6. Deployment Issues

Before Deployment: Readiness

Cryonics training and reference manuals have traditionally assumed that all necessary equipment for standby, stabilization, and transport will be immediately available when team members need it. Manuals have concentrated on procedures, omitting any description of prior preparation that enables the procedures to be performed.

The task of maintaining readiness is mundane and pedestrian but should not be overlooked or trivialized. An organization that provides standby response should have at least one person on staff who is primarily tasked with ordering, assembling, inventorying, and packing the dozens of pieces of equipment and hundreds of components, tools, and supplies that are involved. This person must devote scrupulous attention to detail.

> No standby team should ever open a transport container and find that something was omitted by accident—or was borrowed by a person who forgot to put it back.

Inventory and Identification

The first step in building a standby/stabilization/transport kit is to translate the protocol of a cryonics organization into an inventory of items that will be required. Ideally at least three people should reach a consensus, including one with extensive practical field experience, one with a strong technical background, and one who is intimately familiar with the current inventory. Significant upgrades should be discussed extensively and should never be implemented until feedback has been received from all people who will be affected—especially team members. At the same time, the expiry dates of medications must be tracked so that meds are replaced when necessary.

No matter how well a kit is designed, case simulations at cryonics organization show that it is almost impossible to create a set of standby kits (or the interior of a vehicle) that can satisfy everyone's requirements and can be used effectively without practice and modification. Periodic training sessions are essential to avoid situations in which time is lost in searching for something trivial like a tubing connector or set of instructions.

After a standby/stabilization/transport kit has been developed, the organization must resist two conflicting temptations:

- To imagine that the kit is "finished."
- To allow it to be modified whenever someone comes up with a new idea.

To damp the oscillations to either of these extremes, as many people as possible should be involved in the decision process. This is one of the few areas in cryonics where some inertia is desirable.

Containers should be sealed to discourage anyone from borrowing parts or components from them. They should be numbered or otherwise identified with the following priorities in mind:

- Use large numerals and/or letters, easy to read from a distance.
- Use an obvious numeric or alphabetical sequence, so that the absence of a container is immediately noticeable, especially when pulling them hurriedly off a baggage carousel.
- The identification scheme should be flexible enough so that new containers may be inserted in the sequence if they are needed to accommodate additional standby items.
- If some containers are for mortuary only, and others are for bedside only, color coding should be used to make this immediately obvious. (The option to divide containers between bedside and mortuary is described below.)

Any numbering sequence should match the sequence of events that typically occurs. The first container of a series may store a mechanical

cardiopulmonary support device, with accessories and airway management items. The second container may store medications and IV supplies—and so on. This may seem obvious, but both authors have seen standby kits in which little consideration was given to this principle.

Replication

Any organization that has control over standby procedures will usually want at least two kits, so that one will be immediately available while the other is being refurbished after a case.

We suggest that one kit should be considered as the master, or primary, while others are secondary. The secondary kits must be exact replicas of the primary. Any change to the primary must be propagated immediately through the secondaries, to honor this fundamental rule:

> All kits must be exactly the same, so that personnel who have been trained to use one set of equipment will always find exactly the same set, stored identically.

Similarly, one inventory reference list should be primary, while all others are considered secondary and copied from it. This will also affect inventory pages placed inside each container.

In the past, Alcor maintained regional standby kits distributed around the USA among groups of volunteers who might provide an immediate local response. Keeping track of the inventories of these kits, including medication expiry dates, was a major challenge. While we believe there are significant advantages to regional standby kits, maintaining them will require careful thought if this system is ever reinstated.

Comprehensive vs. Small-and-Simple

Historically we have seen tension between two philosophies regarding the inventory of standby kits:

Those who advocate *Small-and-Simple* kits prefer to minimize the number of containers and the diversity of the inventory, believing that team members will be more easily trained and may work more quickly and efficiently if they are not confronted with a huge and confusing array of items. The team members may still be able to improvise if they lack exactly the right tool for the job.

Those who advocate *Comprehensive* kits believe that transport containers should include equipment to deal with every conceivable scenario, to minimize the risk of a case turning out badly because the right tool for the job wasn't available.

We acknowledge that large inventories and a wide range of supplies can seem daunting, can be more vulnerable to inventory errors, and will incur greater costs during preparation, deployment, and restocking. However, in our opinion, if an elaborate standby kit seems insufficiently user-friendly and compels team members to search numerous boxes and containers for the items they need, this simply means that the kit was not well designed. The answer is to rethink its packaging, not make it smaller.

Comprehensive standby kits can be, and have been, organized in a systematic and logical fashion, grouping equipment by type so that it is easily retrieved, and color-coding labels so that they are easily recognized. Conversely, even a small and simple kit can be made counter-intuitive, difficult to use, and can become an unorganized mess if no thought is given to how the equipment and supplies are packed. Worse, the desire to cram everything into a few containers can make equipment harder to locate and extract.

Sequential vs. Parallel Organization

If a purpose-built vehicle is unavailable for a case, stabilization activities can be divided into two groups: *bedside* and *mortuary*. The bedside procedures include all the initial interventions, after which the patient is usually

transported to another location, such as a mortuary, to be placed on bypass for blood washout and substitution.

Traditionally, preparations have been made sequentially. All equipment is taken to the bedside initially. All equipment then moves with the patient to a location such where blood washout will occur, and the patient must wait for setup of the perfusion equipment. Surgery may take place while this is being done, but setup can easily take longer than the surgery. Forcing the patient to wait is highly undesirable, since rapid cooling on bypass is so potentially advantageous to minimize cellular injury.

In the parallel method for preparations, equipment is divided into two sets of containers. The first set goes to the bedside while the second set goes immediately to the mortuary, accompanied by a team member who will set up the perfusion circuit in advance, so that it is ready when the patient arrives. The team members at the bedside will lose the help of the team member who has gone ahead to the mortuary, but the patient will endure less waiting time. If this option is chosen, equipment must be divided very carefully between the bedside containers and mortuary containers, and some duplication may be necessary. For instance, scrubs must be included in both sets of containers.

Overall, having discussed this issue extensively and having reviewed cases which used either one scenario or the other, we believe the parallel model has advantages, although we prefer to see it used when at least four personnel are available.

What Can Go Wrong

When a team is sent out into the field with a set of standby-stabilization-transport containers, they begin in a situation full of unknowns, where they have little control over the many variables. Their task is to bring the situation gradually under control, to the point where the patient is solely and entirely in their care. The goal of a deployment is to manage this process as rapidly as possible, with a minimum number of errors.

Of course, errors may still occur. Here is a partial list of some that we have seen in actual cases:

- Expired or cancelled member funding
- Other financial irregularities (e.g. patient's suicide invalidates life insurance)
- Simultaneous standbys for two patients; insufficient personnel
- Key personnel on vacation, attending a conference, or out sick
- Patient in a remote or inaccessible location, or foreign country
- Difficulty locating a cooperating mortician
- Insufficient available seats on airline flights
- Too much baggage; some equipment delayed till a later flight
- Weather-related delays
- Missed connections
- National holiday preventing car or van rentals
- Team has difficulty finding patient location
- Hostile relatives or medical personnel
- Patient changes his or her mind, doesn't want cryonics
- Patient legally dies before team arrives
- Medical condition (e.g. pneumonia) conflicts with procedures
- Unable to deploy equipment near patient
- Unable to bring an ice bath into building or room
- Unable to get promptly signed death certificate
- Difficulty pushing medications
- Equipment failures
- Dislodged thermocouple wires

- Temperature logger wrongly set or not started
- Difficulty cannulating fragile blood vessels in elderly patient
- Perfusion problems; lack of flow; edema
- Insufficient ice
- Ice melted during a multi-day standby, was not replenished
- Dry ice unavailable in the standby location
- Patient too large for standard shipping container
- Unable to get transit permit from county in a timely manner
- Airline problems affect transport of patient

The bad news is that for a case to be judged successful, all of these problems (and many more) must be avoided. In other words:

Usually there is only one way for a case to turn out well.

There are countless ways for it to turn out badly.

The good news is that all of the problems listed above can be avoided. The question is how best to achieve this.

The Role of a Coordinator

Sending a standby team out to a remote location is like launching a spacecraft to the moon. The team members must take with them almost every little thing they need, from syringes to spare underwear, and must be capable of improvising repairs if necessary.

The lunar astronauts relied on advice, planning, and directions from Mission Control. Likewise, we believe that a standby team should rely on a "coordinator" (the actual job title may vary) who remains back at the cryonics organization where he has reliable communications and can oversee the case

as it progresses. Running a case remotely may seem counter-intuitive, but the people who are participating in hands-on procedures will have difficulty retaining objective detachment, and may not have time to make phone calls to set up car rentals, find out where the mortician is, or check airline schedules.

The team leader will be on-site at the standby, and will retain authority to make on-the-fly decisions at that level, but the coordinator must have the ultimate authority to make logistical and procedural decisions. While this seems to place the coordinator in a controlling role, he also acts as a servant to the standby team, insuring that anything and everything they need has been foreseen and is immediately available to them. Meanwhile the directors or senior management of the organization will retain the authority to authorize a standby, cancel a standby, and resolve financial or legal issues.

The coordinator will perform the following tasks:

1. Select the members of the team based on personal knowledge of their past experience, their skills, and their mutual compatibility.

2. Maintain liaison with directors or senior management of the cryonics organization, to insure that decisions are properly approved and will not have to be reversed later.

3. Maintain communication with one or more medical advisors, so that they know the current status of the patient and can give properly informed advice.

4. Have immediate access to all patient documents and a fax machine, so there will be no delays on-site caused by lack of legal authorization. Maintain access to a complete patient health history.

5. Have a complete list of the contents of all containers in the stabilization kit, so that in unforeseen circumstances, workarounds can be suggested using existing equipment.

6. Maintain frequent communication with sources of information in the field, so that decisions are properly grounded in reality. Information sources will include the patient (if still conscious), the primary care physician, any key relatives (especially any who have durable power

of attorney for health care), the leader of the standby-stabilization team, a cooperating mortician, and (ideally) cooperating nurses who will often have more timely information than people higher up the command chain. Naturally the coordinator may choose to delegate some decisions to the team leader where this seems more appropriate.

7. Maintain online access to airlines and their schedules and regulations, vehicle rental companies, sources of overnight lodging, local suppliers of welding gases, and maps of the area where the case is taking place, so that the coordinator can line up everything that the people in the field will need before they need it.

8. Attempt to make contact with the local county coroner or medical examiner if there is any risk of autopsy.

9. Be aware of the next procedure or event during the case, and arrange human resources and equipment to be ready, with contingency plans for failure.

10. Respond to problems that do occur, and suggest solutions.

11. Track the position and activity of each team member, and the location and current status of the patient.

12. Make sure that the cryonics organization will be ready to begin surgery and cryoprotective perfusion as soon as the patient arrives.

One of the authors (Platt) has participated in 21 cases. In six of them he played the role of coordinator.

Deployment Committee

In light of the previous points, it should be clear that the decision of when and how to deploy can be a source of uncertainty and disagreement. One way to remedy this situation is to form a deployment committee which includes persons with different kinds of backgrounds and knowledge to ensure that all relevant information is being taking into account.

For example, a deployment committee can consist of the following people:

- The CEO of the cryonics organization, to insure that the strategic goals and priorities of the organization are given due consideration.
- A medical professional who has extensive experience in assessing critical patients and its consequences in terms of protocols and equipment.
- The transport coordinator or team leader, to insure that decisions are made with accurate factual knowledge about the availability and skills of team members and equipment needs.

Ideally, such a deployment committee meets to decide (by majority vote if necessary) when and how to deploy. The committee should not only specify the rules for normal decision making but also specify rules for circumstances in which not all members can participate in decision making or, in cases of extreme emergency, when decisions need to be made without delay in the field.

Clearly, a deployment committee cannot anticipate or cover all aspects of a deployment but it should be expected that when such a committee has been active for a considerable period of time general lessons have been learned which will enable the committee to operate in a more rule-bound fashion without making up decisions on the fly.

For example, in 2009 Alcor Life Extension Foundation formed a deployment committee consisting of the Executive Director, the Chief Medical Advisor, and the Transport Coordinator.

Deployment Decisions

The First Phone Call

One of the most difficult decisions for a cryonics organization is whether to mount a standby, and if so, when to initiate it. Early information about a potential case may be fragmentary and inaccurate. It may take the form of a

single phone call from a distressed relative in the middle of the night. The person who receives the initial phone call should be briefed to ask these questions and make a clear record of the answers:

- Please give me your phone number (in case of disconnection) and your name.
- Are you the patient? If not, what is your relationship?
- If you are not the patient, is the patient still alive?
- Is the patient a member of this organization?

The remainder of the call will depend on the answers to these questions and the policies of the cryonics organization. Four basic situations are possible:

1. Patient is legally deceased and <u>is not</u> a member of the organization
A cryonics organization may be willing to accept this type of case under exceptional circumstances—for instance, if death occurred from natural causes, only an hour or two ago, and verifiable funding is immediately available. The phone call should be transferred to someone in the management of the organization who can make such determinations.

2. Patient is legally deceased and <u>is</u> a member of the organization
The organization must check the signup paperwork to determine the patient's preferences. Many people insist on being cryopreserved even in situations which seem hopeless. In such cases the organization has an ethical obligation to retrieve the patient, and may even seek to disinter the patient if burial has already occurred. On the other hand, some cryonicists (a minority) may allow the organization to "give up" if the situation seems hopeless.

3. Patient is alive and <u>is not</u> a member of the organization
This case is now classified as a "last minute case" (even if the patient still has weeks to live) because the patient (or a relative or friend) has chosen to make cryonics arrangements after the patient has already become terminal. In this

situation, no funding will be in place to pay for deployment of a standby. If the caller is speaking on behalf of the patient, the organization will need to determine whether the caller is representing the wishes of the patient accurately. If the caller is the patient, the organization must make sure that the patient is competent to make decisions and has a rational understanding of the limitations and experimental nature of cryonics. Either way, all documentation and funding must be received and verified before a standby will be attempted.

4. Patient is alive and <u>is</u> a member of the organization

This case may now call for a standby, and should be considered potentially urgent. The telephone conversation may continue with these questions:

1. What is the patient's medical condition?
2. Is the patient conscious and rational?
3. What is the prognosis? How near is the patient to death?
4. What is the patient's location? (Get specific details, including hospital or hospice name, street address, and phone.)
5. Who is the primary care physician? How do we contact him?
6. Does anyone have durable power of attorney for health care? (If so, we need to know how to contact that person.)

At this point, if the person receiving the phone call is not qualified to play the role of coordinator, he should keep the line open (if possible) while contacting the coordinator or senior management of the cryonics organization. The call can then be transferred to someone with decision-making authority. Either way, someone should immediately check the member's paperwork and account to address the following questions:

1. Do we have all necessary signup documents?
2. Do they contain any special requirements or provisions?
3. Is all the necessary funding in place?

4. Are there any special circumstances which could interfere with funding?

If the paperwork checks out, the next step is to decide when a standby should be initiated.

Initial Assessment

If time permits, one individual (usually, the team leader) should go out to make an initial assessment and gather more data.

An initial assessment should include the following:

- Location of patient: Home, hospital, home hospice, hospice?
- Available parking, cost, maximum height (OK for transport vehicle?)
- Permission to deploy equipment?
- Obstructions to equipment (stairs, elevators, small spaces, narrow hallways)
- Names of physicians, nurses, administrators
- Who can pronounce legal death? Who can sign a death certificate?
- Names of family members, friends, others who are involved
- Anyone who has a strong interest (positive or negative) in cryonics
- Name of patient's attorney, if any
- Mental state of patient: Conscious or comatose?
- If conscious: Able to make decisions? In denial, anxious, sedated?
- Health care issues: Blood thinners? IV line? Circulatory problems? Pneumonia?
- Contact information for coroner or medical examiner

- Location of county health department, and hours of business
- Paperwork needed to transport out-of-state
- Other regulations
- Closest mortuary to patient's location
- Cooperativeness of mortician/funeral director
- Size, convenience, cleanliness of prep room (if it may be used)
- Mortuary fees
- Does the mortuary have an appropriately sized Ziegler container?
- Nearest airport, car rental, van rental, welding gas supplies
- Nearest hotel/motel, 24-hour source of ice, sources of quick food

The team leader should return from the assessment with a map of the primary locations, a list of names and phone numbers, and personal observations about the helpfulness of the people whose cooperation may be needed.

The team leader may also discuss with the coordinator the possibility of moving the patient to a better location, if this seems advisable and if the patient and family members are willing.

Air or Ground

The standby team and equipment can be deployed via a ground vehicle, a scheduled airline, or both. As a rule of thumb, a ground vehicle may have advantages if the distance of the patient from the organization is 1,000 miles or less. Assuming a very conservative average speed of 55 miles per hour, a vehicle should be able to bring a patient back to the facility within 18 hours. This is within the preferred 24 hours which has been recommended for transport in water ice after perfusion with MHP2 organ preservation solution. While an airplane may theoretically enable much faster transport over a 1,000-mile distance, the actual flight time may be unimportant compared with time penalties that air travel often imposes. Here are two hypothetical scenarios:

Optimal Air Transport Scenario

This is the kind of scenario which people tend to have in mind when they imagine air travel.

Mortuary very close to airport. Transit time:	0.5 hours
Mortuary is recognized by airline. Paperwork time:	0.5 hours
A convenient flight is available. Waiting time:	1 hour
No weather delays or mechanical problems	0 hours
Flight time, 1,000 miles	2 hours
Taxiing time, unloading time	0.5 hours
Receipt of patient and drive to facility, no heavy traffic	1 hour
Total time, mortuary to cryonics facility	5.5 hours

Suboptimal Scenario

Unfortunately, this scenario is much more likely:

Mortuary far from airport, or bad traffic. Transit time:	1.5 hours
Mortuary has no prior relationship with airline. Paperwork:	2 hours
All flights have gone for the night. Waiting time:	6 hours
Bad weather delays or mechanical problems	2 hours
Flight time, 1,000 miles, delay caused by traffic control	2.5 hours
Taxiing time, unloading time (busy airport)	1 hour
Difficulty finding patient in freight section of airport	1 hour
Pick up patient and drive to facility through heavy traffic	2 hours
Total time, mortuary to cryonics facility	18 hours

Of course, not all of the factors in the suboptimal scenario are likely to occur on the same day. On the other hand, the suboptimal scenario could be much worse. A nonstop flight may be unavailable, forcing a connection that may add a significant time penalty. A holiday season or very bad weather could impose a delay lasting for a full day. An airline may refuse the patient

altogether if a transit permit or other paperwork has not been filled out correctly.

By comparison, the only significant cause of delay for ground transport would be mechanical problems affecting the vehicle. So long as the vehicle is properly maintained and relatively new, such problems should be rare.

The dilemma for the cryonics organization is:

- Should we try to bring the patient in faster by air, taking an unknown risk that there may be some delays?
- Should we play safe and use the ground vehicle?

Note that any problems affecting the ground vehicle will be under the control of the cryonics organization, whereas issues affecting air travel will not be under the control of the cryonics organization. Remember always that the goal of standby-transport is for the organization to acquire as much control over the patient as possible.

Similar considerations will apply if the patient is very near death, and the cryonics organization is trying to determine the fastest way to deploy team members to the patient's location. In this scenario, the organization must consider possible air-travel penalties such as:

Driving equipment to the airport (average traffic)	1 hour
Checking in at airport with a big pile of excess baggage	1.5 hours
Possible flight delay	0.5 hours
Flight time	2.0 hours
Taxiing time and waiting for bags at carousel	1.0 hour
Picking up a rented van	1.0 hour
Driving van from airport to hospital (average traffic)	1.0 hour
Total time, cryonics facility to hospital	8.0 hours

This still looks good compared with a ground transport time of 18 hours, but it depends on a suitable flight being almost immediately available. Also, as airlines attempt to load their flights as efficiently as possible, it is quite likely

(perhaps a 1 in 4 chance) that the airline will refuse to accept all of the standby equipment as excess baggage for the first available flight. Some items may be delayed by several hours, for the next flight. The team will then have to return to the destination airport to pick up the delayed items.

In addition, if a team flies in, it will have to rent a van which will have none of the amenities of the cryonics organization's ground vehicle. Typically it will have no side windows, only one dim light in the load area, and limited means to tie down cargo. There will be no seating in the rear. If team members want to save time by drawing meds on their way to the hospital, they may find themselves doing so under very difficult conditions.

Perhaps most importantly, a ground vehicle that has been converted for standby use by a cryonics organization may enable surgical procedures, thus eliminating a run to the mortuary when the patient has not yet been fully cooled.

If all of these factors are considered, the ground vehicle looks attractive (compared with scheduled air carriers) for a deployment of 1,000 miles or less. Even in an emergency situation, the ground vehicle can still be sent out as backup for team members who fly ahead with stabilization equipment. The vehicle still may arrive in time to be used for blood washout. After stabilization procedures have been completed, the team can decide whether to bring the patient back in the vehicle or, if air travel looks good, they can take the patient to the airport.

Research into the use of organ preservation solutions during transport of cryonics indicates that better results can be obtained by continuous or intermittent low-flow perfusion of the solution. Obviously, these protocols are impractical, if not impossible, during air transport. Future developments in cryonics protocol may place more emphasis on maintenance of brain viability instead of simple cold storage.

Selection of Team Members

Based on personal experience and extensive study of case reports, *we believe that at least four people are needed to manage a remote standby followed by stabilization.* Typically, if the standby lasts for more than 12 hours, two people will sleep while the other two remain awake, in 12-hour shifts.

Ideally the four people should share the following skills and experience among them:

1. Leadership, decision-making based on experience
2. Able to assess and understand the condition of a living patient
3. Draw medications in correct dosages
4. Raise a vessel in a patient with no blood pressure, and set an IV line
5. Intubate an unconscious patient
6. Set up, run, and monitor mechanical chest compressions
7. Place thermocouple probes, initiate and check automatic data logging
8. Take notes either verbally or by hand
9. Create a photographic record in stills or video
10. Drive vehicles and read maps competently under stressful conditions
11. Perform femoral cutdown
12. Cannulate vessels, run perfusion equipment
13. Pack the patient for shipment
14. Sufficient physical strength to move, unpack, and pack equipment

In addition, all team members should be available at any time (day or night), punctual, able to manage stressful situations, resourceful, and likely to create a good personal impression on everyone from relatives to hospital administrators.

No wonder standby work is so hard! How can a cryonics organization find four people who share all of these attributes?

Amateur Assistance

In the early days of cryonics, all standbys were staffed almost entirely by unpaid volunteers who had received varying amounts of basic training. This

system was feasible because cases occurred seldom, participation was regarded as a special privilege, and regional groups encouraged people to get involved. Two key personnel (Mike Darwin and Jerry Leaf) possessed the surgical skills and the ability to run perfusion equipment for blood washout, respectively. These individuals basically told everyone else what to do.

After the untimely cryopreservation of Leaf, Darwin established his own service provider, BioPreservation, Inc, which attracted a series of employees with varying skills, knowledge, and interests. But cases still depended largely on assistance from people who did not have medical qualifications. This situation continued through the 1990s and into the 2000s, and became a source of criticism from observers who felt that cryonics should be "professionalized."

In the skills/experience list above, clearly 6, 7, 8, 9, 10, 13, and 14 can be performed by people who have relatively little training.

In fact we feel there is a very strong need to revitalize regional groups and encourage members of cryonics organizations to get involved, assuming they can satisfy basic criteria. The imperfect data logging, lack of written notes, and lack of visual records in most cases during the past 20 years suggests that a great need exists for personnel who can perform these relatively simple tasks, and they do not need medical qualifications.

Volunteer help obviously has its limits. For example, we doubt that volunteers can draw medications reliably, and we question the usefulness of training them to do so. Still, we feel strongly that cryonics organizations should consider reverting to the former practice of inviting volunteer participants to take care of routine tasks. As a side benefit, the volunteer participants will undergo an apprenticeship that may lead them into a more active role and even a career in cryonics.

Note that the most effective intervention to prevent ischemic injury and perfusion impairment is cooling. Unlike other tasks such as placing an IV or airway, cooling does not require any special skills, just a basic understanding of heat transfer. Some cooling methods are more effective than others but even the more effective methods to induce hypothermia (such as the use of a circulating ice-water bath) should not present major challenges for volunteers with some basic training. Only the most advanced cooling methods (liquid

ventilation and internal cooling by extracorporeal perfusion) require advanced skills.

It should also be noted that no amount of knowledge and skill can substitute for good diplomacy and common sense.

Full-Time or Contractor?

Another debate has centered on the choice between hiring full-time staff or using independent contractors to perform procedures where training is essential, such as administering medications, intubation, perfusion, and surgery. Some of the pros and cons can be summarized in the following table:

	Advantages	Disadvantages
Full-Time cryonics employee	Reliably available for cases (except on vacation/sick days). Long standbys okay. Highly motivated. Good candidates for in-depth training (if they stick around). A long-term investment.	Lengthy hiring process. May see cryonics as career killer. Unreasonable expectations? Cost of wages, benefits. What do they do when they aren't doing standby work? Skills may atrophy.
Contract help such as EMT	Easily found and replaced. "Just a job," no expectations. In their day jobs, they maintain and use skills on a daily basis. Paid only when doing a case (plus maybe a retainer).	No guaranteed availability, may not show up at all. Standby for 3-4 days max. Motivation level unknown. No time or interest for in-depth cryonics training.

We note that while advocates of full-time help often claim that an employee will be "always available," this is not really true. Suppose an employee is willing to be on-call 24 hours during every weekday and half of the weekend days in a year. That will be approximately 310 days. Now deduct 20 vacation days, 5 national holidays, and 5 sick days, to get a net availability of 280 days out of 365. This represents a 77% availability. In other words, even in an optimistic scenario where employees will respond in the middle of the night,

we cannot really expect them to be available for more than three-quarters of the times when we need them for standby work.

Also, the lengthy hiring process for a full-time candidate is likely to be difficult. One of us (Platt) reviewed at least 1,000 resumes in the course of trying to fill one senior position in a cryonics organization. The cumulative time spent assessing resumes, making phone calls, and interviewing candidates is significant.

Also, even a successful candidate may turn out to have problems. Few MDs or surgeons, for instance, see cryonics as a smart career move; thus most candidates are unconventional and may have "problem resumes" or past embarrassments which they will try to conceal from the interviewer. In one instance familiar to us, a job candidate who seemed ideal for a cryonics organization turned out to have a criminal record under a different name. This was not discovered until a year after she was hired.

For various reasons, fewer than half of the medical professionals who have been hired into cryonics have stayed for more than a year. Consequently, all the time that was spent on hiring, training, and orientation of these employees was wasted.

Another problem is that cryonics tends to attract employees who have unrealistic expectations, since they assume that the field has huge growth potential from which they may benefit personally, either in status or financially. They may also see themselves playing a very significant role in an idealistic movement out at the cutting edge of medicine, and will be disappointed, and sometimes angry, when they fully understand the limited resources available for cases and the amount of routine drudgery involved.

When unrealistic expectations are destroyed, a formerly enthusiastic employee may become an angry or even vindictive ex-employee.

Most problematic of all, a surgeon, paramedic, or EMT has skills which are normally practiced and reinforced on a daily basis. At a cryonics organization, cases requiring field work may occur only a few times a year. Action-oriented EMTs may become restless after weeks at the office, and may have little tolerance or aptitude for detail work such as stocking standby kits and maintaining a precise inventory. Someone with surgical skills may feel like a frustrated concert pianist who only gets to touch a keyboard every two

months or so. If the cryonics organization can support an active animal research laboratory, the surgeon can use his skills there; but an animal lab must satisfy demanding regulations, must employ people to care for the animals, must have a defined and rational purpose, and may raise the risk of attacks by activists.

The alternative, of course, is to have a surgeon on call as an independent contractor. Since surgeons typically have busy schedules, a retiree is ideal, but may not be willing to endure the rigors and deprivations of standby work.

Surgeon or Mortician?

If cases should involve blood washout (which we strongly advocate unless there are specific contraindications), there is an inescapable need for at least one person who can make an incision, raise, and cannulate femoral vessels. Fortuitously, morticians perform this task on a daily basis when they need to perfuse patients with embalming fluid. The question is whether morticians should be allowed to perform this procedure on cryonics patients.

One of us (Platt) witnessed a demonstration of surgical technique by a mortician in Phoenix, Arizona which was impressive, since he took less than 30 seconds to raise a femoral vein. But morticians are accustomed to thinking of their patients as “dead,” and if a small vessel is nicked or cut, they may not see some minor leakage of embalming fluid as a serious issue. In cryonics cases where cryoprotective perfusion will be required, nicking a blood vessel is not a trivial matter.

The typical mortuary technique involves a deep and rapid incision with a scalpel, followed by insertion of hooks which raise the vessels. By contrast, surgical technique involves blunt dissection to expose a blood vessel, which is then carefully isolated and inspected for branches that may be hidden. This procedure may take half an hour or more.

Another difference between surgeons and morticians is that morticians are not accustomed to working in conditions where blood clotting is inhibited, and actual blood pressure exists because cardiopulomary support is being performed or has only recently stopped. Unlike cadavers being prepared for embalming, surgical fields of cryonics patients can quickly fill with blood.

Is a slow and painstaking surgeon preferable to a fast but perhaps less detail-oriented mortician? This question has never been adequately answered, in our opinion, especially since levels of skill will vary among both surgeons and morticians.

If a cryonics organization wants to use its own surgeon, the full-time or part-time dilemma described above is problematic.

Emergency Medical Skills

In 2003, Alcor Foundation contracted with a group of paramedics and emergency medical technicians (EMTs) to participate in cryonics cases. These personnel said that they would be able to take two or three days to participate in a case, by swapping their schedules with others in their ambulance or fire companies. Unfortunately, a bout of negative publicity concerning Alcor in 2003 ended this contractual arrangement before the personnel did any cryonics work.

Alcor also contracted with the principals of a paramedic/EMT training facility in South Florida. Two EMTs and one paramedic associated with this company participated in at least three Alcor cases during 2004 and 2005. The results were generally good, but would have been better if Alcor had provided more active supervision.

Suspended Animation, Inc. contracted with the same South Florida training facility, and added more paramedics and EMTs in an effort to create a pool of 10 people who could be called in an emergency. Several training sessions were conducted, and some of the personnel seemed seriously interested in doing cryonics work. Yet when a case finally occurred around 10 pm on a Friday night, *not one* of the EMTs or paramedics was able or willing to respond. One had just been in a car accident; another said he had the flu; two had conflicting work obligations; and others didn't even answer their phones.

What about full-timers?

Alcor hired a paramedic as a fulltime employee in 2003; but this individual expressed disenchantment with the organization and with cryonics generally, and quit in a flurry of recriminations. Alcor hired another paramedic to replace him, who amiably participated in training courses but

showed little serious interest in cryonics and eventually left to become a naturopath. Alcor then hired an EMT who was very serious about cryonics, but left as a result of personal issues. Alcor then hired yet another full-time paramedic, who worked very actively and was a great asset to the organization.

One lesson of this experience may be that an organization must be willing to make multiple attempts to find the right person.

Hiring people for office or workshop work, and then hoping to motivate them to acquire skills relevant to case work, is obviously a gamble, and the investment in EMT training will be wasted if there is high employee turnover. On the other hand, at this time, we feel that the strategy of training existing employees has proved more reliably successful than other strategies. It also creates the possibility of accumulating more skills over time, so that employees can substitute for each other. Multiply competent people should be the ultimate goal to achieve redundancy in case work.

We conclude that at this point in the evolution of cryonics, there is no definitive answer to the problem of maintaining a team with good, well-practiced, reliable medical skills, but on-the-job training should be considered as a serious option.

Members or Nonmembers

A closely related topic is whether to employ staff members who have not made personal cryonics arrangements. The obvious advantage of people who have made cryonics arrangements themselves is that they recognize a close link between their efforts to deliver good care (and improve procedures) and their own fate. The disadvantage is that “cryonicists” often have few relevant skills to offer, at least initially, beyond their commitment to the field. On the other hand, not all aspects of cryonics are a simple translation of existing medical procedures and there is a strong need for people with a comprehensive technical understanding of human cryopreservation.

During the 1990s, when the concept of using professionally qualified nonmembers was first explored seriously, many people were concerned that nonmembers would not “try hard enough” to perform procedures on a person whom they believed was permanently dead.

Now that noncryonicists have participated alongside cryonicists in numerous cases, we find that the anxieties were unwarranted. All team members appear to have worked equally hard, trying to make the case a success according to the criteria which they have been taught. Naturally the results will be better when a team member is a hard worker who wants to prove himself, but this is true in any activity.

Provided a coordinator has had some personal dealings with the people available for a case, he should feel no concerns about using those who have not signed up for cryonics.

The Final Mix

The final mix of team members will be determined by the coordinator at the time when the standby is mobilized. To some extent this will be influenced by pragmatic factors, such as who happens to be available. But the coordinator should strike a balance between experienced team members who have worked often together, and new people who will benefit from field experience.

We feel it is a very bad idea to restrict the number of people on a standby. Four is an absolute minimum. The human costs associated with a standby (such as air fares and lodging) are usually modest compared with other expenses (such as medications, other consumables, equipment transport, mortuary fees, and employee time for cleaning and restocking a standby kit). Every standby should be an opportunity to educate newcomers as well as utilizing the skills of people with experience.

Ready to Roll

Maintaining standby equipment in a ready state should be a simple task, yet experience shows that on a depressing number of occasions, organizations have failed to do this. Apparently, few people have the detail-oriented mindset to stock containers with precisely the right inventory, and keep them in perfect order. This very unglamorous job tends to be given a low priority in a field where many people are motivated by grand dreams. Still, it is absolutely essential.

Any coordinator should frequently check that standby equipment is in a ready state. Containers that have been inventoried must be sealed, and any broken seal should be a cause for serious inquiry. Anyone who is found "borrowing" standby equipment should understand that this is a serious infraction, regardless of good intentions to return the item "in just a few minutes."

Standby equipment that has been stationed in regional locations presents a far bigger challenge, since employee turnover at a cryonics organization may result in records being lost until literally no one knows what is in the containers or even where they are. The coordinator has a serious responsibility to make periodic phone calls to regional groups, visit them, and if necessary bring the containers back to the organization for upgrades and restocking.

Since cryonics is an evolving procedure, there is a constant temptation to include new gadgets in standby kits. The cryonics organization must have a strict policy controlling this, probably requiring that at least three people should concur before changes are made. Any changes should then be duplicated in all standby kits, no matter where they are, and team members must be told about the new items. When a team member opens a container, he should always find exactly what he expects, packed in exactly the same way, ready for us, with absolutely no exceptions. Achieving this can be almost a full-time job in itself.

The one exception to this rule is when an organization maintains a set of standby kits for use in their local area that allows more advanced procedures. Certain pieces of equipment (battery operated mechanical CPR devices, respiratory monitoring devices) may only be affordable for use in local cases. In these situations separate lists for such kits (or vehicle inventory) must be maintained.

RONKs

Individual team members should maintain their own mini-kits of personal items, always packed in a suitcase small enough to be accepted as carry-on baggage by any airline. Since these kits are usually in roll-on bags, they are known as "roll-on overnight kits," or RONKs. While a team member should have latitude to add specific goodies (such as a video player to help the time

pass during long standby waiting periods), the basic contents are non-negotiable:

- Two changes of clothes, minimum. If uniforms are not issued, attire should be conventional, including white or pale -blue shirts and dark-colored pants such as Dockers. Team members should look professional in a hospital setting.
- Toothbrush, tooth paste, hair brush, nail clippers, soap, other basic grooming accessories.
- Printed materials issued by the cryonics organization, for use when informing medical personnel about cryonics procedures.
- Basic information regarding the organization's location, phone, email, and fax. A map of the route from the airport to the organization.
- Notebook and at least two pens.
- Audio recorder and camera, or reliable handheld device.
- Spare cell phone and charger. Can be a low-cost Wal-Mart phone.
- Name tag (if one has been issued).
- Ear plugs, inflatable pillow, blindfold, and any other accessories that the team member needs to sleep in difficult locations such as hospital waiting areas.
- Any medications or vitamins that the team member needs. Prescription medications must be in properly labeled bottles with the member's name on them.
- Food bars/snack bars.
- Ideally, a cheap laptop computer (such as a netbook) and charger, to be provided by the team member.

- Liquids, gels, or aerosols must be packed separately in a 1-quart ziploc bag for inspection by the Transport Security Administration.

Mini-Kits

A more recent development is to assemble kits that include only the most basic and cost-effective supplies to stabilize a patient. The typical contents of such kits include:

- Drugs to prevent and reverse blood clotting
- Supplies to set up an IV
- A body bag for patient transport and cooling
- Hospital instructions

These kits should not be considered a substitute for a comprehensive standby kit. They are intended as a stopgap measure for caregivers of members who are in a critical condition but do not meet the criteria for a full deployment. The use of such mini-kits allows for basic stabilization procedures when a patient deteriorates faster than expected or when a cryonics organization finds itself confronted with multiple standbys at the same time. Mini-kits can also be sent to areas that do not satisfy the criteria for having a comprehensive set of standby kits but enough infrastructure to do basic standby and stabilization.

Logistics

Once the team has been dispatched for the case, the coordinator's serious work begins. While electronic work aids are useful, a cork bulletin board and wall map are also important, so that anyone who walks into the office can obtain information immediately without asking questions. The wall map, which may be hand-drawn or assembled from pages printed from an online mapping service, should show the patient location, nearby parking spots, mortuary location, car rental/truck location, welding gas supplier location (if

gases will be used), and airport location. The cork board should have contact phone numbers pinned to it, and other information that accumulates during the case.

The coordinator should keep a record of every phone call, including its time, its source, and some key phrases from the conversation. Being able to type while talking is an advantage. The phone log will provide an important cross-check for the timeline of the case after it is completed and the report is being written. Phone logs may also be important if anyone disputes an action or event at a future date. If Skype is used for placing and receiving calls, they can be recorded automatically on the host computer as digital sound files.

If the team has departed by air, the coordinator should reserve at least one car rental and van rental to be available at the destination airport. If the team is traveling via ground vehicle, the coordinator should consider arranging a car rental near the destination, since an extra set of wheels is often very necessary during cases—for instance, if someone needs to return to the hospital to clean up and gather loose items, while the rest of the team has moved on.

Reservations should be made at a hotel or motel as close as possible to the patient. If someone is available with knowledge of the area, the coordinator may obtain the names of some local fast-food places, delis, or mini-marts. Whatever the team is likely to want, the coordinator should be ready to provide, with a goal of allowing team members to focus entirely on their work.

The coordinator should obtain frequent updates of the team's arrival time, and should keep in touch with the patient (if still conscious), family members, hospital personnel, and medical advisors retained by the cryonics organization.

If the team has flown in and will be using a mortuary prep room for blood washout, and if the patient is near death, the coordinator may decide to send one of the team members ahead to the mortuary with the perfusion equipment, to set it up, prime it, de-bubble it, cool the perfusate, and have everything ready when the patient arrives. The loss of this team member from the bedside should be more than offset by the time saving of being able to get to work as soon as the patient reaches the mortuary (assuming there are no

surgical problems). As indicated earlier, it will be helpful if the standby equipment is clearly labeled to distinguish containers that should be at the bedside, and containers that will be needed at the mortuary.

Once the standby begins, the coordinator should make judiciously spaced phone calls to obtain progress reports. This information should then be relayed to medical advisors and management at the cryonics organization.

Assuming that a mortuary has already been found and will be used for blood washout, the coordinator should insure that it is ready to receive the patient. In any instance where extra services are required (for instance, if a mortician has to make an extra trip to the county health department, or has to work unusual hours) the coordinator should be quick to offer additional fees. A few hundred dollars is a small price to pay if it will save an hour or two or help to insure good treatment for the patient.

If independent contractors are being used for the case, the coordinator should know how long each one can stay on-site, and should have replacements lined up, so that personnel can be rotated in and out with minimal disruption.

As the case progresses, the coordinator should check airline schedules, lining up the various possibilities, giving priority to those with the best connections if nonstops are unavailable. This should be done as a contingency plan, even if the team has travelled by ground. The coordinator must always have as many options as possible available.

If the case will use an air ambulance to bring the patient back, the coordinator must make inquiries at two or three different companies, since availability of private jets can fluctuate unpredictably. Note that some air ambulances have a “wide door” configuration. These are the only ones which will accept a wholebody patient in a typical Ziegler steel transport box.

When the patient is ready for transport, the coordinator must verify, as well as he can, that all documents are properly executed. He should then turn to the task of making sure that the operating room is ready and personnel will be available to begin work as soon as the patient arrives.

After the patient reaches the cryonics facility, the coordinator’s job is done, but he should resist the temptation to unwind and get some sleep. First

he should make notes of every fact or observation that seems relevant to the case. Many of these items will be forgotten if he waits until the next day.

A debriefing involving all principal participants in the case should be held via conference call as soon as possible after the case is over. The coordinator should establish a polite and friendly atmosphere in which no one is discouraged from being frank and open. The debriefing should be relentlessly factual, and everyone should understand that its goal is to establish what happened and when, without assigning responsibility or blame. It is not an appropriate time to criticize or hold someone responsible. The debriefing should be recorded, and the recording should be transcribed. A copy should be kept with the patient's records, and another copy should be used for the case report that should be written within the next two to three weeks. Often, the coordinator will be in the best position to write that report.

One persistent problem with debriefings (and the case reports that are based on them) is that there is little systematic follow-up to ensure that the problems that were discussed are dealt with. A good rule of thumb is to determine which problems can be solved by the cryonics organization and assign people to these tasks. During a subsequent post-debriefing meeting staff members (or volunteers) report on the progress that has been made. When quick solutions are possible, these fact that the problem has been addressed should be mentioned in the case report. The importance of this kind of follow-up cannot be underestimated. Debriefing sessions should not just be ritual where people share the strengths and the weaknesses of the case but should be used to ensure that problems that can be resolved by the cryonics organization are not likely to happen in the future.

Predicting Cases

It is estimated that less than a majority of cryonics cases are "good" cases, where this may be defined as the timely deployment of a standby team so that there is little delay between pronouncement of legal death and start of stabilization procedures. One important factor has been inaccurate patient assessment, which we will discuss in Section 7.

A systematic analysis of the membership database can help to reduce the "surprise factor" in cryonics. Members can be grouped by region , high-density areas being a higher risk for cases. We may also try to predict the growth as a function of membership growth. For example, in 2006 Dr. Michael Perry did an analysis of Alcor's database to predict future caseload and the probability of having simultaneous cases.

Another tool that has been employed is the use of actuarial tables to estimate regional caseload. Although some simplifying assumptions are made (such as assuming no difference between the general population and cryonics members) the information obtained can be used to allocate standby equipment in areas with the highest likelihood of multiple cases. Below is an analysis that was done in March 2009 by Mike Perry and one of the authors (de Wolf) using an actuarial table from the US government Social Security administration (2004). For example, the expected number of cases within a year for California is 2.4 (all results are rounded to tenths).

Expected cryonics cases per year, by state

State	Females	Males	Total
AK	0.0	0.0	0.0
AL	0.0	0.0	0.0
AR	0.0	0.0	0.0
AZ	0.1	0.8	1.0
CA	0.4	2.1	2.4
CO	0.0	0.1	0.2
CT	0.0	0.0	0.0
DC	0.0	0.0	0.0
DE	0.0	0.0	0.0
FL	0.2	0.4	0.6
GA	0.0	0.1	0.1
HI	0.0	0.0	0.0
IA	0.0	0.1	0.1
ID	0.0	0.0	0.0
IL	0.0	0.1	0.1
IN	0.0	0.1	0.1
KS	0.0	0.0	0.0

LA	0.0	0.0	0.1
MA	0.0	0.2	0.2
MD	0.0	0.0	0.0
ME	0.0	0.0	0.0
MI	0.0	0.0	0.0
MN	0.0	0.1	0.1
MO	0.0	0.0	0.0
MS	0.0	0.0	0.0
NC	0.0	0.1	0.1
ND	0.0	0.0	0.0
NH	0.0	0.0	0.0
NJ	0.0	0.2	0.2
NM	0.0	0.1	0.1
NV	0.2	0.2	0.4
NY	0.1	0.2	0.3
OH	0.0	0.0	0.0
OK	0.0	0.0	0.0
OR	0.0	0.1	0.1
PA	0.0	0.1	0.1
SC	0.0	0.1	0.1
TN	0.0	0.0	0.0
TX	0.1	0.2	0.3
UT	0.0	0.1	0.1
VA	0.0	0.0	0.0
VT	0.0	0.0	0.0
WA	0.0	0.2	0.2
WI	0.0	0.0	0.0

Such an analysis needs to be supplemented by making personal contact with older members periodically and checking the health status of patients with serious conditions. During 2009 Alcor designated a specific room to display these kinds of data and track potential cases. The combination of all these measures will not completely eliminate the surprise factor in cryonics but they go along away towards a more rational approach to readiness.