Chapter 3
Assessment, Planning, And Gaining Cooperation

Introduction

Before any plan of care can be formulated or applied, it is essential to assess the patient's condition and situation. Four basic types of situations are possible, with many variations of detail.

1) The patient has been pronounced legally dead one hour or more before notification of Alcor personnel was attempted, or was even possible.

2) The patient is legally dead or legal death is imminent. In such a situation, organized, thoughtful preparation to handle the emergency will not be possible.

3) There is adequate notice for preparation of transport equipment and personnel and procurement of the cooperation of the institution caring for the patient.

4) The patient is a "coroner's case" and there is the possibility of a medicolegal autopsy.

Situation 1: The Patient Is Ischemic: Delayed Post-Ischemic Notification

If the patient has experienced ischemia in the absence of cardiopulmonary support at normal body temperature for more than one hour, no cardiopulmonary resuscitation should be attempted. Initiation of cardiopulmonary support beyond one hour of ischemia is, at the time of this writing, considered to have an unfavorable risk versus benefit ratio due to the possibility of ischemic blood clotting and the possibility of massive reperfusion injury due to ischemic biochemical changes. An alternate protocol of drug treatment and cooling is prescribed for use in this situation, and is detailed following the Emergency Instructions for Stabilization of Alcor Biostasis Patients at the end of Chapter 2 (See: Abbreviated Emergency Instructions...).

Providing that legal death has been pronounced, efforts should be focused on administering the appropriate medications if they are available, initiating adequate external cooling, and securing quick release of the patient from the health care facility or morgue.

External Cooling

If the institution will cooperate, the patient should be completely packed in ice, with special attention to the head, until release can be secured (See Chapter 8: External Cooling). If possible, use the Portable Ice Bath (PIB) with ice in direct contact with the patient's skin in order to facilitate as rapid a rate of heat removal as possible. Ice cooling should be carried out even if the patient has already been transferred to a refrigerated morgue "cooler." In the absence of circulatory and metabolic support, such
as would normally be provided with CPR or extracorporeal circulation, the most urgent priority is the rapid reduction of the patient's core temperature to as close to 0°C as is possible. Air cooling alone is an extremely inefficient way to reduce the patient's core temperature. Packing the patient in water ice (never use dry ice, ice/salt mixtures, or chemical coolants) is the most effective way to achieve rapid reduction of core temperature in the absence of circulation.

Safeguard Against Freezing

A primary concern in this situation is the protection of the patient from the possibility of accidental freezing. If the patient is in a refrigerated morgue, a manual check on the accuracy and stability of the refrigeration temperature control equipment is essential. Hospital or morgue personnel should be repeatedly cautioned about the importance of not allowing the patient to freeze.

Some larger institutions will have a morgue cooler with 24-hour temperature recorders, which log the temperature 2-3 days at a time. Where possible, the records should be carefully inspected to insure that the temperature never cycles below freezing, even for a short time. Be certain to caution the hospital or morgue personnel to set the temperature on the cooler to 35°F to 36°F (2°C to 2.5°C) (this keeps the temperature a few degrees above the freezing point of water), and then to rely on ice to cool the patient to near 0°C.

After external cooling is underway and the patient's release has been secured, the procedures in Chapter 14: Shipment of the Patient should be followed.

Situation 2: The Patient is Legally Dead or Legal Death is Imminent

This situation presents the most challenges and the most potential complications. Due to the urgency imposed by time constraints, it will not be possible to secure in an orderly fashion cooperation with the institution caring for the patient. Additionally, the institution may be unable to give cooperation because of medicolegal reasons which may necessitate involvement of the coroner and possibly an autopsy.

In such a situation, it will be important to rapidly determine to what extent the institution can and will cooperate (see discussion of coroner's cases below) and then to provide the institution with as much information and reassurance as is possible. The objective in such a situation is the persuasion of hospital personnel to carry out, assist with, or allow to be carried out as much of the transport and stabilization protocol as possible.

A brief summary of the key elements of the protocol is provided at the end of Chapter 2 under Emergency Instructions For Stabilization of Cryonic Suspension Patients. Many of the key things to determine will also be the same as in Situation 3, below:

Situation 3: Adequate Pre-clinical Death Warning

In this situation, it will be important to carefully explain the nature of cryonic suspension, provide necessary legal authority to act (in the form of suspension paperwork), and provide a clear plan of action which spells out the roles and duties of everyone involved.
Page 3-3 does not exist in the original printed manual.
Access To Oxygen

The Alcor transport kits contain 2 "E" cylinders of oxygen, enough to operate the Brunswick HLR for approximately 30 minutes. This will usually be sufficient to transport the patient via hearse or ambulance from the hospital or nursing home to a mortuary or other facility where extended external cooling and/or blood washout can be carried out. Arrangements should be made with the cooperating mortuary (or, if legal death is occurring at home, with the family) for the presence of adequate oxygen (at least 2 "H" cylinders of 220 cubic foot capacity, or larger).

It is highly desirable to conserve E-cylinder oxygen for vehicular transport of the patient. To facilitate this, it will be desirable to use the hospital's oxygen supply while awaiting the arrival of the mortician or ambulance. In order to tap into the hospital wall oxygen supply, it will be necessary to acquire a special adapter or coupling from the respiratory therapy department of the hospital.

*Never attach the HLR to wall adapters with flow restrictions in place, such as a flow meter or other medical device.* Only a wall oxygen connector with a DISS fitting (see illustration on page 3-3) should be used. The HLR may then be attached directly to the hospital's 50 to 90 psi. central oxygen delivery system.

The illustration on the next page shows several typical systems employed by hospitals to tap into the central oxygen supply. Owing to the wide range of such systems currently in use (there is no universal or "standard" system), it is not possible to equip each kit with every possible fitting.

If the hospital does not have or will not make available such a fitting, an acceptable alternative would be for the hospital to supply an H-cylinder or other source of bottled oxygen. Yet another alternative would be to secure permission to allow a source of bottled oxygen to be brought in to the patient's room from outside. *Always transport H-cylinders on a proper cylinder truck or hand cart.* This is a safety requirement which is vigorously enforced in all hospitals.

Access To Ice

If the institution which has control of the patient does not have access to ice or will not make access available, it will have to be obtained from an outside source. Most large cities have 24-hour ice services. Between 300 and 400 pounds of ice will be required to cool the average 160 pound (72 kg) man. Another 200 pounds will be needed for shipment. It may be possible to store ice brought in from an outside source in a hospital food or morgue freezer for quick availability when it becomes necessary. If ice is obtained from an outside vendor and stored in a freezer in advance of use, it may be necessary to obtain an ice pick or screwdriver to break it up since refreezing after transport may have transformed cubed or flaked ice into a semisolid mass.

Arranging Prompt Release Of The Patient

If the hospital has a staff mortician or diener (lab assistant) who is responsible for handling and processing remains in the morgue, this individual should be contacted and his help solicited. An inquiry to this department early on can bring someone into the loop who might otherwise be offended at being overlooked and who could very well cause serious problems in obtaining prompt release of the patient.
Figure 3-2: Some commonly used access couplings for central oxygen delivery systems.
Figure 3-3: "H" Oxygen cylinder with 50 - 90 psi delivery pressure regulator.

Where possible, a death certificate should be filled out in advance, so that execution requires only entry of the cause of death and the pronouncing physician's signature.

Securing A Private Room

If the institution is willing to cooperate and the patient is on an open ward or in an undivided Intensive Care Unit (ICU), it is probably appropriate to ask that transfer be arranged to a private room or cubicle, preferably near an exit. This should be done to minimize disruption and attention attracted during stabilization and removal. If the patient is unequivocally terminal, reassure the hospital that Alcor will pay for the added expense of a private room.

Evaluating The Patient's Condition

Once the basic administrative and physical details outlined above have been dealt with, it is appropriate to see the patient and ask to examine the chart. A general assessment of the patient should be made at that time, and the evaluation carefully recorded by good note-taking.

Is the patient alert, oriented as to person, place, and time? Is the patient comatose? What is the patient's fluid status: edematous, dehydrated, in balance? Where possible, obtain a photocopy of the recent medical history and daily "graphic record" from the nursing staff and/or the attending physician. This may be difficult; use the Patient's Directive and Power Of Attorney to facilitate this. Key items (current status and status for the previous 24 hours) to record are:

Temperature
Blood Pressure
Pulse
Neurological Status (oriented, disoriented, conscious...)
Fluid Balance (pulmonary edema?)
Hematological Status (bleeding or coagulopathies?)
Laboratory Test Results
Medications Currently Being Administered (or given during the previous 48 hours)
Surgical/Diagnostic Procedures
Unusual Findings
Prognosis

It is particularly important to be aware of the patient's temperature and fluid balance, since both of these things can profoundly affect the course and quality of resuscitation and stabilization efforts. If a patient is markedly febrile (running a temperature), CPR will be even less effective at meeting metabolic demand than normal. It will be important to note this on the patient's transport records. Likewise, the presence of edema will affect the efficacy of CPA due to diminished lung gas-exchange surface area. Severe dehydration could result in inadequate blood circulating volume and thus in inadequate blood pressure and tissue perfusion during CPR.

Predicting Cardiac Arrest

Once an evaluation of the patient's condition has been undertaken, it is important to try and establish a likely time course for the standby effort. Is the patient likely to experience cardiac arrest and be pronounced legally dead in a few minutes, a few hours, or a few days? This assessment will profoundly affect planning and logistics for every aspect of the operation. Obviously, if the start of ischemia is only minutes away, it will be necessary to start summoning essential support personnel such as the cooperating mortician/ambulance service and to begin drawing up medications. On the other hand, if the time-course is one numbered in days rather than minutes, determining where to situate yourself and your equipment will be the most immediate priority.

Unfortunately, determining the moment of cardiac arrest on the basis of a general assessment of the patient (vital signs, etc.) is rarely straightforward. Human beings are complex, and many factors go into determining with any precision when such a complex system will fail.

Nevertheless, there are a few general guidelines, discussed below, that are useful in determining when cardiac arrest will occur. However, it should be noted that using these "markers" as predictors with any precision requires both skill and experience. Wherever possible, the Transport Technician should rely on the judgment of those with the greatest clinical experience. In particular, the nurses caring for the patient may be able to tell with a fair degree of accuracy when the patient will experience legal death. You should ask them for an assessment of the patient's prognosis and give their estimations considerable weight.

Key Factors To Consider

There are two fundamental ways that a patient can experience cardiac arrest: acutely, as a result of a some very rapid decompensation (a cardiac arrhythmia, hemorrhage, etc.), or slowly, as a result of decompensation and shock. The presence of arrhythmias—which can precipitate sudden cardiac death—can be disclosed by discussing the patient's condition and likely prognosis with the nursing staff providing care. The range of cardiac conditions that can lead to sudden death is large, and a discussion of the risk factors for sudden cardiac arrest is beyond the scope of this manual. Also, the presence
of arrhythmias linked to sudden cardiac death is usually not going to be very useful in determining with any degree of precision when the patient is going to arrest.

Shock is the pathway to all non-sudden death, and therefore it is useful for the Transport Technician to understand its elements, and the many ways it can present itself. What is shock? Simply put, shock is inadequate blood flow, as a result of decompensation or of frank failure in one or more of the homeostatic mechanisms responsible for delivering blood flow to tissues.

Shock can result from an inadequate cardiac output secondary to a diseased or failing heart, or it can result from inadequate distribution of a very large cardiac output, or as a result of insufficient blood volume for the heart to pump—or as a combination of all or just some of these things! In turn, the possible causes of pump failure or inadequate volume could be many. Hemorrhage may deplete circulating volume, but then so may altered capillary permeability, which allows vascular fluids to leak out of the circulatory system and into the tissues. But whatever the cause, shock is the proximate cause of all slow death.

All too often, shock is exclusively associated with low blood pressure. This may be a mistake, especially in the slowly dying patient. A patient who is in shock may have a centrally measured mean arterial pressure of 100 mmHg, and yet have grossly inadequate perfusion of limbs and even core organs. The critical element is not pressure or even "flow", but adequate perfusion. In septic shock, for instance, flows may be very high and yet be inadequate. The point is that the patient has to be considered as a unit and in context, rather than on the basis of any isolated number. The assessment points given below are designed to help the Transport Technician make that assessment. Although, as will be noted again and again, there is no "royal road" to achieving clinical skill in patient assessment.

Level of consciousness. The patient's level of consciousness, considered with the patient's diagnosis and the other factors below, is one of the most valuable and easily evaluated indicators of prognosis. If the patient has been conscious and the level of consciousness deteriorates, that may be an ominous sign that cardiac arrest is approaching.

Urine Output/Fluid Status Perhaps the second most important general indicator of the progression of shock is urine output. When a dying patient becomes oliguric (oliguric= <30 cc urine output per hour) or anuric (no urine output), that is a sign that the kidneys are no longer receiving adequate blood flow and that cardiac arrest is no more than hours or, at the extreme, a day or two away.

Peripheral Circulation One of the first, most important, and easiest things to assess is the patient's peripheral circulation. Are his arms, legs, hands, and feet well perfused? Are they warm to the touch, with healthy color? When a patient is agonal (dying) and the body is desperately trying to compensate for failure of one or more homeostatic mechanisms, the brain and core organs are become first priority, since failure to adequately supply them would result in the immediate death of the organism. Usually, the body accomplishes this by shunting the blood flow away from those organ systems which can tolerate periods of reduced or absent flow, such as the limbs, skin, and the gastrointestinal system. In the case of the limbs this will be evidenced by cyanosis, blanching (chalky white appearance), and cooling of the extremities. The nail beds will lose their normal pink color and become cyanotic, and the arms and legs will become cool to the touch.

These changes in the status of a patient's peripheral circulation, particularly if
they occur in conjunction with abnormalities in the patient's vital signs (low blood pressure or pulse), should be considered warning signs that cardiac arrest will occur within a few hours at most.

**Vital Signs.** (Primary vital signs are generally defined as being blood pressure, heart (or pulse) rate, and respiratory rate.) The patient's vital signs may in many situations be a reliable guide to determining the agonal time course. Of course, the patient's underlying condition and status will have a significant impact on your determining the importance of the vital signs. For instance, extreme tachycardia (elevated heart rate) will be tolerated far longer in a young marathon runner in shock after an accident than it will be in an 86-year-old heart attack victim. In other words, how long a patient experiencing serious abnormalities in vital signs will survive always relates to that patient's overall physical condition.

Nevertheless, there are certain vital signs which are incompatible with life. A peak systolic blood pressure of 50 mmHg or less is almost never tolerated by the heart for more than an hour. Terminal patients (i.e., those in whom no resuscitation intervention is planned) with peak systolic pressures of 50 mmHg or less should be considered agonal and in imminent danger of cardiac arrest. Sustained peak systolic pressures below 80 mmHg should also be considered cause for concern, particularly in the presence of other abnormal vital signs (tachycardia, bradycardia, Cheyne-Stokes respiration, ...) of peripheral vascular shutdown. On the other hand, if a patient's blood pressure is 70 mmHg, while his other vitals appear stable and his peripheral perfusion is good, it is unlikely that the low blood pressure alone is very predictive of impending cardiac arrest.

(=NOTE: Blood pressure readings are given as the systolic pressure over the diastolic pressure, e.g., 120/70. A few adults may have very low normal blood pressure, even as low as 70 systolic. The difference between the patient's normal pressure and the current pressure may be the most important number to determine.)

It is very important to point out that arterial pressure, to be a reliable indicator, must be measured by a central catheter rather than a cuff. The use of a cuff to evaluate perfusion pressure in the agonal or shocky patient is nearly useless. It is not uncommon to have a cuff-measured pressure that is nonexistent or very low and have a central arterial pressure reading of 80 or even 100 mmHg!

**Tachycardia** (rapid heart rate) and **bradycardia** (slow heart rate) are also indicators of impending cardiac arrest, particularly when considered in light of other vitals signs. Typically, heart rates in excess of 150 to 175/min. are not sustainable for more than a few hours. Heart rates over 120/min. are cause for concern, particularly if the blood pressure is less than 100 mmHg, or other signs of decompensation such as peripheral vascular shut-down are present.

Bradycardia must always be taken in the context of the patient's overall condition. Some patient's can tolerate heart rates in the range of 30 to 40 for extended periods of time, particularly if the bradycardia is a result of conduction defects and has developed over a long period of time. Alternatively, a patient in serious distress who is classified as "dying" and who experiences a heart rate of 40 (down from a normal or elevated heart rate) should be considered at high risk for imminent cardiac arrest.

Respiratory rate is simply too variable a factor to be considered prognostic by itself. However, a respiratory pattern consisting of stepped, sonorous intakes of air known as Cheyne-Stoking (see Glossary for details) is a frankly agonal sign and the Transport Technician should prepare for cardiac arrest within 24 to 48 hours—or less. Very low respiratory rates or respiration characterized by increasingly long periods of
apnea should also be considered prognostic of impending legal death.

**Death Rattle.** This is a fairly distinctive bubbling or gurgling respiration which results from a combination of impaired consciousness and mucous accumulation. This is a very reliable sign that cardiac arrest is very near (within a few hours at most).

Finally, the presence of so-called classical shock, as indicated by hypotension (low blood pressure), with tachycardia and diaphoresis (sweating), should be considered a serious warning sign. If the patient's skin is cold and clammy, his respirations are fast and shallow, and his blood pressure is low, he can be considered in shock and not far from cardiac arrest.

**Laboratory Measurements**

Generally, the terminal patient will not be a candidate for the kind of clinical laboratory measurements that would be of use in estimating the time to cardiac arrest. Nevertheless, some patients may be in an acute care setting fighting for their lives (ICU, CCU), and it will be useful for the Transport Technician to know if they are winning on the basis of all the information available.

**Arterial Oxygen Tension.** A pO₂ (a measure of dissolved oxygen in blood) of less than 70 mmHg in a patient breathing 100% oxygen on a ventilator is an indicator that cardiac arrest may be imminent.

**Blood Lactate.** Metabolic acidosis with elevated blood lactate levels (over 1 mEq/dL) is indicative of inadequate perfusion.

**pH.** Blood pH of less than 7.25 (with normal pCO₂ levels) is another indication of terminal shock.

**A Final Note**

Generally, shock is not tolerable for more than a few hours, particularly in the chronically ill and debilitated. Rely on the nursing staff for an assessment of whether or not a patient is experiencing shock—and for a prediction about the time remaining before cardiac arrest.

**Situation 4: Coroner's Cases And Medicolegal Autopsy**

The most frustrating and difficult situation occurs when a patient is a "coroner's case." Classes of deaths reportable to the coroner and thus likely to be subject to autopsy (which involves extensive disruption and dissection of the body) are listed below:

1) Unattended Deaths (No physician in attendance continued absence of the attending physician). *See discussion below.*

2) The deceased has not been attended by a physician in the 20 days prior to death.

3) Physician is unable to state the cause of death. (Unwillingness does not apply.)

4) Known or suspected homicide.

5) Known or suspected suicide.
6) Any death involving a criminal action or suspicion of criminal action.

7) Related to or following known or self-induced or criminal abortion.

8) Associated with known or alleged rape or crime against nature.

9) Following an accident or injury. (Primary or contributory.) Deaths known or suspected as resulting in whole or in part from or related to accident or injury, either old or recent. See discussion below.

10) Drowning, fire, hanging, gunshot, stabbing, cutting, starvation, exposure, acute alcoholism, drug addiction, strangulation, or aspiration.

11) Accidental poisoning. (Food, chemical, drug, or therapeutic agents.)

12) Occupational diseases or occupational hazards.

13) Known or suspected contagious disease constituting a public health hazard.

14) All deaths in operating rooms and all deaths where a patient has not fully recovered from an anesthetic, whether in surgery, recovery room, or elsewhere.

15) In prison or while under sentence.

16) All deaths of unidentified persons.

17) Suspected sudden infant death syndrome (crib deaths).

It should be noted that the 17 conditions listed above may vary significantly from area to area depending upon the local policies and procedures of the coroner's office. For instance, in some localities, any death within 24 hours of any surgical procedure is a reportable to the coroner. Also, allowable elapsed time since last having seen a physician will vary widely from locale to locale. Generally, the local coroner's office will have a "requirements list" or flyer which sets forth which deaths are reportable. This should be requested from the coroner's office, with copies placed in this text and your emergency manual.

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It is essential that you thoroughly understand the requirements and resolve any ambiguities in the written material provided you by the coroner. In particular, it is essential to understand the requirements for the presence of a physician or nurse in pronouncing and certifying legal death. Vague or ambiguous language such as "physician in attendance" must be clarified: does physician in attendance mean that the physician must physically be present at the moment of death, or merely that he must have seen the patient in the preceding 24 hours?

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Several of the above conditions are worth explaining in greater detail (these are discussed by point number as given above):

1) Unattended deaths: This includes all deaths which occur without the attendance of a physician. The coroner's office will usually proceed to conduct an investigation
of the death. If during or after the investigation it is ascertained that the death was due to natural causes, and if there is an attending physician who is qualified and willing to so attest, the coroner will waive the case to the physician for his certification and signature, and the custody of the patient may at that point revert to Alcor.

If the patient is in a hospital, this is always considered the same as a physician being in attendance.

Cases where the physician is unavailable for reasons of vacation or attending conventions, etc., will result in the death being reported to the coroner for investigation and possible autopsy.

Where possible, it is prudent practice to urge the attending medical personnel to perform any radiological, laboratory, or other tests which would help to establish the cause of death in an acutely ill patient and thus avoid or at least reduce the risk of autopsy. Pointing out to the hospital personnel that avoiding autopsy is of paramount importance may help to motivate investigative testing which could aid the physician in certifying the cause of death (signing the death certificate).

9) Following an accident or injury: This covers a lot of ground, with the key word here being *following*, be it in traffic, at home, at work, etc.

This includes such cases as an elderly person falling at home, incurring a fracture of the hip, being taken to a hospital, being confined to bed, and then dying some weeks or even months later of bronchopneumonia or any other natural cause which may possibly be related to the fall and its consequent effects.

In many such instances the coroner will waive the right to autopsy on the basis of the physician's statements and the medical record.

Whenever a patient has become or is likely to become a "coroner's case," it is essential to move quickly. The coroner's office should immediately be contacted, with cooperation enlisted everywhere possible. Asking for a delay in the autopsy (if it is planned immediately) is a first step. Coroners will generally allow (and often prefer) arterial embalming of the body to take place before they perform the autopsy. It is conceivable that a coroner might allow a cryonics organization to carry out a limited cryoprotective perfusion of the head before conducting the autopsy and removing and/or sectioning the brain.

Where possible, secure permission to carry out cryoprotective perfusion of the brain before the post-mortem examination is begun. This may be done under the supervision of the coroner (or contract pathologist) immediately prior to his conducting the autopsy. Always ask the coroner to forego sectioning the brain and to perform any noninvasive tests on the patient's head/brain (such as CT scan, NMR scan, and/or conventional X-ray) as may be necessary to establish a brain related cause of death. Alcor will pay for such testing. (This is quite a long-shot, but you should ask).

Notifying personnel at Alcor Southern California as soon as possible that a patient is or might be a coroner's case is critical to effective handling of the situation.

Coroners and the contract pathologists who work for them are sometimes incredibly arbitrary and even dishonest. It is important to be on the scene as quickly as possible
and to remain on the scene until the autopsy is performed and the patient's brain becomes available. Coroners in the past have agreed to delay autopsies or to otherwise accommodate cryonics organizations, and then have proceeded at their convenience to do as they chose. The presence of the transport technician at the hospital, mortuary, or morgue will allow for prompt receipt of the patient's body and/or brain should the autopsy proceed sooner than agreed upon or otherwise anticipated.

Whenever there is the probability or strong possibility of an autopsy, the transport technician must not leave the facility where the patient is being held until the issue of an autopsy has been resolved.

Not all deaths which are reportable to the coroner will be autopsied. In many instances, particularly if pressure is brought to bear from family and lawyers and the case is a routine one (such as an elderly person having fallen at home), the coroner will waive the autopsy. However, in cases of homicide, suicide, or industrial, home, or vehicular accident, an autopsy will almost invariably be carried out. In such a situation, every attempt should be made to limit the scope of the post-mortem dissection. Examples of this would be to persuade the coroner to confine the examination to the likely target area such as the chest or abdomen and forego dissection of the head. Alternatively, just persuading the coroner to forego sectioning the brain and to promptly surrender it to Alcor personnel may be as much cooperation as reasonably can be hoped for.

As a minimum, insuring that the patient is stored at the proper temperature prior to post-mortem examination and that Alcor personnel are present to immediately take possession of the brain may be all that it is possible to achieve.