The Swiss Donation Pathway

Identification, reporting and treatment of a DCD donor

Module — 9

Version 1.1 — February 2023

CNDO
Nationaler Ausschuss für Organspende
Comité National du don d'organes

swiss transplant

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Inhalt

[1] DCD: donation after cardio-circulatory death
[2] FOGS: Medical Professionals in Organ and Tissue Donation

The term "organ donation" also includes tissue donation wherever appropriate.

1.0

Introduction

1.1 The history of the Swiss Donation Pathway

The Swiss Donation Pathway guidelines and recommendations were developed to serve as quality assurance with national standards for the donation process. They are intended for persons involved in the donation process as a training resource to meet the legal requirements of the Transplantation Act, which entered into force on 1 July 2007.

Module 9: "Identification, reporting and treatment of a DCD donor" forms part of the Swiss Donation Pathway, which is based on the critical pathway for organ donation following brain death.

The Swiss Donation Pathway is a joint project by the Swiss Society of Intensive Care Medicine (SSICM) and the National Committee for Organ Donation (CNDO) / Swisstransplant. The recommendations were developed by intensive care physicians belonging to the expert group of the CNDO.
The recommendations for the treatment of an adult donation after cardio-circulatory death (DCD) donor are intended for use by medical professionals in intensive care units in Switzerland. The aim is to make donation possible in the case of every potential donor who qualifies for organ donation and whose wishes are in line with organ donation. A further aim is to minimize the number of donors who cannot be used due to non-identification or suboptimal donor treatment, and thereby to improve the quantity and quality of organs available for transplantation.

1.2 The history of DCD

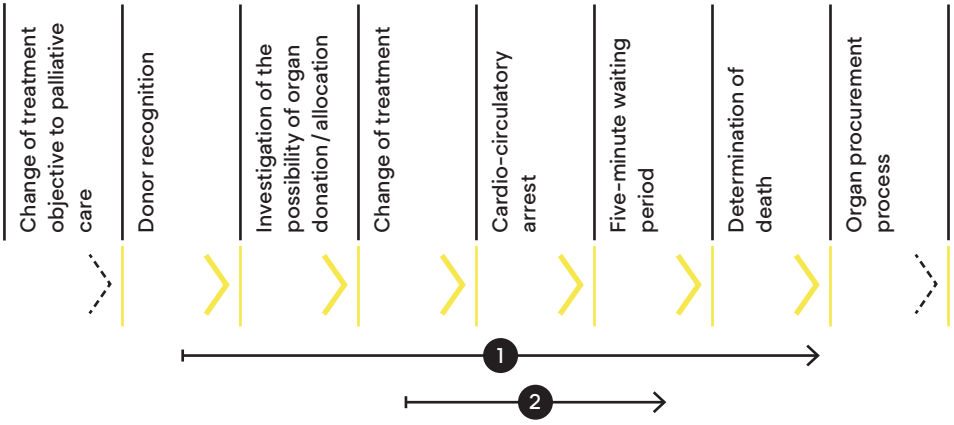
The donation of organs after cardio-circulatory arrest came at the beginning of the history of organ donation, and it was also common in Switzerland [1]. It was generally recognized that a person's death is imminent once their heart has stopped beating. In the first guidelines of the Swiss Academy of Medical Sciences (SAMS) on the determination of death in 1969, the key criterion was cardio-circulatory arrest, taking priority over the state of brain death with the failure of brain function, despite the heart continuing to beat. Historically, however, donation after brain death (DBD) rapidly became the standard, while organ donation after cardio-circulatory arrest became increasingly uncommon. This development also resulted in the perception of "normal donation" moving towards DBD.
With the implementation of the new Swiss Transplantation Act in 2007, all DCD activities were suspended as a result of legal uncertainties [2]. On the initiative of Swisstransplant, all involved experts were invited to a round table in 2009 in order to begin with the reintroduction of DCD in Switzerland [3, 4]. In a legal assessment by Olivier Guillod in 2011, the legal uncertainties with regard to DCD were clarified, and DCD was deemed legally permissible [5]. A completely new DCD programme was subsequently developed, and it was established within Swiss networks [6].
In this module, the Swiss Donation Pathway guidelines and recommendations as described as quality assurance with national standards for the DCD process.

2.0

Summary

2.1 Process flow chart

Figure 1: Process flow chart



1 = preparatory measures
2 = accompaniment of dying process by relatives

2.2 The core points of a DCD donation

DCD is a combination of two processes – the palliative care of a patient and the facilitation of organ donation. The possibility of DCD must be considered as soon as it becomes clear that a patient's death in hospital is imminent. This generally involves patients in an intensive care unit or resuscitation room, for whom the decision to move to palliative care is made due to the ineffectiveness or unlikely success of possible therapy measures and who do not meet the SAMS criteria for brain death within the permissible waiting period following consent to organ donation. If it is highly probable that the patient will die soon after the withdrawal of life-support measures, the patient can be considered a potential DCD donor. This possibility must then be aligned with the patient's wishes, and with medical guidelines. All decisions and actions form part of the palliative therapy stages of end-of-life care, with the requirement to safeguard the interests of the patient in this phase. Ensuring the best possible palliative care under consideration of the patient's wishes and the needs of their relatives has absolute priority. The question of organ donation is only discussed once a definitive decision has been made to change the treatment objective to palliative care. Once consent has been obtained, contraindications are ruled out, organ function is assessed and, following typing, the corresponding recipients are selected and called up in accordance with national allocation.

If death by natural causes cannot be established, a public prosecutor must be consulted before the move to palliative care is carried out. If there are no absolute contraindications (see SDP module 1), then the relatives must be asked about the wishes of the deceased person. If the Swisstransplant medical advisor gives their approval, the organs will continue to be evaluated further, and all of the data will be recorded in the Swiss Organ Allocation System (SOAS). Once the medical advisor has checked the data, they release the donor. Appropriate recipients are then selected following typing and in accordance with national allocation. This move is planned with great care and implemented in accordance with palliative guidelines [7 – 10]. The relatives are able to accompany the patient during the dying phase (chart, **Figure 1:** arrow 2). They say goodbye once cardiac arrest has been confirmed by means of echocardiography. The death is determined by two specialists who are independent of the transplantation team, following a waiting period of at least five minutes. Organ procurement is then carried out by the transplant team, and the deceased is finally laid out for their relatives. Only organs that have been allocated to recipients are removed. After procurement, the wound is closed by a surgical team so that physical integrity is preserved. After multi-organ procurement, the deceased can be laid out to provide more time and another opportunity for saying goodbye, and this is generally recommended.
Responsibility for the entire process lies with the treatment team of the intensive care unit, from donor recognition to determination of death. Ensuring the best possible palliative care under consideration of the patient's wishes and the needs of their relatives has absolute priority. All measures for organ donation, from change of treatment objective to palliative care to determination of death, are preparatory measures (chart: arrow 1) and are subject to strict limitations with regard to appropriateness, necessity and consent. (SAMS guideline "Determination of death with regard to ogran transplantation and preparation for organ procurement", p. 21)

3.0

The individual stages of a DCD donation

3.1 Identification

Patients with an infaust prognosis and relevant life – support measures are to be considered as potential donors and must be evaluated with regard to donor suitability. Appropriate supervision during intensive care is vital in order to determine the wishes of the dying patient and facilitate a potential organ donation.

Every patient who, after consent to organ donation, has not undergone brain death within 48 hours and who will die imminently after withdrawal of life support measures is a potential DCD donor. It is important that the possibility of organ donation is considered before a change of treatment objective to palliative care is implemented, in order make the donation possible provided it conforms to the patient's wishes. This calls for experience and for a systematic approach with checklists and elements of control in the treatment pathway to which a treatment team can refer. The following points outline the core aspects in the process of identifying a potential DCD donor.

3.1.1 Basic requirements

A change of treatment objective to palliative care is a prerequisite for organ donation after cardio-circulatory arrest. The decision must be made independent of the organ donation and before any clarification, and is based on alignment of the assessment within the treatment team (prognosis) with the real or assumed wishes of the patient. Once this decision has been made, the question about the possibility of organ donation can be asked.

In 1995 in Maastricht, the classification of death after permanent circulatory arrest was established (revised in 2013) [7].

Maastricht classification

Category I: dead on arrival in hospital
Category II: death after unsuccessful resuscitation
Category III: death after withdrawal of life-sustaining treatment
Category IV: cardio-circulatory arrest after death due to primary brain damage
Category V: unexpected cardio-circulatory arrest in a critically ill patient

Categories I, II, IV are organ donations following unexpected or uncontrolled cardio-circulatory arrest (uDCD; u: uncontrolled). Category III (cDCD; c: controlled) is organ donation after a planned change in the objective of treatment to palliative care. The directives and recommendations of the Swiss Donation Pathway set out in this module have been designed as a quality assurance programme in accordance with the applicable national standards for the category III DCD donation process.

With DCD Maastricht III, a decision to change the treatment objective is the basic prerequisite that determines whether a patient can be considered for investigation of the possibility of organ donation. The change in treatment objective is a medical decision based on prognosis and the wishes of the patient. The prognosis is an assessment of the best possible outcome and the probability that it will occur, but also the likely progression. It is a medical assessment based on examinations, expertise and experience.

A change of treatment objective to palliative care can be initiated for two reasons. Firstly, the prognosis is infaust, i.e., short or medium-term survival is not possible, and treatment is therefore ineffective. In this case, the termination of therapy is also indicated from a purely medical perspective.

In the second situation, the prognosis does not meet the expectations of the patient in terms of quality of life, i.e., the continuation of therapy is not in their interest in view of the anticipated poor quality of life. This is referred to as futile care. Here too, a change of treatment objective to palliative care is indicated, based either on the wishes of the patient as indicated in advance or determined through consultation with the relatives.

It is essential in the evaluation of the treatment objective that this evaluation is carried out with maximum care and consideration by the treatment team. This decision must not be influenced by the possibility of organ donation. The prognosis assessment and the alignment with the patient's wishes comprise subjective elements and must be protected from any possible conflicts of interest. It is for this reason that any change of treatment objective to palliative care must always be clearly determined and carefully documented before the possibility of organ donation is investigated. Members of the treatment teams of potential transplant candidates must not be involved in the decision to change a treatment objective to palliative care. Organ donation can only be considered once the decision to change treatment objective has been made in consultation with the patient's relatives.

Figure 2: Basic requirements for organ donation following cardio-circulatory arrest

Ineffective or futile treatment	Decision to change treatment objective to palliative care	Evaluation of DCD donation
	– Treatment team with relatives according to patient's wishes	– Treatment team with relatives according to patient's wishes – Organ donation personnel

3.1.2 Which patient is eligible?

If it is probable that brain death will occur within the next 48 hours with maintained circulatory function, and the patient thereby qualifies for DBD, this period should first be allowed to pass. According to the SAMS guidelines, organ-preserving treatment with a view to transplantation before death is permissible for two days under consideration of the wishes of the patient and their relatives. If brain death does not occur, a DCD donation can then be considered.

The deciding factor in identifying a patient for consideration as a possible DCD donor is dependence on mechanical or pharmaceutical support of vital organs, the withdrawal of which would result in the death of the patient within a short time – in Switzerland within two hours as a rule. Typically, this situation applies in the case of high dependence on catecholamines, mechanical circulatory support or mechanical ventilation. Very often, such a situation is the result of severe neurological damage, cardio-circulatory insufficiency or respiratory failure, and usually a combination of all three.

3.1.3 Where is a potential DCD donor identified?

Possible DCD donors are generally to be found in accident and emergency departments or intensive care units. If the patient is in an accident and emergency department, it is recommended that they be transferred to an intensive care unit for further decisions and measures, as there is usually more time and expertise available for the implementation of a comprehensive end-of-life concept and the related investigation of the possibility of organ donation. Ideally, it should have been determined before transfer to the intensive care unit whether the patient qualifies for organ donation and whether consent can be assumed in principle. In many cases, the latter cannot be determined because ideally, the relatives should not be asked about organ donation at the accident and emergency department.

3.1.4 Who identifies a DCD donor?

The treatment team (both physicians and nursing staff) in the intensive care unit and the resuscitation room is important when it comes to identifying a possible organ donor. Decisions and discussions are the responsibility of the consultant with experience in end-of-life care or intensive care medicine. The identification of possible donors for individuals outside intensive care units is more complex. It is generally recommended, however, to consult a specialist at an early stage (before any extubation and/or cessation of life support measures (such as ECMO in the case of terminal heart failure)).

3.1.5 When does the question of a possible organ donation arise?

Particularly in an accident and emergency department, but also in an intensive care unit, a possible donor must be identified quickly in order to ensure that the donation can be carried out if it corresponds to the individual's wishes. However, the possibility of organ donation is only discussed once a definitive decision has been made to change the treatment objective

to palliative care. As soon as this has been decided, planning for the change of treatment and therefore also an investigation into the possibility of organ donation will begin.

3.1.6 Support, FOGS information, hotline

The hotline provides physicians in a network's partner hospitals with a telephone number they can call if they have identified a potential organ donor and need support or information.

Depending on the network, the hotline contact persons are consultants working in an intensive care unit, organ donation coordinators, organ donation and transplant coordinators, or Swisstransplant coordinators, who in turn contact the Swisstransplant medical advisor on duty. They process all organizational and medical matters relating to the organ donation. They accompany and support the donation process, from the identification of the donor to the procurement and transplantation of the organs.

The hotlines are available around the clock to teams in accident and emergency departments and intensive care units:

Netzwerk Schweiz Mitte:

Basel:	+41 61 265 25 25 (via the telephone switchboard of the University Hospital)
Bern:	+41 31 632 83 95
Netzwerk DCA:	+41 44 255 22 22
Netzwerk Lucerne:	+41 41 205 64 00
Netzwerk PLDO:	+41 79 553 34 00
Netzwerk St. Gallen:	+41 71 494 70 60 (via the Netzwerk NOOhotline)
Swisstransplant:	+41 58 123 80 40

3.2 Preparatory measures in the treatment of a DCD donor

Measures taken during the treatment of a possible DCD donor that serve the sole purpose of organ donation are considered preparatory measures, are subordinate to the palliative process and are limited by law [2]. All decisions and actions form part of the palliative therapy stages of end-of-life care, with the requirement to protect the interests of the patient in this final phase. Preparatory measures are permissible if they are vital to successful transplantation and are reasonable considering the situation. Treatment generally comprises the continuation of intensive care measures in the interest of organ-preserving therapy and the necessary investigation of the possibility of organ donation. The consent of the patient or, if

not available, that of their relatives is required. Procedures forbidden by law in this context are ante-mortem mechanical reanimation (SAMS guideline "Determination of death with regard to ogran transplantation and preparation for organ procurement", p. 21) and the placement of an arterial cannula for cold perfusion (SAMS guidelines, Appendix H, negative list) [10].

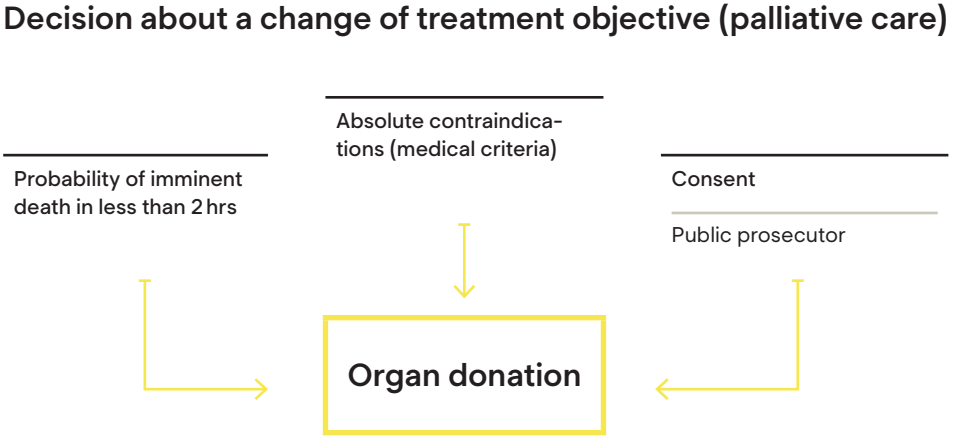
3.3 Organ donation evaluation

Once a possible organ donor has been identified, it must be determined whether the guidelines for organ procurement have been met. It is necessary to determine whether an organ donation corresponds to the patient's wishes, and whether it is medically feasible and ethically and legally permissible. In principle, the following four questions must be answered before concrete planning of organ procurement and allocation can begin (see **Figure 3**):

1. Has the decision about a change of treatment objective to palliative care been taken?
2. Are there any absolute contraindications for organ donation?
3. Will the patient soon be deceased, thereby facilitating organ donation? (probability of imminent death in less than 2 hours)
4. Does the organ donation, with the necessary preparatory measures, correspond to the wishes of the patient? (consent)

The individual points are explained below. Certain questions are easy to answer, while for

Figure 3: Investigation of the possibility of organ donation



others it is advisable to consult a specialist with the corresponding experience as early as possible, i.e., a member of staff of the hospital, organ donation network or Swisstransplant. The first requirement must be met, and this decision must be made without any regard to the question of organ donation. Before any investigations with regard to organ donation are carried out, it must first be checked whether there are any obvious medical contraindications (e.g. metastatic tumours).

The sequence of clarification steps is not predefined but should follow the principle of simplicity in order to avoid placing an excessive burden on the relatives: straightforward questions are clarified before complex ones. All four requirements must be met for an organ donation to be realized. If one requirement is not met, organ donation will not be possible. The process is terminated, and no further clarification is necessary. In most cases, the first step is to evaluate the wishes of the patient.

3.3.1 Consent

If there are no recorded wishes (e.g. on an organ donor card, in an advance directive or in other documents), then the patient's wishes with regard to organ and tissue donation must be clarified in the discussion with the relatives. If the patient's wishes cannot be determined with certainty, their relatives will be required to decide on their behalf. If there are no close acquaintances who can offer an opinion, donation is not permissible.
If consent has been given, this consent must also include consent to continuation of organ-preserving treatment and to the use of preparatory measures (medication-based treatments, blood draws and additional tests). It is important that the relatives are informed in detail of the entire process and the necessary medical measures. The timeline of the organ donation process should be mapped out for them, and they should be told about the place where treatment will be withdrawn and what the procedure will be at that time. Equally, it is also essential to inform the relatives of the possibility that organ donation may not be possible in some circumstances (because the maximum agonal phase of 120 minutes was exceeded, or because organs could not be allocated due to medical findings) and they should be informed about what will happen in this case.

3.3.1.1 Unexplained / unusual death

If a death is not due to natural causes – accident, crime, suicide, unexplained death – the legal authorities must be informed in accordance with the applicable cantonal procedure in order to obtain permission for organ procurement. This permission must be obtained once consent for organ donation has been given, but before a change of treatment and thus before the time of death. It must be determined which public prosecutor is responsible (place of event versus place of death), whether a body search needs to be carried out before death, whether any organs can be procured and if so which ones, and whether a forensic examination will need to take place. Cantonal regulations must be complied with, especially in the event of the transfer of a potential DCD donor to a tertiary hospital.

3.3.2 Probability of imminent death

In DCD donation, death occurs on cardio-circulatory arrest. With the cessation of blood circulation, the brain is also no longer supplied with blood, resulting in the patient's death. The dying phase with the five-minute waiting period and the preparation for surgery can result in ischaemic damage to organs intended for transplantation. If the dying phase is excessively long, the organs can no longer be transplanted with an acceptable result. Patients can therefore only be considered as possible donors if the dying phase is so short following the withdrawal of life support measures that the organ damage caused by ischaemia remains within a tolerable limit. The maximum tolerable ischaemia time for transplantation varies depending on the organ concerned and is described in detail in the Standard Operating Procedure (SOP) for DCD (see Documents, DCD_SOP).

Maximum functional warm ischaemia time for each organ:
Pancreas: 30 min
Liver: 50 min (if shorter, second recipient)
Kidneys: 120 min
Lung: 120 min
Heart: 30 min

The assessment of the **probability of imminent death,** i.e., the likely duration of the dying phase, is essential to the decision as to whether a DCD donation can take place. A short dying phase is to be expected when the level of intensive care support being provided to the vital organs is high, and cardio-circulatory arrest will therefore occur rapidly following their withdrawal. The experience of the intensive care physician, and clinical examination including the **Wisconsin Score** are important parameters for a reliable assessment [12]. If the probability is sufficiently high, then the patient is a potential donor, and the organ donation can be planned. If it is very low, no organ donation should be planned, because an unsuccessful organ donation attempt can have a significant impact on the end-of-life care process. Responsibility for whether the criterion is met lies with the treatment team. The decision must always be made with the best interests of the patient and their relatives in mind.

3.3.3 Medical criteria

Organ donation is possible if there are no contraindications, and the functionality of the organs is sufficient for transplantation. The aim is to ensure that the transplantation does not cause any damage to the recipient. The same rules apply in principle as to DBD (see Module 1: "Donor recognition").

Contraindications

The contraindications for organ donation are as follows:
- Neonates <28 days old or postmenstrual age <44 weeks
- **Refractory** systemic infections
- Certain degenerative diseases of the central nervous system (CNS)
  - e.g. rabies, prion disease etc.

Nowadays, a **highly differentiated** approach is required when it comes to **malignant neoplasms** [13]. In principle, it is possible for malignant neoplasms to be transferred to immunosuppressed organ recipients from donors with a known or unknown malignant tumour, but the risk is small if the donors are selected carefully [13]. Malignancies in the medical history of potential donors – and in some cases even an active cancer – should therefore **not** automatically lead to a person being rejected as an organ donor. The expected risk of tumour transmission must be carefully weighed against the benefit of a possible transplantation [13]. Advances in medicine and new scientific knowledge in particular have made it possible to relax rules governing the inclusion of donors with neoplasms – especially in the case of localized or regionally limited tumours in the early stages. In many cases, a neoplasm that has been transmitted to the recipient can even be treated. However, **particular caution** must be exercised with regard to the detection and evaluation of malignant neoplasms in donors.
The **general rule** is that organ donors with a history of tumours that have been treated and cured are acceptable for carefully selected recipients as long as tumour aftercare was performed with corresponding care and the period of complete absence of tumours has been well-documented. There is no international consensus on criteria for freedom from tumour recurrence – the required time free from tumours ranges between more than five and more than ten years, depending on the type and stage of tumour.
Primary tumours in the CNS account for up to 1.5% of causes of death in organ donors. The two most important factors for the assessment of CNS tumours with regard to their risk of transmission in the context of organ donation are 1) the histologically determined WHO grade of the CNS tumour and 2) any tumour-related intervention (surgery, shunt, chemotherapy and/or radiotherapy). The general rule is, the higher the tumour grade (higher than WHO grade III) and the more interventions required, the higher the risk of transmission [13].
Malignant melanoma has been shown to have a 74% transmission rate and a 60% mortality rate in recipients. The published data are still insufficient, meaning that a high transmission rate for malignant melanoma should still be assumed. In light of this fact, a superficial tumour with a tumour thickness of less than 1.5 millimetres following curative tumour resection and a recurrence-free period of more than ten years is considered an acceptable risk with low transmission rate for the recipient.

There is **no** contraindication in the case of:
- Primary basal cell carcinoma of the skin
- Cervical carcinoma **in situ**
- Localized, clearly demarcated tumour of low malignancy (e.g. renal cell carcinoma <2 centimetres)

Therefore, in any **cases where there is doubt,** Swisstransplant should always be asked to check whether the person may be a potential donor **before** they are categorically ruled out.

Transplantable organs

The number of potential DCD donors is significantly higher than with DBD donations, as many other causes of death may apply in addition to neurological damage. Patients are also more likely to experience multiple organ failure, e.g. in septic or cardiogenic shock. As a DCD donor is still in the end-of-life care phase, a rapid assessment of whether an organ can be transplanted at all is extremely important. Sometimes it is clear from the beginning that no transplantation will be possible in view of the bleak situation. In this case, no further investigations should be carried out in order to avoid placing any additional burden on the end-of-life care process. Often, however, a comprehensive evaluation with experienced organ donation specialists and Swisstransplant staff is needed in order to achieve certainty that no organ is transplantable.

3.4 Notification – entry in the Swiss Organ Allocation System (SOAS)

If the requirements are met, the patient is given an ST number by Swisstransplant and the necessary patient data are entered in the SOAS by the coordinators. The organs are checked in terms of quality for transplantation and allocated to possible recipients. Ultimately, responsibility for acceptance of the organs for transplantation lies with the transplantation teams concerned. They decide whether any further investigations are necessary for successful transplantation. However, these investigations are subject to the legally prescribed limitations applicable to preparatory measures, which must be appropriate and essential. The appropriateness of the measures is determined by the treatment team together with the relatives in the best interests of the patient.

3.5 Transfer of a potential donor to an organ procurement hospital

If organ procurement cannot be performed at a particular hospital due to a lack of infrastructure, the physician will transfer the patient to a reference hospital with the permission of the relatives. This can be from one intensive care unit to another, or directly to an operating theatre. The transfer is organized jointly by the physician responsible for the patient and the coordinator, in collaboration with Swisstransplant. A meticulous handover between the physicians responsible is crucial. The treatment objective decision in particular must be documented and communicated well, as the physician taking over will be required to complete the death certificate and report any unusual death. In the event of an unusual death, the public prosecutor responsible for the reference hospital must contact the locally responsible public prosecutor. In order to avoid additional costs for the relatives and the donor detection hospitals, the transfer of the potential donor and the return of the deceased person to their place of origin are carried out by Swisstransplant.
The relatives must be informed of the procedure in detail. This includes notification that there will be a change of team and a re-evaluation of the donor criteria mentioned above, and that there is a chance that organ donation will not be possible despite the transfer.

3.6 Implementation of organ donation: process of dying and organ procurement

3.6.1 Immediate preparation / planning

The process of dying and the subsequent organ procurement must be meticulously planned. A DCD donation is a combination of two processes: the implementation of a change of treatment objective to palliative care and the facilitation of organ donation. The change of treatment and the process of dying are subordinate to the guidelines for end-of-life care [7]. For organ donation to be possible, however, the process of dying must be structured accordingly, especially with regard to timing and location. Nevertheless, this must not result in the interests of the patient or their relatives being neglected.
The distribution of roles, with the definition of associated responsibilities, must be clarified before a change of treatment objective to palliative care, for each individual step and for all those involved. A preliminary discussion to coordinate the dying phase, the determination of death and subsequent organ procurement, as well as the supervision of the relatives, are all essential. It is vitally important to ensure that the interests of the donor take priority at all times, and that no transplant medicine specialists are permitted to influence palliative decisions. Furthermore, the use of specialists such as neurologists for the determination of death, anaesthetists for reintubation, cardiologists for any pacemaker deactivation and staff to support the relatives must be planned in advance.

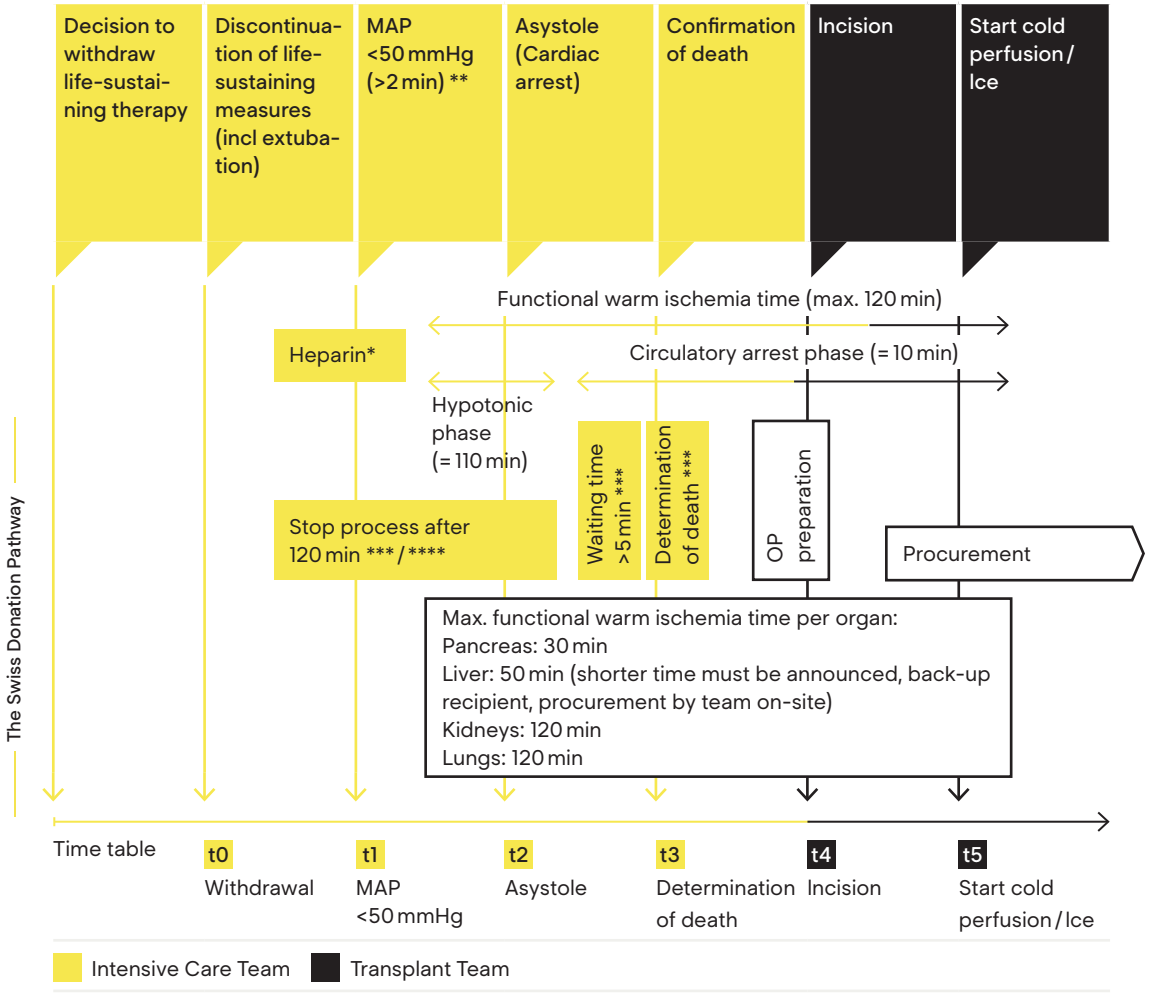
3.6.2 Implementation: change of treatment, dying phase, death

Following careful preparation of the patient and the environment, the relatives are taken to the patient so that they can accompany the patient through the dying phase. Terminal weaning, terminal extubation and palliative analgo-sedation are carried out by the team in accordance with the principles of intensive care, in the interests of the patient in view of the palliative situation. Once life support measures have been withdrawn, the acute dying phase will begin, with desaturation and increasing cardiovascular failure and cardio-circulatory arrest. The relatives then say goodbye and are led out of the operating theatre. Five minutes after cardiac arrest (StA recommendations for determining cardio-circulatory arrest with transthoracic echocardiography) documented by means of echocardiography, determination of death is carried out in accordance with the SAMS guidelines. The conclusion of the examination represents the time of death. Only now does the organ procurement process begin (see **Figure 4**).

The change of treatment can take place in the intensive care unit or in the operating theatre. Should the patient's death not occur within the defined time frame, the DCD process is terminated, and palliative care of the patient will continue. The relatives must in any case be informed of this possibility in advance, as any failure of the donation process is often experienced as an additional burden.

Procurement under normothermic regional perfusion
In the procedure for procurement under normothermic regional perfusion following confir-

Figure 4: DCD Scheme: Rapid procurement (RP)



* **Heparin administration** at t0 (300 IE / kg iv). It the likelihood of mortality is low and / or there is an increased risk of bleeding, the attending IC doctor may decide to administer the heparin later; however, the dose must be injected no later than at t1 (MAP <50 mmHg).

** **MAP <50mmHg (depending on age):** The following values are tobe used, depending on age category: **0 to 1 year: <35 mmHg; 1 to 3 years: <40 mmHg; 3 to 5 years: <45 mmHg; 5 years and above: <50 mmHg (for a minimum of 2 minutes).**

*** **Swiss Academy of Medical Sciences (SAMS)**

**** Premature termination may occur, if after >60 minutes from t0 none of the 3 criteria are not met: **pH <7.2; BP syst <70 mmHg; SpO_2 <70%**

mation of death, the femoral arteries and veins are cannulated, and an intra-aortic balloon is positioned at the level of the descending thoracic aorta. The purpose of this is to ensure perfusion of the intra-abdominal organs while preventing perfusion of the brain and limiting cellular damage caused by ischaemia, all of which helps to improve the quality of the transplants.
After two to four hours of circulation, the procurement of organs (apart from the lungs) can begin. The waiting period provides the opportunity to observe and monitor biological changes in the organs by way of regular blood draws, and it allows the patient to be transferred to the operating theatre at the optimal time.

Practical description
On the day of withdrawal of treatment, prior to the start of the withdrawal of life support measures, the system for normothermic regional perfusion is prepared, along with the equipment for the cannulation of the femoral vessels.
The withdrawal of treatment, the start of warm ischaemia, the 5-minute no-touch time, the echocardiography to confirm cardio-circulatory arrest and the clinical examination for confirmation of death are carried out in the same way as in the case of a rapid organ procurement procedure.

As soon as the patient is declared dead, the cannulation team cannulates the femoral arteries and veins. The positioning of the cannulae is checked using transthoracic echocardiography. Before the regional perfusion machine is started, balloon occlusion is carried out by way of advancement of the balloon via the femoral artery to the thoracic aorta to limit circulation at the level of the infradiaphragmatic organs. If the lungs are to be procured, the patient is also intubated at this time in the usual manner, and mechanical ventilation is resumed.
Once the positioning of the intra-aortic balloon has been confirmed by transthoracic echocardiography, normothermic regional perfusion is started. From this point onwards, mean blood pressure should be monitored, and the target should be 60 mmHg. If necessary, volume expander and amines can be administered to ensure satisfactory perfusion of the abdominal organs.
Repeated arterial blood gas tests can be used to ensure that lactate, a marker of ischaemia, is being progressively eliminated. Haemoglobin should also be monitored, and packed red blood cells (PRBCs) can be transfused if necessary.
After 1 hour of regional circulation, liver tests are carried out, and the decreases in values are assessed as part of a second check-up prior to leaving for the operating theatre.

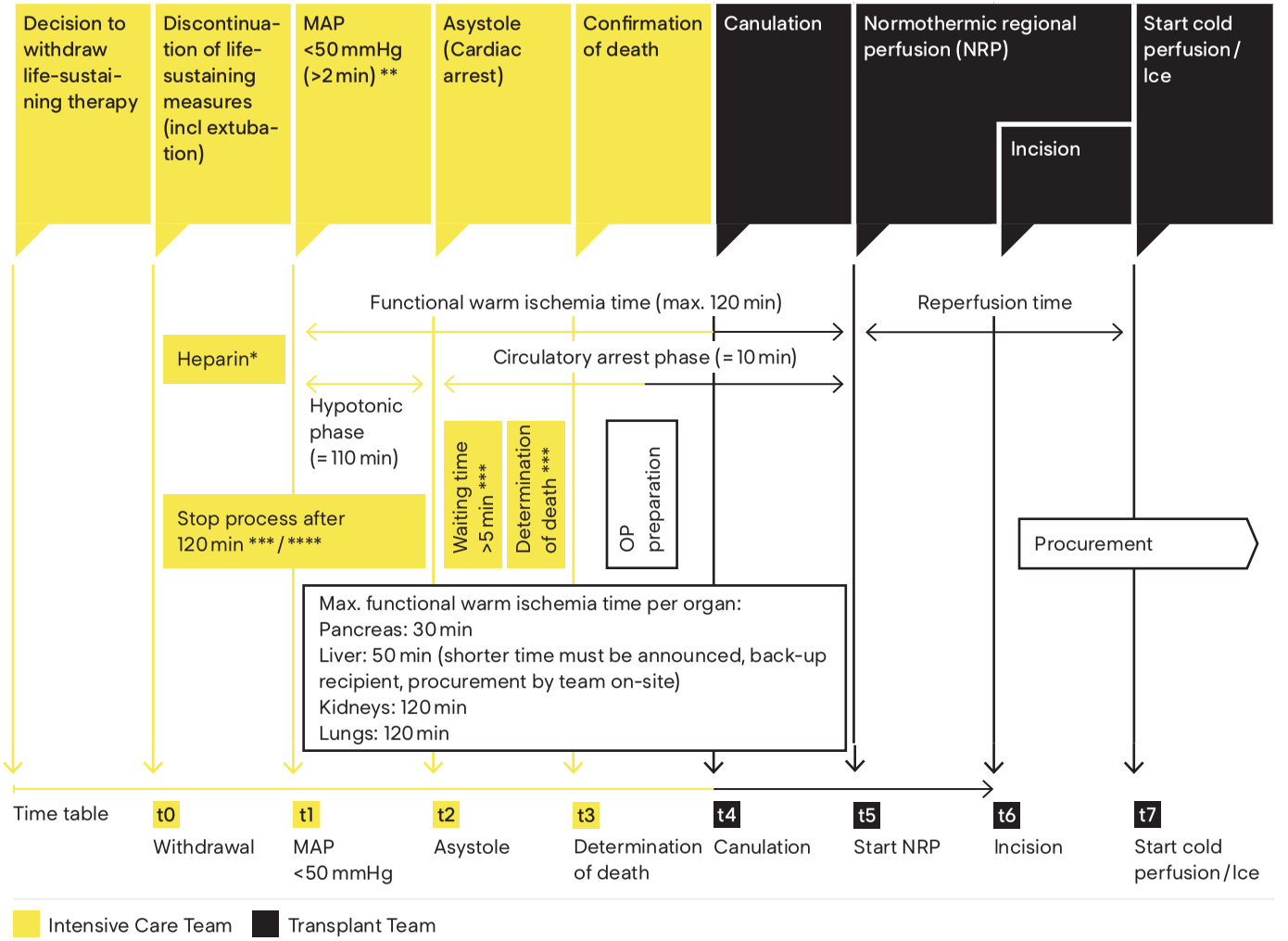
3.6.3 Organ procurement

Organ procurement is initiated following the determination of death, with medical responsibility passing from the treatment team to the transplant medicine specialists. For transplantation to be successful, it is vital for those involved to be familiar with the exact procedures and ensure optimal coordination with transplantation surgeons. The coordinators serve as a link between the treatment team and the transplant medicine specialists.

There are currently **two different** possible procedures for organ procurement in Switzerland:
- The most commonly practised **rapid procurement** (see **Figure 4**)
- Rapid cannulation with subsequent **normothermic regional perfusion** (see Documents, DCD_Scheme)

The revised technique of organ procurement in DCD donors and of **rapid procurement** is

Figure 5: DCD Scheme: Normothermic regional perfusion (NRP)



* **Heparin administration** at t0 (300 IE / kg iv). It the likelihood of mortality is low and / or there is an increased risk of bleeding, the attending IC doctor may decide to administer the heparin later; however, the dose must be injected no later than at t1 (MAP <50 mmHg).

** **MAP <50mmHg (depending on age):** The following values are tobe used, depending on age category: **0 to 1 year: <35 mmHg; 1 to 3 years: <40 mmHg; 3 to 5 years: <45 mmHg; 5 years and above: <50 mmHg (for a minimum of 2 minutes).**

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**** Premature termination may occur, if after >60 minutes from t0 none of the 3 criteria are not met: **pH <7.2; BP syst <70 mmHg; SpO_2 <70%**

described in detail in the SOP "Multi-Organ Retrieval DCD" (see Documents, SOP_multi-organ_retrieval_DCD/STAPT/V.8).

3.6.4 Care of the body

Once the surgical procedures are complete, the donor's body is taken to the same location at the hospital in which all deceased patients are held, provided no instructions to the contrary have been issued for forensic purposes. The relatives will again be given the opportunity to say goodbye to the deceased.

3.6.5 Follow-up care of relatives

The relatives will be informed of regional possibilities for follow-up care. They will, for example, be offered regular anonymous reports on the results of the transplant for recipients or will be invited to attend events where relatives can meet and exchange experiences, and experts are available to answer questions.

3.6.6 Quality control

All patients whose death occurs in an intensive care unit or accident and emergency department are entered in the Swiss Monitoring of Potential Donors (SwissPOD) database, making it possible to assess to a certain degree whether donors were being comprehensively identified. Transplant-relevant incidents are reported and processed in the Critical Incident Reporting System (CIRS).
Regular discussions involving all of the disciplines concerned helps to ensure that processes continue to improve.

3.6.7 DCD and heart procurement

In certain countries (UK, USA, Australia, Austria), the heart is also removed in the case of a DCD organ donation. While efforts are being made in this direction in Switzerland, it is currently not yet being practised and has therefore not yet been included in this pathway [14].

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Version 1.0

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Further reading (chronological)

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Documents

DCD_SOP
The SOP provides a concrete description of national standards and procedures under consideration of the various centres and interfaces with transplant medicine. Examples include the administration of heparin (timing, dosage) and concrete time management with the maximum tolerable ischaemia times. It includes the medical standards currently valid in Switzerland, and it is regularly revised by the Steering Committee and the Operational Core Team, and it is ratified by the CNDO.
https://www.swisstransplant.org/fileadmin/user_upload/Infos_und_Material/Fachpersonen/DCD_SOP_DE.pdf

DCD_diagram
Schematic representation of DCD processes along a timeline (two documents for the two different procedures ("rapid procurement" and "normothermic regional perfusion")).
https://cloud2.qm-pilot.com/swisstransplant/File/CoreDownload?id=779&filename=DCD_Scheme_RP_NRP_EN.pdf&langId=1

DCD_timesheet
Work document: time protocol for documentation of the DCD process.
https://www.swisstransplant.org/fileadmin/user_upload/Infos_und_Material/Fachpersonen/DCD_Zeitprotokoll_V1.pdf

SOP_multi-organ_retrieval_DCD/STAPT/V.8
SOP with details of the adapted organ procurement technique in DCD donors and rapid procurement (version 03/2018).
https://cloud2.qm-pilot.com/swisstransplant/File/CoreDownload?id=645&filename=SWISSTRANSPLANT%20STANDARD%20OPERATION%20PROTOCOL%20DCD%202018%20.pdf&langId=1

SAMW_Vernehmlassung RL Reanimation (SAMS_consultation of resuscitation guidelines, only available in German and French)
Revision of the medical-ethical guidelines for "Decisions on cardiopulmonary resuscitation", currently in the public consultation process.
https://www.samw.ch/dam/jcr:15ad7d5b-67aa-4b0d-9fe4-8e2a0c7417af/richtlinien_samw_reanimationsentscheidungen_2020_vernehmlassung.pdf

Changes

Date	Version	Changes
February 2023	1.1	Correction

Addendum

StA recommendations for determining cardio-circulatory arrest with transthoracic echo-cardiography:
(Addendum to "The Swiss Donation Pathway, Module 9: Identification, reporting and treat-ment of a DCD do-nor")

As defined in Section 3.2.2. of the SAMS document "Determination of death with regard to organ transplantation and preparation for organ procurement", death occurs due to a sustained lack of blood flow to the brain. Cardio-circulatory arrest is identified using transtho-racic echocardiography (TTE).
TTE is the preferred method for identifying cardio-circulatory arrest because an absence of pulse found through palpation appears to be unreliable and because the electrocardiograph (ECG) can detect electrical activity without the presence of mechanical cardiac action[i] .

To improve diagnostic precision, the following is recommended:

If residual activity is detected in the four-chamber view of the right heart, cardio-circulatory ar-rest may also be identified if the aortic valve is no longer opening. The persisting inactivity pre-sents as hyperechogenicity in the left ventricle and in the outflow tract (blood coagula-tion). However, this is not always straightforward. The lack of the arterial waveform provides further evidence when the ECG continues to show electrical activity. Experience has shown that it is often difficult to explain why the patient has been pronounced dead to relatives when the ECG continues to show sonographic activity in the right heart. It is therefore impor-tant to include relatives in the process for making this determination and to explain it to them.

[i]SAMS, 2nd Edition, Dec. 2019, p. 15, Determination of death with regard to organ transplantation and pre-para-tion for organ procurement

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