



Independent Cryonics Educators Program

4.3: The role of cardiopulmonary support in cryonics

In explainer 3.2, we saw that four procedures are used in initial stabilization to extend the period for viability of the brain: Cardiopulmonary support (CPS), induction of hypothermia, administration of medications, and – when needed – blood substitution. Before looking at the details of CPS we should form a clear picture of what an optimal cryopreservation looks like.

1. A Standby Team (see 2.6) deployed to the member's location due to risk of legal death occurring.
2. Prompt pronouncement of legal death no more than five minutes after cardiac arrest by an independent and qualified medical professional. This is typically only possible with in-facility hospice or hospital care.
3. Restoration of oxygenated blood circulation by high quality mechanical CPS, stabilization medication administration, and commencement of surface cooling.

The goal of initial stabilization is cardiopulmonary support (CPS) rather than cardiopulmonary resuscitation (CPR). Remember the three objectives of CPS: Restore circulation of oxygenated blood to the brain; circulate medications; and improve the rate of external cooling to stop accumulation of further injury from stopped blood circulation. With current methods, all cryonics patients will suffer some cerebral ischemic injury (damage from lack of blood flow to the brain). The goal is to limit this to no more than the equivalent of a few minutes of ischemia at normal body temperature.

Prompt restoration of blood circulation after the heart stops is not always possible. In that case, cryonics stabilization may consist only of administration of basic medications to inhibit blood clotting followed by several minutes of chest compressions to circulate the medications. This is because prolonged restoration of blood circulation after long periods of stopped circulation can do more harm than good. [See Explainer 4.2.] Alternatively, cryoprotectants can be introduced immediately in some situations.

CPS methods: If the top priority is to minimize ischemic injury by restarting circulation and respiration, what is the best way to provide CPS? In terms of effectiveness, the ideal method would be extracorporeal bypass to ensure adequate blood flow. This method suffers from a practical problem, however. It requires invasive surgery to directly access the circulatory system and this takes time, making it typically

not a good option for immediate intervention.

Conditions may change at some point so that this method becomes a practical option rather than just a theoretical ideal. In the meantime, the preferred method for cryonics organizations is what can be thought of as external cardiac massage using a mechanical device.

A mechanical device is used instead of manual chest compressions because it is more effective and allows team members to work on other tasks such as administering medications and data acquisition. Chest compressions continue during transport of the patient from one location to another. Alcor uses devices that perform compressions at a consistent rate and depth and allow for a variety of body sizes. A ventilator is also used.

Cooling rate and cessation of CPS: When the surgeon is in place and ready, the determining factor for stopping CPS will be a combination of the patient's temperature and rate of cooling. A simple rule is to continue CPS until the patient reached a targeted core temperature. This reduces ischemic injury during surgical preparation for blood substitution or cryoprotectant perfusion.

The surgery for perfusion will take time during which there is no circulation, the patient should be cool enough to substantially slow metabolism. Once surgery is completed, cooling can be greatly accelerated by introducing cryoprotectant at a low temperature.

We strongly urge terminally ill members to relocate to a hospice in Scottsdale or northeast Phoenix, Arizona. Being positioned at a cooperative hospice near Alcor helps to ensure prompt pronouncement, quality stabilization, and an optimum cryoprotectant perfusion with minimum compromise caused by long distance transport or field cryoprotection procedures.

[10/31/22]

References/Sources

[Rapid Stabilization in Human Cryopreservation - Alcor](#)

B. Wowk, "[Cardiopulmonary Support in Cryonics](#)", monograph published by the Alcor Life Extension Foundation (2003).

Next: 4.4: Cryopreservation vs. chemical fixation

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