforts, but on the possibilities and limits of medical treatment and on the patient's expectations and wishes. If this is successfully discussed, the CPR decision will generally be made almost automatically.

In the case of severely ill patients who are not yet at the end of life, there is a need to discuss not only the prognosis with CPR. As part of advance care planning, and with the necessary sensitivity, medical measures adapted to the individual treatment goals should be discussed in detail for possible future health crises and emergencies, and recorded in an emergency/treatment plan. It should be pointed out that a cardiac arrest may enable a patient to die without having to endure a chronic progressive disease to the very end. Also to be mentioned, with the requisite empathy, are the – sometimes severe – treatment- and care-related burdens to be expected for the patient and relatives in the event of a poor neurological outcome after CPR.

5.4. Documentation of the CPR decision in the patient's records

The CPR decision must be documented, with a brief statement of reasons, in the patient's records. The documentation must include details of when and where the discussion took place and who took part, CPR status (Yes/No), intensive care (Yes/No) and intubation (Yes/No). Whereas further specification of resuscitation measures ("pharmacological only/electrical only) is not appropriate in prehospital situations and for the general ward, such distinctions are more frequently made and documented for patients monitored in an ICU. Here, it is essential that the documented measures are re-evaluated at interfaces (e.g. transfer to/from ICU) and that this is noted in the patient's records. If a decision is changed, reasons must be given and responsibilities defined. An advance directive, if available, and other advance care planning documents – in particular, instructions for medical emergencies[55] – are to be taken into account.

54 Cf. Section 3 ("Talking about dying and death") of the SAMS medical-ethical guidelines "Management of dying and death" (2018).

55 Cf. Footnote 10.

6. Procedure for the acute cardiac arrest situation

6.1. Chain of survival

The first few minutes after a sudden cardiac arrest are decisive. Training, involvement of the public and simplification of the method used are therefore essential if the success of CPR is to be significantly improved. To achieve this goal, increasing importance is being attached to instruction in basic life support (BLS) as part of the general school curriculum.[56] Resuscitation or BLS performed immediately by bystanders until the emergency medical services arrive leads to a doubling of the hospital discharge rates associated with various ambulance response time categories.[57] The standard emergency number (144) established in Switzerland makes it possible to summon professional help without delay and at the same time offers telephone CPR instructions, facilitating immediate intervention. So-called first-responder systems also appear to be suitable for bridging the critical interval between the event and the arrival of emergency medical services. The effectiveness of these systems is demonstrable, and they are increasingly also being developed in Switzerland.[58] New opportunities are arising from the introduction of smartphone apps which make it possible to raise the alarm and establish a direct connection with emergency medical services.

The chain of survival must also function within the hospital. Here, too, a delay in the initiation of CPR is associated with poorer outcomes. Programmes to improve in-hospital CPR procedures can significantly increase the chances of survival, which have now reached encouraging levels (neurologically intact survival rates up to 40%).

6.2. CPR in specific situations

6.2.1. In the peri-interventional situation

If, before an intervention, the patient has consented to the performance of all emergency measures, the situation is not to be regarded as any different from that of a sudden cardiac arrest not of (partly) iatrogenic origin. CPR is performed in accordance with standard medical practice and subsequent treatment is based on the same medical-ethical foundations as the aftercare provided following a cardiac arrest outside the interventional setting: an individual prognostic assessment is carried out, taking into account the course of the resuscitation and subsequent diagnostic measures, and treatment goals and measures are defined in consultation with the patient, if he/she has capacity, or, much more commonly, with the patient's authorised representatives.

56 Cf. Wissemberg et al. (2013).
57 Cf. Bürger et al. (2018); Sasson et al. (2010).
58 Cf. Saner et al. (2013).

If a patient has rejected CPR in an advance directive, it must be enquired whether this also applies to the situation of the planned intervention. If a patient specifically states, before an intervention, that CPR is not to be attempted, this must be respected. For the treatment team, which may feel particularly responsible for the survival of the patient, this is not easy. In addition, if there are concerns or, if it is certain, that a cardiac arrest was caused by an intervention, there may also be feelings of guilt and anxieties about civil or criminal liability. Not uncommonly, this will mean that, in the event of cardiac arrest of (partly) iatrogenic origin, action will be guided, not by the prognosis and the patient's wishes, but by the desire to remedy the damage and to do everything possible for the patient's survival. To avoid this situation, it is recommended that a preoperative discussion be held between the medical personnel involved (surgeon, anaesthetist, possibly intensive care specialist, GP, palliative care specialist) and the patient and/or relatives. If possible, this discussion should take place several days before the intervention.

In practice, various approaches exist in cases where a patient, before an intervention, has specified in an advance directive that CPR is not to be attempted, but this has not been clearly discussed. One common misconception is that advance directives are essentially not applicable in the operating theatre or during interventions, and that therefore all emergency measures – including CPR – can be performed irrespective of the existing advance directive. To justify this view, it is argued that the patient has consented to the intervention, and that this always also covers any emergency measures. These assumptions run counter to the right to self determination and could also have legal consequences.

Regardless of whether or not a patient has refused intraoperative CPR, an intraoperative death is highly distressing for the care team. Institutional and interprofessional structures and attitudes should make it possible for those concerned, even in this difficult situation, to ensure that treatment is guided by the well-considered individual prognosis and the patient's wishes. Also important is an active safety culture, encompassing a high degree of collegiality, knowledge and excellent skills in the empathetic, proactive communication of adverse events and medical errors to patients and relatives. It will also include a "second victim" support programme for the treatment teams concerned. This is also based on an awareness – among the institution's legal staff and risk managers – that a restrictive approach to the disclosure of adverse events and medical errors leads to more damage for those concerned – including more serious consequences in terms of legal liability.[59]

59 Cf. Truog et al. (2011); Chamberlain et al. (2012); Marron et al. (2018); Clark & Dudzinski (2013).

6.2.2. In the intensive care setting

As part of daily reviews of emergency decisions, fine-grained determination of CPR status is standard practice in the ICU. Based on the technical options available and individual experience with the patient, the use or withholding of life-sustaining interventions (e.g. intubation/ventilation, cardiovascular pharmacotherapy, renal replacement therapy, etc.) will generally be determined separately from CPR itself. Here, individual restrictions such as "pharmacological resuscitation only", "electrical resuscitation only", "intubation only, no mechanical resuscitation" or combinations of these interventions are customary or appropriate. While the withholding of resuscitative measures does not entail also withholding other life-sustaining interventions, it often represents a further step towards changing the goal of therapy to purely palliative treatment.

6.2.3. In the institutional care setting

Each old people's and nursing home should determine whether CPR can be offered round the clock throughout the year or not. This decision should be transparently and actively communicated, so that future residents and their authorised representatives can take local practice into account when choosing a home. Existing advance directives should be adapted if necessary.

If an old people's/nursing home decides to offer CPR comprehensively (generally basic measures including defibrillation), then the necessary framework[60] must be established to ensure that CPR can be performed in a professional manner. In particular, in discussions with individual residents, it should be explained in which groups of patients CPR offers little or no likelihood of benefit and should therefore not be attempted (cf. Section 5.3.5). The CPR decision is to be documented.

The goal must be to provide guidance for the professionals concerned. As well as explaining the importance of self-determination, it should therefore be emphasised that the principle of non maleficence imposes an obligation not to attempt CPR in every situation. In cases where the CPR decision is not documented, an assessment should be made independently by the emergency physicians or medical services in accordance with their authority.

6.2.4. After attempted suicide

In the case of cardiac arrest due to attempted suicide, it should not generally be concluded – purely on the basis of the possible suicidal act – that the person concerned would refuse CPR. The ethical considerations are closely linked to the patient's individual history, e.g. duration of suicidality, the method employed and

60 This includes, for example, the definition of procedures (SOP), an appropriate infrastructure and regular staff training, including training in specific communication skills – see, for example, the Harvard Medical School TRACK (transparency, respect, accountability, continuity and kindness) model in Truog et al. (2011).

mental capacity. The interpretation of an advance directive – should one be available – and/or suicide note is particularly difficult. In a suicide situation, it cannot automatically be assumed that the advance directive covers the specific suicide situation and was prepared in a state of capacity. Moreover, a suicide may also be simulated so as to conceal an unlawful killing.

Case studies can be helpful in evaluating whether the initiation or withholding of CPR is justified in particular cases.[61] Lying at one end of the spectrum is a planned so-called rational suicide attempted by a patient with capacity and with no underlying psychiatric illness, suffering from a severe somatic disease. At the other end of the spectrum are an impulsive suicide attempt or suicide in the context of an acute psychiatric illness – cases in which it can be assumed that the individual concerned, having regained capacity, would wish to live. In the first type of situation, attempting CPR is certainly not justified. In the second situation, CPR is to be initiated, unless the circumstances indicate that there is little or no likelihood of benefit. The fact that cardiac arrest has been caused by a suicide attempt should not automatically mean that CPR is initiated in the patient (triggered perhaps by the idea that suicide is never justifiable); nor is it to be assumed that the withholding of CPR is justified merely on the grounds that suicide has been attempted. In the case of an unsuccessful assisted suicide, it can be assumed that the patient wished to die. In doubtful cases, CPR should be attempted (unless the prognosis is wholly unfavourable) whenever it cannot be unequivocally assumed that CPR would be refused by the patient, even if capacity were regained. The same applies if unlawful killing is suspected on the basis of concrete evidence.

If, however, based on the evaluation of the particular case, the medical professional (e.g. paramedic) called to provide emergency assistance concludes that the person attempting suicide would refuse such assistance, then he or she may withhold or terminate CPR.

6.3. Use of special aids

6.3.1. Prehospital use of electromechanical devices

Many emergency medical services in Switzerland are equipped with mechanical chest compression devices (e.g. AutoPulse®, Lucas® 2). The compression device serves, inter alia, to provide physical relief for the CPR team, but its use should not lead to resuscitative measures being needlessly prolonged.

Give that evidence for a survival advantage with mechanical compression devices is still lacking[62], their use should be restricted to specific situations in which transport with mechanical CPR may be appropriate, e.g. refractory or recurrent ventricular fibrillation in cases where the initial conditions are otherwise favourable,

61 Cf. Krones (2018).
62 Cf. Wang et al. (2018).

situations involving alternating phases of circulation and circulatory arrest (e.g. in pulmonary embolism), hypothermia and severe electrolyte disorders. These devices should be used primarily to ensure uninterrupted cardiac massage during patient transfer (in staircases, ambulance transport or air rescue). They are not recommended for younger paediatric patients.

6.3.2. Use of ECLS/ECMO for extracorporeal CPR (ECPR[63])

ECPR is defined as the use of a (miniaturised) heart-lung machine during cardiopulmonary resuscitation. This involves emergency veno-arterial cannulation and the initiation of extracorporeal membrane oxygenation (ECMO, i.e. extracorporeal life support/ECLS). While the use of ECPR has been steadily increasing in recent years, especially in the hospital but also in the prehospital setting, it should continue to be considered only for specific patients in specific situations.[64] The use of ECLS has become established particularly in hospitals with an ECLS team available at short notice around the clock 365 days a year. ECPR is in principle also an option in paediatrics, although it is only available at individual specialised centres, which are often not conveniently accessible.

The use of ECLS/ECMO etc. is only appropriate in the presence of a potentially reversible aetiology, i.e. if causal therapy is possible and promising (bridge to therapy/recovery) or if additional time is required for decision-making (bridge to decision[65]). The decision on use will always also depend on the quality of previous resuscitation and the neurological outcome to be expected. According to the literature[66], a decision on the use of ECLS should be taken between 8 and (at most) 20 minutes after the initiation of adequate conventional CPR following a witnessed cardiac arrest, and reperfusion should be commenced at the latest within 60 minutes after the start of CPR to permit survival with a good neurological outcome. Factors to be taken into account when evaluating the use of ECLS are – as for all intensive-care interventions – the patient's age, any serious underlying conditions, or established predictors, and – if known – the patient's preferences. For the subsequent treatment, an ICU with appropriately trained staff is required. Evaluation of the prognosis is often difficult, as defined predictors for the risk-benefit assessment of ECLS are not currently available. For this reason, routine use of ECLS in refractory cardiac arrest is not recommended. Prehospital use of ECLS systems only occurs in individual pilot projects and is still to be considered "experimental".

The above-mentioned criteria are also applicable in paediatrics. As an additional aid to decision-making, a prognostic score based on three variables (CPR duration, blood lactate and blood pH) may be used.[67]

63 Cf. ERC (2021a).
64 Cf. ERC (2021a).
65 Bridge to decision: bridge to device, bridge to transplant.
66 Cf. Grunau et al. (2016a); Hutin et al. (2018).
67 Cf. De Mul et al. (2019).

6.4. Withholding CPR where it offers little or no likelihood of benefit[68]

In some situations, the initiation of CPR is not indicated or appropriate. This is the case if the patient has rejected CPR, or if there is clear evidence that it would offer little or no likelihood of benefit. CPR is to be withheld in patients with signs of certain death or with non-survivable injuries.

In younger persons, especially in children, the emotional pressure is much greater: in practice, even in situations where there is essentially no prospect of success (unwitnessed cardiac arrest, absence of hypothermia, asystole, no first-responder CPR, emergency medical services response time >10 minutes), CPR is sometimes attempted for a limited period for the sake of relatives or parents – above all, to show the parents that every effort was made.[69] This is ethically problematic.[70]

In some cases, in the prehospital setting, a number of high doses of adrenaline are administered, leading to ROSC in a prognostically dire situation. The result is then often brain death or an extremely poor neurological outcome.

The decision not to initiate CPR should be made by a physician or by a professional with the relevant (medically delegated) authority and, as far as possible, on the basis of consensus among the professionals providing assistance. In emergency medical services, instructions on procedure must be available for non-medical personnel.

In situations with no prospect of success, CPR efforts are to be terminated.

6.5. Duration and termination of CPR

In the literature, 20 minutes[71] is generally specified as an adequate duration for (mechanical, electrical, pharmacological) resuscitation, if ROSC is not achieved. In cardiac arrest, the period available for successful restoration of cerebral function is extremely short; for this reason, further prolongation of CPR in the absence of ROSC is generally unsuccessful. Under certain conditions, continuation of CPR beyond 20 minutes may be justified in adults with bystander-witnessed cardiac arrest.[72] The goal of CPR in previously independent persons is return to an autonomous life (CPC 1-2), not merely attainment of ROSC.

68 Cf. ERC (2021b).
69 Cf. Truog (2010).
70 Cf. also ERC (2021b).
71 Cf. European Resuscitation Council (www.erc.edu); American Heart Association (www.heart.org); cf. also Goldberger et al. (2012).
72 Cf. Nagao et al. (2016); ERC (2021b).

In adults, the following are highly significant predictors of poor neurological outcome after out-of-hospital cardiac arrest (OHCA) and can justify the termination of CPR:[73]

- unwitnessed cardiac arrest,
- initial rhythm other than ventricular fibrillation/ventricular tachycardia (OR 4.06) (non shockable rhythm),
- cardiac arrest with no intervention (downtime >10 minutes),
- use of higher adrenaline doses and dosing frequency (OR 2.08),
- bilateral absence of corneal and pupillary reflexes, Glasgow Coma Scale motor response score = 1 (OR 2.64),
- partial pressure of end-tidal CO_2 during 20 minutes of CPR in an intubated patient <10 mmHg (1.3 kPa): 0% survival,
- no ROSC after 20 minutes or no prehospital ROSC (approx. 1% survival with good neurological outcome); if spontaneous, perfusing cardiac activity is temporarily restored during CPR, the 20-minute CPR period begins anew.

In addition, there is a close association between time to ROSC and favourable neurological outcome, which is less pronounced in patients with a shockable initial rhythm. Whereas in patients with a shockable initial rhythm a favourable neurological outcome was observed in individual cases (<10%) with a time to ROSC of up to 47.5 minutes, an acceptable neurological outcome was not seen in any patients with a non-shockable initial rhythm and a time to ROSC of 30 minutes or more (except in cases of severe hypothermia, electrolyte disorder or poisoning).[74]

Irrespective of the duration of CPR, termination can be justified on the following grounds:

- onset of ROSC: guidelines require post-defibrillation CPR to be performed for 2 minutes before checking for ROSC (ROSC may possibly be detected by an increase in end-tidal CO_2),
- pre-existing chronic illness with poor prognosis for acceptable recovery,
- acute, almost certainly non-survivable injury (severe multiple trauma, blunt trauma with asystole, trauma with apnoea and pulselessness), extensive third-degree burns, severe brain injury (e.g. cessation of brainstem activity),
- trauma requiring repeated resuscitative measures (prehospital, emergency room).

Extension of CPR duration up to 45 minutes may be indicated under the following conditions:[75]

- children and patients with persistent ventricular fibrillation, until reversible factors have been treated or all options (CPR and therapeutic hypothermia during CPR and ECMO and early coronary artery revascularisation) have been exhausted (50% of patients treated with mechanical CPR and intra-arrest thera-

73 Cf. Martinell et al. (2017); Drennan et al. (2017).
74 Cf. Grunau et al. (2016b).
75 Cf. Stub et al. (2015).

peutic hypothermia and ECMO and early revascularisation had a favourable neurological outcome),
- no ROSC after 30 minutes, bystander CPR *and* ventricular fibrillation/ventricular tachycardia as initial rhythm *and* age <65 years *and* no significant comorbidities,
- hypothermia ("not dead until warm and dead"),
- asthma (need to correct dynamic hyperinflation),
- toxic cardiac arrest (complete neurological recovery possible after >4 hours CPR if asystole is a result of a direct substance effect, with gradual recovery over time),
- metabolic derangement (e.g. difficult-to-correct electrolyte disturbances),
- thrombolytic therapy during CPR; CPR should be continued until 2 hours post intervention,
- pregnancy, including emergency Caesarean.

6.6. Relatives in the acute cardiac arrest situation

In recent years, the focus of care has shifted from purely patient-centred treatment towards patient- *and* family-oriented care. During CPR, the patient is at the centre. Nonetheless, any family members on hand should be asked, if possible, whether they wish to be present while CPR is attempted. If relatives witness a CPR attempt, they are thus reassured that all necessary measures have been taken to revive their loved one. In addition, in out-of-hospital CPR, relatives can provide important information on the patient's medical history and (presumed) wishes with regard to resuscitation and report any symptoms which preceded the cardiac arrest.

Relatives who witness CPR after cardiac arrest are less likely to develop post-traumatic stress related symptoms, better able to cope with grief and often find it easier to come to terms with the events. Better mental health outcomes have been found among those who witnessed CPR, with no differences in medical team performance or patient survival.[76]

Despite the encouraging data, the possible disadvantages need to be carefully considered. Relatives witnessing CPR may be confronted with measures perceived as brutal and dehumanising, as well as incomprehensible medical terminology. The presence of relatives may also lead to CPR efforts being curtailed or prolonged.

If relatives are present during CPR, a designated person with a medical background should be available to provide appropriate explanations and support. A post-CPR debriefing with a qualified professional is also recommended.

76 Cf. DeWitt (2015); Kramer & Mitchell (2013); Krochmal et al. (2017); Morrison et al. (2010).

7. Aftercare

7.1. Support and aftercare for the patient and relatives

After cardiac arrest and/or an extended ICU stay, up to 80% of patients suffer post-intensive care syndrome (PICS), with impairments in their cognitive, physical (up to 25%) or mental health status (up to 60%). Muscle weakness (40%), concentration difficulties, problems with functioning (planning and organisation), fatigue, anxiety (70%), depression (30%) and post-traumatic stress disorder (10–50%) can persist for months or even years[77], leading to long–term changes in physical and psychosocial aspects of life. For these patients, professional aftercare is appropriate.

In paediatrics, PICS affects a significant proportion of children discharged from intensive care, with impairments likewise observed in the cognitive, physical and psychological domain. Risk factors include younger age, lower socioeconomic status, multiple interventions and sedation, as well as a long ICU stay.[78]

Long-term mental health can also be affected in relatives of critically ill patients (post-intensive care syndrome-family/PICS-F or PICS-P, if children are affected). In a long-term study[79], post traumatic stress disorder was detected in 40% of relatives of out-of-hospital cardiac arrest patients.

Patients and relatives often lack important information on physical and psychological challenges, subsequent treatment, the resumption of activities of daily living (ADL) and the development of relations between partners, as well as details of other health services. Both patients and relatives may require specialist support from experts in rehabilitation, neurology, psychiatry, geriatrics, physio- and speech therapy, and domiciliary care (Spitex). Patients and relatives at particular risk for PICS and PICS-F should be followed up three to four months after ICU or hospital discharge and if necessary referred to experts from a multidisciplinary team for a careful needs analysis and individualised aftercare. Such aftercare increases quality of life for patients and relatives, shortens treatment duration and leads to an earlier return to work.

In all patients, aftercare[80] should be systematically planned, either by physicians or by specialised nurses (e.g. Advanced Practice Nurse/APN). In children, it is recommended that aftercare be provided by the attending paediatrician and experts in psychiatry/psychology.

77 Cf. Inoue et al. (2019); Chahraoui et al. (2015); Vijayarafhavan et al. (2018); Emsden et al. (2018); Nolan et al. (2015).
78 Cf. Herrup et al. (2017).
79 Cf. Zimmerli et al. (2014).
80 The organisation of post-cardiac arrest/post-ICU follow-up clinics offering comprehensive management of the various impairments varies considerably between hospitals and countries in Europe. Initiatives in this area are also being developed in Switzerland, e.g. guided ICU visits, discussion of ICU diaries, patient information booklets on PICS and ICU follow-up consultations. Cf. also Ricou et al. (2018).

Aftercare should include the following elements:
– screening for cognitive impairments,
– screening for emotional impairments,
– monitoring of current health behaviour,
– in children, additionally: monitoring of psychomotor development,
– information on possible non-cardiac post-arrest symptoms, e.g. fatigue,
– information on heart disease and the future treatment plan (e.g. insertion of a pacemaker or implantable cardioverter defibrillator/ICD),
– information on ADL, partnership and burdens on relatives,
– in children, additionally: school reintegration,
– in relatives: screening/assessment of emotional stress and symptoms of PICS-F and, if necessary, referral to GP or specialised aftercare.

A combination of information booklets and personal consultation has proved effective in aftercare.

7.2. Aftercare for medical professionals

CPR may also be stressful for medical professionals, especially for personnel confronted with resuscitation either rarely or for the first time. Post-CPR debriefing should be institutionalised. This is essential particularly after emotionally difficult situations (e.g. unsuccessful CPR attempt, conflicts within the team, communication problems). All parties should be able to request such discussions. For this purpose, it is appropriate to train suitable team members as "peers". Peers can support team members if necessary immediately after a stressful deployment and facilitate discussion among colleagues. In healthcare institutions and emergency service organisations, processes should be defined to enable personnel to receive additional psychosocial support.

7.3. Determination of subsequent medical measures

After ROSC, the predictors described above, together with the clinical and diagnostic findings given below, can be used – albeit only after 72 hours – to assess the prognosis and, if appropriate, to modify the goals of treatment, to evaluate the outcome of resuscitation, and thus to define subsequent medical measures:
– (early) generalised myoclonic movements (highly predictive),
– bilateral absence of pupillary light reflex or corneal reflexes >72 hours,
– bilateral absence of cortical components in median nerve somatosensory evoked potentials,
– burst suppression EEG, isoelectric EEG, continuous generalised epileptiform discharges,

– elevated serum neuron-specific enolase (NSE) concentrations after 24–48 hours; the threshold level is evidently higher in hypothermic (>60 µg/L) than in normothermic patients (>33 µg/L).
– possibly, results of additional imaging procedures (e.g. angio-CT, MRI, resting-state fMRI).

Neurological improvements may occur within a period of up to two years, but they are often very limited over the long term. Of crucial importance are the improvements observed in the first few days after cardiac arrest. If they are pronounced, a substantial recovery can be expected; if they are limited, recovery to the CPC 1–2 level is not generally to be expected. In addition, in certain patients who experience a delay (several days to weeks) due to neuroinflammatory and apoptotic mechanisms, secondary irreversible deterioration may occur.

8. Conflict situations

Conflicts may arise, for example, in the following circumstances:

1. CPR status not defined or CPR status defined without the involvement of the patient/parents and/or no documentation specifying the reasons for the decision.
2. There is a good chance of CPR being sufficiently likely to lead to an extension of life with a good quality of life. However, the patient rejects CPR. The parents refuse to allow their child to be resuscitated.
3. The adolescent patient with capacity or the parents authorised to represent a child wish to have CPR performed. In view of the initial situation, the treatment team believe that CPR offers little or no likelihood of benefit and have communicated this repeatedly and unambiguously.
4. Termination of CPR or the decision whether or not to institute ECPR (ECMO cannulation) gives rise to disagreement within the team, and (for example) interprofessional conflicts arise.
5. Patient handovers, at various levels:
   a) Bystanders have initiated CPR and it is terminated by emergency medical services.
   b) Ground-based emergency medical services have performed CPR and request a helicopter; the indication is questioned by the aircrew.
   c) Following CPR, the patient is admitted to hospital in a poor condition. The emergency room team expresses its disapproval.
   d) The duty cardiologist is called to the emergency room to perform cardiac catheterisation in a resuscitated patient, which he or she does not believe to be indicated.

Patient-related situations (1–3) should be jointly discussed with the patient or authorised representative before a possible cardiac arrest occurs, as there will scarcely be time to reflect on the decision after the onset of cardiac arrest.

As regards the first type of situation, it should be noted that, in general, the patient and family must be informed that, in accordance with the principle of non-maleficence, CPR will not be performed in the event of cardiac arrest. If CPR is withheld without this decision being known, it may be traumatic for the bereaved. The information should be communicated in accordance with the principles applicable for breaking bad news and the serious illness conversation.

In the second type of case, it is generally appropriate to ask the patient or relatives whether they have received and understood the necessary information concerning the prognosis. Discussions with specially trained professionals facilitate decision-making with the patient or authorised representatives and can help to prevent possible conflicts. If cardiac arrest has already occurred and no enquiries can be made, no relatives acting as authorised representatives are present, or the patient is known to have rejected CPR, then it must not be attempted. If the parents reject CPR for their child even though the treatment team is clearly in favour since the prognosis is good, then it must be performed.

The third type of situation concerns patients and families in conflict-prone constellations. In spite of excellent communication by the treatment team, the adolescent patient or the family cannot accept the inevitability of imminent death and requests that everything possible be done to extend the patient's life. This may be the case particularly for seriously ill children. Even though such an approach may be ethically comprehensible in exceptional cases, it remains the case that, where the prognosis is extremely poor, the focus should be on palliative care, and that a CPR attempt may prolong the dying process and be unduly burdensome for the patient.[81] Ethics support may be especially helpful in this situation, since not uncommonly the failure to accept that the situation cannot be remedied may be partly attributable to biographical, deeper-lying causes (e.g. retraumatisation due to past experiences of discrimination against migrants, fear of not receiving sufficient care).

With regard to ECPR (the fourth type of situation), internal hospital guidelines should ensure that a defined plan – with indications, patient eligibility and exclusion criteria, and organisational procedures, including moderated round-table/interdisciplinary discussions and timelines – is agreed between the disciplines concerned and communicated to the professionals responsible.

In handover situations (the fifth type), it should first be discussed within the treatment team whether CPR offers no prospect of a short- or medium-term extension of life, with a tolerable quality of life, or whether, even though the prognosis is poor, CPR cannot be said to offer little or no likelihood of benefit in this strict sense. CPR offering little or no likelihood of benefit must be withheld. Here, the principle of non-maleficence is an essential aspect of care. This must be communicated empathetically to the patient or to relatives acting as authorised representatives.

81 Cf. Truog (2010).

1. Glossary

ADL	Activities of Daily Living
CASPRI score	Cardiac Arrest Survival Postresuscitation In-hospital score
CPC score	Cerebral Performance Categories score: description of neurological status, using a five-category scale
DNAR decision	Do Not Attempt Resuscitation decision
ECLS	Extracorporeal Life Support
ECMO	Extracorporeal Membrane Oxygenation
ECPR	Extracorporeal Cardiopulmonary Resuscitation
Medical professional	Physician, nurse or therapist
OHCA	Out-of-hospital cardiac arrest
PAM score	Pre-Arrest Morbidity score
PAR score	Prognosis After Resuscitation score
PICS	Post-Intensive Care Syndrome: impaired cognitive, physical or mental health status after cardiac arrest and/or an extended ICU stay
ROSC	Return Of Spontaneous Circulation

2. Medical foundations

2.1. Scoring systems

2.1.1. Cerebral Performance Categories (CPC) scale

CPC 1	Good cerebral performance: patient is conscious, alert, able to work; may have mild neurological deficits.
CPC 2	Moderate cerebral disability: patient is conscious, with sufficient cerebral function for independent activities of daily living; able to work in a sheltered environment.
CPC 3*	Severe cerebral disability: patient is conscious, dependent on others for daily support because of impaired brain function. Ranges from ambulatory state to severe dementia or paralysis.
CPC 4**	Coma or vegetative state: any degree of coma without the presence of brain death criteria. Unawareness, even if patient appears awake (vegetative state), without interaction with environment; may have spontaneous eye opening and sleep-wake cycles. Cerebral unresponsiveness.
CPC 5	Brain death: apnoea, areflexia, EEG silence, etc.

* Addition to CPC 3: Cognitive-motor dissociation: dissociation between the capacity for conscious thought and the ability to communicate or interact with the environment via motor or verbal signs.[82]
** Addition to CPC 4: Coma or unresponsive wakefulness syndrome (UWS) (formerly known as "vegetative state").

2.1.2. Prognosis After Resuscitation (PAR) score[83]

This score is only applicable for adults.

Variable	Score
Metastatic malignancy	10
Non-metastatic malignancy	3
Sepsis	5
Dependent functional status	5
Pneumonia	3
Creatinine >130 µmol/L	3
Age >70 years	2
Acute myocardial infarction	-2

A score >5 indicates that the patient is unlikely to survive.

82 Cf. Schiff (2015), Pincherle et al. (2019), Diserens et al. (2021).
83 Cf. Ohlsson et al. (2015).

2.1.3. Pre-Arrest Morbidity (PAM) index[84] and Modified Pre-Arrest Morbidity index

This score is only applicable for adults.

Clinical characteristic	PAM points	Modified PAM points
Hypotension (systolic ≤90 mmHg)	3	3
Azotaemia/uraemia	3	2
Malignancy	3	2
Pneumonia	3	2
Homebound lifestyle	3	1
Angina pectoris	1	0
Acute myocardial infarction – within 2 days of hospital admission – more than 2 days after hospital admission	1	 0 1
Heart failure (NYHA class III or IV)	1	1
S3 gallop	1	1
Oliguria (<300 mL/day)	1	1
Sepsis	1	1
Mechanical ventilation	1	1
Recent cerebrovascular event	1	2
Coma	1	1
Cirrhosis	1	0
Age <45 years >70 years	 0 0	 0 1
Dementia (unable to recognize family or friends)	0	2

The version of the PAM index used today has been modified from the original publication. It takes into account the fact that the effects of an acute coronary event on the survival rate tend to be positive and assigns different weights to pre-existing conditions. In studies, survival was not observed with a PAM score >8.

84 Cf. George et al. (1989).

2.1.4. Cardiac Arrest Survival Postresuscitation In-hospital (CASPRI) score[85]

This score is only applicable for adults.
Determination of the CASPRI score: for this cardiac arrest risk score, points are determined for each variable, and a summary score is obtained.

1. Age group, years	Points
<50	0
50–59	0
60–69	1
70–79	2
≥80	4

2. Initial arrest rhythm	Points
VF/VT time to defibrillation	
≤2 minutes	0
3 minutes	0
4–5 minutes	2
>5 minutes	3
Pulseless electrical activity	6
Asystole	7

3. Pre-arrest CPC score	Points
1	0
2	2
3	9
≥4	9

4. Hospital location	Points
Telemetry unit	0
Intensive care	1
Non-monitored unit	3

85 Cf. Zwingmann et al. (2016).

5. Duration of resuscitation (minutes)	Points
<2	0
2–4	0
5–9	3
10–14	5
15–19	6
20–24	6
25–29	6
≥30	8

Factors present prior to arrest	Points
6. Mechanical ventilation	3
7. Renal insufficiency	2
8. Hepatic insufficiency	4
9. Sepsis	3
10. Malignancy	4
11. Hypotension	3

Scores of 0–4 are associated with an 83%, 15–19 a 23%, and 30–34 a 2% likelihood of survival.
CPC, Cerebral Performance Category; VF/VT, ventricular fibrillation/ventricular tachycardia.

2.1.5. Score for prognostic evaluation of mortality with ECPR in children

Variable	1 point	2 points	3 points	6 points
CPR duration (minutes)	<40	40–59	60–104	≥105
Lactate (mmol/L)	<8.0	8.0–13.9	14.0–17.9	≥18.0
pH	>7.00	6.85–7.00	6.61–6.84	≤6.60

N.B: If a variable was not measured prior to the initiation of ECLS, the normal value should be used in calculating the score.
If the score is ≥9, ECPR (ECMO) should not be initiated.[86]

2.1.6. Clinical Frailty Scale

The current version of the Clinical Frailty Scale (pictorial scale with explanatory text and training material) is available on the website of Dalhousie University (Halifax, Canada).[87]

86 Cf. De Mul et al. (2019).
87 Cf. www.dal.ca/sites/gmr/our-tools/clinical-frailty-scale.html. Translations are available in German (Benzinger et al.), French (Abraham et al.) and Italian (Baldasseroni et al.).

2.2. Detailed presentation of findings on CPR outcomes (supplement to Section 4)

Recent studies on CPR outcomes show that the results of in-hospital CPR differ from those of out-of-hospital CPR. A review of data from the US published in 2019[88] showed that in around 81% of the estimated 290,000 adult patients (58% male, mean age 66 years) suffering in-hospital cardiac arrest each year, the presenting rhythm is non-shockable (i.e. asystole or pulseless electrical activity). The cardiac arrest has a cardiac cause in 50–60% of patients and is due to respiratory insufficiency in 15–40%. Around 25% of patients survive to hospital discharge, and of these patients around 85% (i.e. 21.5% of the total cohort) have a favourable neurological outcome (CPC 1–2). No information on these patients' quality of life is included in the study.

An analysis of regional and national registries from all over the world published by the International Liaison Committee on Resuscitation (ILCOR) in 2020[89] showed that the annual incidence of emergency medical services-treated out-of-hospital cardiac arrest was 30–97.1 individuals per 100,000 population, with the median age varying from 64 to 79 years in the various registries and more than 50% being male. The rate of favourable neurological outcome at hospital discharge or 30 days after CPR was 2.8–18.2% overall and 9.9–33% in patients with bystander-witnessed and shockable out-of-hospital cardiac arrest.

In a validation study[90], multivariable logistic regression analysis was used to identify factors significantly associated with a favourable neurological outcome in 94 (11.8%) of a group of almost 800 patients. Six of these factors – i.e. duration of CPR to ROSC, favourable neurological status before cardiac arrest, no malignant disease, shockable initial rhythm, normal renal function and younger age – are also to be found in the Cardiac Arrest Survival Postresuscitation In-hospital (CASPRI) scoring tool developed by Chan et al.[91]. In this tool, scores of 0–4 are associated with an 83%, 15–19 a 23%, and 30–34 a 2% likelihood of survival. In the univariate logistic regression analysis, the CASPRI score was significantly associated with the neurological outcome (odds ratio [OR]: 0.83; 95% confidence interval [CI]: 0.80–0.87).

In the largest study on survivors of out-of-hospital cardiac arrest published to date, a total of 15,113 deployments by paramedics in Victoria (Australia) were analysed using registry data (OHCA patients are eligible for inclusion in the registry if they are pulseless at any stage during emergency medical service attendance or are defibrillated before EMS arrival).[92] In around 8000 patients (53%), CPR was not performed. Of the roughly 7000 patients (47% of the total cohort) who received CPR, around 4500 (65%) died before reaching the hospital. Thus, around

88 Cf. Andersen et al. (2019).
89 Cf. Kiguschi et al. (2020).
90 Cf. Wang et al. (2018).
91 Cf. Chan et al. (2012).
92 Cf. Smith et al. (2015).

12,500 patients (83% of the total cohort) died prior to hospital admission. 927 patients (38% of those admitted to hospital alive; 6.1% of the total cohort) survived to hospital discharge; of these, 851 (91.8%; 34.7% of the primary survivors or 5.7% of the total cohort) were alive 12 months post discharge. Of these 851 patients, 687 (80.7%) were interviewed – either directly (530) or by proxy (157) – using standardised questionnaires[93], the EuroQol (EQ-5D) tool and questions on work-related and living status factors. Of the respondents, 381 (55.6%; 2.5% of the total cohort) had a good recovery (GOS-E ≥7) and 499 (72.3%) were living at home without care. Of the respondents (50%) who reported working before their cardiac arrest, 229 (almost two thirds) had returned to the same role. Quality of life, as measured by the GOS-E, was rated by 575 (84%) as unchanged (good recovery) or somewhat restricted (moderate disability). However, women and younger patients (18–44 years) reported lower scores for quality of life. The EQ-5D tool assesses five domains (mobility, self-care, daily activities, pain, anxiety); 88% of respondents reported no problems with self-care. In this analysis, the vast difference in Australia's geographical conditions needs to be taken into account; for this reason, the data cannot be directly applied to Switzerland.

In basic life support (BLS), whenever all of the following criteria are met, the prognosis for non traumatic OHCA is extremely poor (i.e. mortality is 100%)[94]:

1. cardiac arrest unwitnessed by emergency medical service team,
2. non-shockable rhythm (i.e. pulseless electrical activity or asystole detected by AED or other monitor) or no shock applied,
3. no ROSC after 20 minutes (in exceptional cases up to 40 minutes) with no evidence of a reversible cause in non-traumatic OHCA.

In advanced life support (ALS) or advanced cardiac life support (ACLS), whenever all of the following criteria are met in addition to the above-mentioned criteria 1–3, mortality is 100%:

- unwitnessed cardiac arrest,
- no bystander CPR,
- trauma. According to the literature, the prognosis for traumatic OHCA is not only poor in terms of survival to hospital discharge (less than 10%), but also extremely unfavourable in terms of neurological outcome. Individual prognostic factors are:
  - non-survivable injury,
  - blunt trauma and asystole,[95]
  - apnoea, pulselessness and absence of organised cardiac activity or other signs of life (spontaneous movement, ECG activity, pupillary response).

93 The Glasgow Outcome Scale–Extended (GOS-E) and the twelve-item short form (SF-12) health survey.
94 Cf. Morrison et al. (2010); Callaway (2016).
95 Cf. Chiang et al. (2017).

In patients admitted to hospital with cardiac function, the likelihood of neurologically intact survival varies, depending on whether they require only prehospital, only emergency room, or prehospital and ER resuscitation; overall, however, the prognosis is unfavourable.

	Dead	Vegetative state	Severe disability	Moderate disability	Good recovery
Prehospital resuscitation (n = 944)	68.3 % (645)	6.4 % (60)	10.6 % (100)	7.7 % (73)	7.0 % (66)
ER resuscitation (n = 1197)	74.4 % (891)	1.3 % (15)	5.1 % (61)	9.7 % (116)	9.5 % (114)
Prehospital + ER resuscitation (n = 911)	95.2 % (867)	0.7 % (6)	1.4 % (13)	1.3 % (12)	1.4 % (13)[96]

It must, however, be ensured that potentially reversible causes which can be rapidly eliminated are detected and treated in a timely manner. These include:
- the Hs: hypovolaemia, hypoxia, hydrogen ions (acidosis), hypo- or hyperkalaemia, hypothermia and hypoglycaemia.
- the Ts: toxins, (cardiac) tamponade, tension pneumothorax, thrombosis (acute coronary syndrome) and thromboembolism (pulmonary embolism).

96 Cf. Zwingmann et al. (2016).

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4. Cochrane Switzerland study

To provide a basis for the sub-committee's work on the revision of these guidelines, the SAMS commissioned Cochrane Switzerland to prepare an evidence synthesis on CPR outcomes. The results were published in a report at the end of 2018: www.samw.ch/dam/jcr:ad020b7b-83e5-4c5d-80cc-de0f6b998ddf/report_sams_cochrane_evidence_synthesis_cpr.pdf.

5. Q & A

When is CPR described as successful?

According to the guidelines, the outcome of CPR is not to be evaluated merely on the basis of whether return of spontaneous circulation (ROSC) is attained and the patient survives to hospital discharge. What is crucial is that the patient should survive without severe neurological sequelae and with a (subjectively) good quality of life. Neurological status is to be described using the Cerebral Performance Categories (CPC) classification. However, the CPC criteria do not encompass all possible late effects. An important additional factor in evaluating the outcome of CPR is the patient's subjective experience and satisfaction with the (new) situation.

How is the prognosis to be assessed in individual cases?

Assessment of the prognosis is extremely difficult. While statistical information is available on specific patient groups, this often does not allow precise conclusions to be drawn about particular cases. To predict the outcome of CPR, scoring systems which quantify pre-existing impairments and/or illnesses are used in some cases. The chances of surviving cardiac arrest without significant health deficits remain low. In recent years, however, there has been an increase in the proportion of successful resuscitations, with a good neurological outcome. This is largely attributable to three factors: (1) improvements in the so-called chain of survival, (2) a better knowledge of unfavourable prognostic factors (with the result that CPR offering little or no likelihood of benefit is not attempted), and (3) the fact that the topic has become less of a taboo (determination and documentation of patients' wishes, also leading to fewer CPR attempts).

What role is played by factors such as sex, age and comorbidities?

As mentioned in the guidelines, significant predictive sex-related differences exist. For example, studies report poorer long-term survival in women suffering out-of-hospital cardiac arrest. This is attributable to various (modifiable) factors (cf. Section 4.4.1).

Advanced age and frailty are prognostic factors. Even though, for example, an age limit is specified in the guidelines, this is given merely for guidance, to be taken into account in individual cases. For the assessment of frailty, various scales are available, each with its own advantages and disadvantages. In general, SAMS guidelines recommend the use of the Rockwood Clinical Frailty Scale (CFS), which was developed for adults over 65 years of age. Here, too, however, what is decisive is the individual prognosis.

When is CPR considered to offer little or no likelihood of benefit?

According to the guidelines, CPR offers little or no likelihood of benefit in cases where, prognostically, a short- or medium-term extension of life, with a (subjectively) tolerable quality of life, can almost certainly be ruled out.

Why is it important to help patients decide at an early stage whether they wish CPR to be attempted in the acute cardiac arrest situation?

Advanced age, comorbidities and also frailty increase the likelihood of cardiac arrest. When an initial situation of this kind exists, if not earlier, it is appropriate to raise the question of a CPR decision – e.g. as part of advance care planning – and to document the patient's wishes in a legally valid form. To permit a realistic assessment of the prognosis, an advisory discussion with a professional is recommended. Patients may, however, formulate their wishes without expert support and record them in a document with legal force, e.g. an advance directive. For an individual risk-benefit assessment and to facilitate the decision on CPR status, a discussion between the patient or authorised representative, relatives and a medical professional can be helpful. A decision, even when it has been recorded, may be modified at any time by a patient with capacity. This in turn should be appropriately documented.

How does the emergency medical team decide how to proceed in the acute cardiac arrest situation?

The requirement for explicit consent to treatment is essentially also applicable for CPR. As a patient suffering cardiac arrest lacks capacity[97], it is not possible to obtain informed consent at this point. In an urgent case of this kind, according to the Swiss Civil Code[98], the physician is entitled to carry out medical procedures in accordance with the presumed wishes and interests of the person lacking capacity. If the (presumed) wishes are known, all measures are to be guided thereby. If circumstances (time pressure, cardiac arrest site, etc.) so permit, the emergency medical team must look for any evidence that would indicate the patient's (presumed) wishes. If the person concerned rejects CPR, it must not be performed. If it is not possible to ascertain the patient's (presumed) wishes, his/her interests are the decisive factor. In this situation, the patient's life is to be preserved if possible, but CPR is to be withheld if it offers little or no likelihood of benefit.

How significant/binding are DNAR symbols?

DNAR symbols (e.g. "No CPR" stamps and necklaces) do not have the same legal force as an advance directive, the validity of which is assured by the Swiss Civil Code. DNAR symbols do, however, provide strong evidence of the patient's (presumed) wishes, and the emergency medical team may be guided by this in the emergency situation and withhold CPR. A stamp represents a marking "in the author's own hand", as a stamp applied each day after showering bears the day's date and thus expresses the patient's current wishes. There may, however, be situations where, in view of the circumstances, the emergency medical team doubts whether a symbol actually reflects the patient's wishes (e.g. when close relatives provide a credible assurance that the wishes of the person concerned have changed). In this situation, the emergency medical team will initiate CPR.

97 Cf. SAMS Medical-ethical guidelines "Assessment of capacity in medical practice" (2019).
98 Cf. Art. 379 SCC.

What happens if the patient's wishes are only ascertained after the initiation of CPR?

If it only becomes apparent after the initiation of CPR that this does not accord with the patient's (presumed) wishes – for example, in the light of an advance directive or credible information provided by authorised representatives and/or relatives – then the CPR efforts must be terminated.

Even if, at this point, return of spontaneous circulation (ROSC) has already been attained, the measures must be guided by the patient's (presumed) wishes. As stated in the guidelines, the measures already initiated (e.g. intubation, ventilation) are to be continued until hospital admission, but no additional strictly resuscitative measures (e.g. administration of catecholamines, antiarrhythmics) are to be performed and, in the event of a renewed cardiac arrest, no further CPR is to be undertaken.

If the patient then continues to require ventilation, this is to be terminated and the aim of treatment should be purely to alleviate symptoms. For it is to be assumed that patients who have rejected CPR in order to avoid the long-term risks (neurological damage) would not change their wishes in this situation. The crucial point (also from a legal perspective) is that, in the post-ROSC situation, the risks of long-term damage, which the patient hopes to avoid by refusing CPR, still exist.

Is it always appropriate to initiate CPR if the patient so wishes, or if the patient's wishes are not known?

The decision on CPR status and its documentation in the patient's records are of great significance. Each decision must therefore be based on the fundamental ethical values of good medical practice, which include respect for human autonomy and respect for the principles of beneficence and non-maleficence. These entail a duty to preserve a patient's life if possible, but also to withhold CPR efforts if they offer little or no likelihood of benefit. The guidelines state that it is not ethically justifiable to perform CPR offering little or no likelihood of benefit, as this would impose an unnecessary burden on the patient and merely prolong the dying process.

IV. INFORMATION ON THE PREPARATION OF THESE GUIDELINES

Mandate

In April 2018, the Central Ethics Committee (CEC) of the SAMS appointed a sub-committee to revise the medical-ethical guidelines "Decisions on cardiopulmonary resuscitation" (2008/2013).

Responsible sub-committee

Professor Reto Stocker, Zürich, Intensive Care Medicine (Chair)
Beat Baumgartner, Spiez, Paramedic Care
Luk de Crom, Affoltern am Albis, Nursing/Rehabilitation
PD Dr Karin Diserens, Lausanne, Neurorehabilitation
Dr Gudrun Jäger, St. Gallen, Paediatrics
Professor Tanja Krones, Zürich, Ethics
Angelika Lehmann, BSc, MNS, Basel, Intensive Care Nursing
Nicole Rapin Christen, Zürich, Swiss Patient Organisation
Professor Bara Ricou, Genève, Intensive Care Medicine
lic. iur. Michelle Salathé, Bern, MAE, SAMS, Law (ex officio)
Professor Jürg Steiger, Basel, CEC Chair (until 31 December 2020), Internal Medicine
Professor Andreas Stuck, Bern, Geriatrics
Professor Marc Thommen, Zürich, Law
Professor Wolfgang Ummenhofer, Basel, Emergency Medicine

Experts consulted

Roman Burkart, Bern, Interassociation for Rescue Services (IVR)
Professor Bernhard Frey, Uster, Paediatrics
Professor Catherine Gebhard, Zürich, Cardiology
Professor Andreas U. Gerber, Burgdorf, Internal Medicine
PD Dr Franz Immer, Bern, Swisstransplant
Professor Ralf Jox, Lausanne, Medical Ethics
Dr Renato Lenherr, Zürich, Intensive Care Medicine
Professor Rouven Porz, Bern, Ethics
PD Dr Fabio Rigamonti, Genève, Cardiology
Professor Hans Ulrich Rothen, Bern, Intensive Care Medicine († 2020)
Dr Anca-Cristina Sterie, Lausanne, Social Science of Medicine
Dr Erik von Elm, Bern, Cochrane Switzerland

Consultation procedure

On 24 November 2020, the Senate of the SAMS approved a draft version of these guidelines to be submitted for consultation to professional associations, organisations and other interested parties. The comments received have been taken into account in the final version.

Approval

The final version of these guidelines was approved by the Senate of the SAMS on 11 June 2021.