CPR Revolution On The Horizon

Medical scientists are on the edge of a new discovery concerning the mechanism of cardiopulmonary resuscitation. It involves "pneumatic circulation" and a possible "mystery valve" in the heart. Sinclair Germaine, veteran observer of the health care scene, explains the new theories and where they may lead. Germaine writes under his real name for a national publication in the New York area.

"Prepare to revise all your CPR literature," advised a physician member of an elite group dubbed the "Flow Volume Underworld." The American Heart Association's 1979 Annual Scientific Session (at Anaheim) was the scene of dramatic revelations concerning the mechanism of artificial circulation. The physician wouldn't elaborate on his startling suggestion. "Attend our seminar tonight," he suggested.

We did, and we weren't disappointed. What we saw and heard was a sneak preview of the future of CPR (cardiopulmonary resuscitation). At the center of this new CPR theory is the phrase, "pneumatic circulation." What's that? Dr. Solbert Permut (Johns Hopkins) says it's all about how elastic containers flow through their own recoil. Coining the "Flow Volume Underworld" handle, Permut admitted that the theory of dominance of flow (by volume) goes against most people's instincts (dominance of flow by pressure).

Inquisitive by their nature, medical scientists seldom subscribe to status quo as anything more than temporary. Medical publishers nervously print their publications with concern over how soon the inquisitive challengers are going to obsolete warehouses full of unsold books. They have new cause for concern.

In essence, the Flow Volume Underworld is suggesting that the movement of blood in the pulseless patient is not a function of the heart being compressed between sternum and spine (ventricular compression). Roughly stated, they are suggesting that there is a pressure gradient in the cardio-respiratory system. That is, when blood pressure is produced (through intrathoracic pressure), blood will flow to an area or passage where the pressure is lower. At present, this is deemed to be the alveolar vessels. With each surge in externally induced pressure, it is presumed that the blood moving in this loop (across the pressure gradient) will move a little farther, eventually completing the circuit through the cardiorespiratory system.

Obviously, since blood is the transporter of oxygen, it's important to move as much as possible. According to Dr. Permut, with regard to the non-beating or failing heart, there are no theoretical limitations to the movement of blood through external or artificially induced thoracic pressure. I might have suggested friction loss as a possible theoretical factor — but what do I know?

By Sinclair Germaine

It was truly humbling to realize that Dr. Permut's mathematical equations (projected onto a screen at Anaheim) are light years beyond the comprehension of us ordinary people. But, trying to break it down to our level of understanding, it occurs to us that he has demonstrated that the chest cavity (thorax) contains a number of elastic, blood-filled organs and vessels. By squeezing the thorax, thus causing intrathoracic pressure, the blood can be forced from these organs and vessels. Following the course of least resistance, this blood tends to move across a pressure gradient.

But how can we keep this blood from moving backwards through the loop? It would seem that intrathoracic pressure would exert equal force in all directions, thus producing an impasse at the top of the loop, or pressure gradient (blood being forced through the loop from both directions would meet midway and negate any further movement). In most mechanical fluid pumps, this problem is managed with valves.

Just about the time we get cocky over our knowledge of science and medicine, Mother Nature reminds us how little we really know. This time, the subject is basic anatomy and physiology. At least in laboratory animals, it has been determined that the cardiovascular system has a neat little device nobody really understood before late 1979. It's a kind of valve. It's located in the external jugular. It seems to keep externally pressurized blood from blowing backwards through the system.

Apparently, this newly discovered valve was ignored by most of the standard anatomy texts. It didn't seem to have a function. But then nobody spent much time studying what happened when blood was forced backwards through the cardiovascular system. That is, until Dr. J. Michael Criley and his associates started experimenting with "Cough CPR."

As early as 1960, Criley has been fascinated by the possibility of maintaining circulation in a fibrillating and conscious patient through voluntary and repeated coughs. His slides and movies of this phenomena are very convincing. But it wasn't until Criley teamed up with Doctors James Niemann, Daniel Garner and John Rosborough that the actual function of the mystery valve was determined. Using a contrast medium and cineangiaography on experiments with a dog, they produced a dramatic picture of this valve at work. As the contrast medium was introduced and the animal made to cough repeatedly, the dark medium could be seen reaching the point of the valve and stopping abruptly.

An excited Mike Criley explained his discovery to a dazzled audience in Anaheim. As we understood him, he was explaining that Mother Nature had conveniently designed and installed a check valve to protect the animal's cardiovascular system from stalling (or running backwards) during brief episodes of intrathoracic pressure (such as coughing, retching, etc.).

Teaming up with Criley and Permut at the Anaheim meeting was Dr. Myron Weisfeldt, also from Hopkins. Weisfeldt has published his findings as to a pronounced pause in CPR[1]. Though not published yet, he also has reported on the apparent value of simultaneous ventilation and compression in CPR. We're not sure whether Weisfeldt's findings were coincidental or part of the Flow Volume Underworld's research plan. Whatever the strategy (or absence thereof), it appears that Mike Weisfeldt's findings are compatible with Permut's plastic container and Criley's mystery valve.

If Permut is correct (that squeezing the elastic container will cause pressure and displace blood from the various organs, and that releasing the pressure will cause a recoil and a flow of blood into the emptied elastic container), it would seem that air-filled spaces and organs in the thorax would absorb some of that pressure and limit the amount of effective pressure applied to the blood-filled organs and spaces. *But,* if those air-filled spaces and organs were ventilated (filled) to capacity, they would consititute resistance (back pressure), less absorption of energy, and would allow more blood to be moved. Throw in Criley's mystery valve to prevent retrograde blood flow, prove that it's also present in humans, and you've got tons of obsolete medical literature and CPR training materials.

If you're a CPR-trained layman, a CPR instructor, an EMT, paramedic, nurse, emergency physician or private practitioner, color this report interesting and informative. But please don't start experimenting with it. If you're a clinical researcher, please contact the Flow Volume Underworld.

If some clinical researchers can confirm these tentative findings in controled laboratory settings, we might be able to make the official transition to pneumatic circulation and the second generation of CPR as soon as possible. But the brilliant people who have introduced these intriguing possiblities would be the first to insist that premature change (prior to confirmation of their findings by other researchers) would be ill-advised if not just plain dangerous. □

Footnote

1. Taylor, George J., MD, Tucker, W. Michael, MD, Rudikoff, Michael T., MD, Weisfeldt, Myron L., MD, "Importance of Prolonged Compression During Cardiopulmonary Resuscitation in Man," *New England Journal of Medicine,* June 30, 1977.

Editor's Note: For a more complete and scientifically precise description of the presentations and concepts referred to in this column, readers should consult the following publication: Barkalow, Clare E., "A Review of the 1979 AHA Scientific Sessions; CPR Technology, and The Status of Mechanical CPR;" Techspecs, Volume IV, No. 1, published by Dixie U.S.A., Inc., P.O. Box 13060, Houston, Texas 77019.

The new standards for cardiopulmonary resuscitation and emergency cardiac care

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In September 1979 a National Conference on Cardiopulmonary Resuscitation (CPR) and Emergency Cardiac Care (ECC) was held at the American Heart Association National Center in Dallas. The conference was convened in order to update the standards developed in 1973 and published in 1974 as the very well-known supplement to the *Journal of the American Medical Association*. Co-chairmen of the conference were Kevin M. McIntyre, M.D., and Malcolm R. Parker, M.D., of the American Heart Association (AHA). Cooperating agencies were the American College of Cardiology, American College of Emergency Physicians, American Society of Anesthesiologists, National Academy of Sciences–National Research Council, Division of Emergency Medical Services–Health Services Administration, Department of Health, Education and Welfare, American Red Cross (ARC), and Inter-Society Commission for Heart Disease Resources.

The conference recommendations were finalized in February and will be published by the American Medical Association this summer, again as a supplement made possible by a grant from Asmund S. Laerdal. In fact the conference did not recommend major changes. Instead procedures were redefined in the light of new information and the content of some areas was expanded. In light of the importance of CPR and ECC standards to EMT's, a brief summary of some of the additions or changes that will be incorporated in the new standards will be helpful. Certainly the standards should be read carefully in their entirety upon publication. As a participant in the conference and in the preparation of the final draft of the new standards, I will highlight here some of the areas most directly pertinent to EMT-A's and EMT-P's in the basic life support (BLS) and advanced cardiac life support (ACLS) sections.

ADULT BASIC LIFE SUPPORT

Opening the airway

Head tilt is the most important step in opening the airway and this procedure is augmented by either chin lift or neck lift. Head tilt is accomplished by placing the hand on the victim's forehead and applying firm, backward pressure with the palm, resulting in tipping the victim's head maximally backward. Since optimal and effective head tilt may be difficult to obtain utilizing one hand on the forehead, additional assistance is gained in opening the airway by using either chin-lift or neck-lift with head tilt as described below.

Head tilt–neck lift. Having achieved head tilt by placing one hand on the forehead and applying backward pressure, the rescuer places the other hand beneath the neck and lifts and/or supports it upward. Excess force in performing this maneuver may cause cervical spine injury. Since the specific movement used is extension of the head at the junction of the neck rather than hyperextension of the cervical vertebrae, the hand lifting the neck should be placed close to the back of the head to minimize the cervical spine extension. Emphasis should be placed on the need for gentleness when lifting the neck. If loose dentures are a problem they may be managed with the head tilt–chin lift or may be removed. The fact that lay person–initiated CPR employing neck lift may have a survival rate as high as 61% in selected subgroups attests to the efficacy of head tilt–neck lift.

Head tilt–chin lift. It was established as early as 1960 that head tilt–chin lift offered a greater opening of the airway than head tilt–neck lift. It has been demonstrated that in unconscious nonbreathing victims an additional 11% of airways will be opened by chin lift when compared with head tilt–neck lift. In the unconscious victim making spontaneous respiratory effort, chin lift combined with head tilt is 93.3% effective in opening the airway when used initially and will open an additional 66% of airways when compared with the head tilt–neck lift. Support of the lower jaw may be accomplished by lifting the chin. The tips of the fingers of one hand are placed under the lower jaw on the bony part near the chin, bringing the chin forward, supporting the jaw, and helping to tilt the head back. The fingers must not compress the soft tissues under the chin which might obstruct the airway. The other hand continues to press on the victim's forehead to tilt the head back. The chin should be lifted so the teeth are nearly brought together, but the rescuer should avoid closing the mouth completely. The thumb is used rarely when lifting the chin and then only to slightly depress the lower lip so that the mouth will remain open. If the victim has loose dentures, they can be held in position, making obstruction by the lips less likely. If rescue breathing is needed, the mouth-to-mouth seal is easier when dentures are in place. If dentures cannot be managed in place they should be removed.

Conference recommendations for opening the airway. The Conference recognized that many millions of individuals around the world have been taught to open the airway by the head tilt–neck lift technique. Many lives have been saved by the application of this technique. The Conference further recognized its responsibility to avoid discouraging the application of CPR in any way by creating a sense of confusion or a sense that a technique proved to be effective in a high percentage of cases should now be discouraged.

Thus, while the Conference recognized that chin lift is superior in some ways and may supersede neck lift eventually, the proved efficacy of the head tilt–neck lift sequence and worldwide acceptance of this sequence was appreciated and it was recommended that (1) the two techniques be accepted as alternatives and (2) chin lift should be emphasized as an approach that has been recognized as having certain advantages that may eventually make it the approach of choice.

As more experience with lay persons utilizing chin lift is gained, an opportunity for transition, should it seem appropriate, will exist and such transition may be accomplished with minimal confusion.

Foreign body airway obstruction

The Conference heard data that offered evidence for the following: (1) Either back blows or thrusts when used alone may relieve obstruction. (2) Neither back blows nor thrusts are always successful. (3) A combination of back blows and thrusts is more effective than either technique used alone. This data supported the recommendations of the National Conference on Emergency Airway Management sponsored by the National Academy of Sciences–National Research Council in 1976 as well as ARC and AHA guidelines.

Back blows produce an instantaneous increase in pressure in the respiratory passages that may result in either partial or complete dislodgement of a foreign body. The manual thrust produces a more sustained increase in pressure and airflow in the respiratory passages and may further assist in the dislodgement and movement of the foreign body. At this time, there is not enough evidence to indicate whether back blows or manual thrusts should be delivered first. There is evidence which suggests that a combination of maneuvers may be more effective than any one single method used alone.

The Conference recommends the following: (1) No change is to be recommended unless unequivocal advantages have been documented to support such change. (2) The sequence of back blows and thrusts, as taught by the AHA and ARC, should continue to be the recommendation of choice. (3) In recognition of the fact that the only credible data showed that the combination of back blows and thrusts was superior to either method alone, the sequence of thrusts followed by back blows could represent an acceptable alternative to the recommended sequence of back blows followed by thrusts. The 1979 Conference recognizes and recommends that because of the lack of information regarding a definitive technique, controlled prospective studies by conducted to address this issue.

Artificial circulation

The Conference reaffirmed the importance of regular, smooth, and uninterrupted compressions, with the time allowed for release of chest pressure equal to the time required for compression. These recommendations are essentially consistent with data indicating that downstroke time is a critical determinant of blood flow during external cardiac compression. The techniques for entry of a second rescuer are to be those currently taught by the AHA. Switching of positions during two-rescuer CPR can be accomplished at the time of a carotid pulse check, much as is currently taught by the ARC. The intent of these modifications is to utilize "the best of both worlds" and at the same time to establish uniformity in instruction and practice.

INFANT AND CHILD BASIC LIFE SUPPORT

Size

Children differ in size from infancy through adolescence. For purposes of CPR we have called anyone under 1 year of age an infant and between 1 and 8 years of age a child. Above 8 years of age, techniques appropriate to the adult may be applied. One should not, at the time of an emergency, get too involved with the exact age of the child—a slight mistake one way or the other will not make much difference. Most people can readily recognize an infant and a preadolescent.

Opening the airway

Once it is established that the victim is either unconscious or is having serious difficulty breathing, the airway must be opened. A child who is struggling to breathe but whose color is not blue probably has an adequate airway and is best immediately transported to an advanced life support facility. If the child is not breathing or is making breathing efforts but is blue, the airway should be opened. This is best done by the *head tilt–neck lift technique* and if necessary augmented by the *chin lift*. The head tilt–neck lift technique is performed by placing one hand (or as many fingers as will fit comfortably) under the victim's neck, and the other on the forehead. The neck is then lifted and the forehead is pushed. This extension of the head will usually be sufficient to move the tongue away so it does not obstruct the airway. In some situations, chin lift will be helpful in moving the tongue out of the way. Extension is maintained with the hand on the forehead and the other hand is brought from under the neck to raise the chin so that the teeth almost meet.

Airway obstruction

Relief of foreign body airway obstruction is achieved through a combination of back blows and chest thrusts. Abdominal thrusts are not recommended in children because of the potential danger of injury to the abdominal organs, especially the liver. In order to deliver back blows to the infant, the victim is straddled over the rescuer's arm, with the head lower than the feet. The head must be supported with a hand around the jaw and chest. For additional support, it is advisable to rest the forearm on the thigh. Back blows are delivered in the same way as for an adult: four rapidly delivered blows with the heel of the hand, between the infant's shoulder blades. But be *careful;* you need to use much less force in the infant. Immediately after delivering the back blows, place your free hand on the infant's back so that he is sandwiched between your two hands. While providing good support to the neck from both hands, turn him over, place on thigh with the head lower than the chest, and you are ready to deliver the four chest thrusts. The technique for the chest thrusts is the same as used for cardiac compression.

If the victim is a child and obviously too large to straddle over your forearm, kneel on the floor and drape him across your knees, with the head lower than the trunk. The four back blows can be delivered with proportionately greater force. With the head and back supported, the child is rolled over onto the floor and is now in good position for the chest thrusts.

If the back blows and chest thrusts have been successful, you should now be able to clear the cause of the obstruction for the mouth. Blind finger probes in the mouths of infants and children may cause further obstruction and should be avoided. If the foreign body can be seen it should be removed with great care so as not to push it down, thereby causing further obstruction. The mouth is opened using the tongue-jaw lift technique. The thumb is placed in the victim's mouth over the tongue; the other fingers are wrapped around the jaw. The mouth is opened by lifting the jaw. The foreign body is visualized and then the head is turned to the side and the foreign body swept out of the mouth with the index finger. This step is performed only if the victim is unconscious.

If the victim has not begun breathing after this maneuver, the head should again be extended to open the airway, an appropriate seal made over the mouth or the mouth-nose of the victim, and four breaths again delivered. If the chest does not rise, the obstruction persists and its relief must again be sought via this technique.

Check 20 on Reader Service Card

Check 21 on Reader Service Card

Checking the pulse

This is an area of substantive change, since for *infants* the standards recommend use of the brachial pulse rather than palpation of the precordium for evidence of cardiac activity. Once the airway has been opened and four breaths delivered, it must be determined whether only breathing has stopped or whether a cardiac arrest has also occurred. Cardiac arrest is recognized by absence of a pulse in the large arteries in an unconscious victim who is not breathing. The pulse in a *child* can be felt over the carotid artery in a manner similar to that described for the adult. Feeling the pulse of an infant is more of a problem. Unfortunately, the very short and at times fat neck of an *infant* makes the carotid pulse difficult to feel. Precordial activity represents an impulse rather than a pulse and has been found not to be reliable. Some infants with good cardiac activity may have a very quiet precordium, leading to the erroneous impression that cardiac compression is indicated. Because of this difficulty it is recommended that in *infants* the brachial pulse be checked. With practice this can be as easily mastered as palpating a carotid pulse.

The brachial pulse is located on the inside of the upper arm, midway between the elbow and the shoulder. The rescuer's thumb is placed on the outside of the arm, between the shoulder and the elbow. The tips of the index and middle fingers are placed on the opposite side of the arm. The index and middle fingers are pressed lightly toward the bone until the pulse is felt. In hospital situations the femoral pulse may be used.

External cardiac compression

The bigger the victim, the more force will have to be exerted. In the case of a small infant, two or three fingers will suffice. But if the child is large enough so that the sternum does not compress easily with three fingers, the heel of one hand will be needed. The fingers must be kept off the chest. If the victim is large enough to require the heel of a hand for compression, the depth should be increased to 1 inch — 1½ inch.

Because of the inherently faster heart rate of infants and children, the compression rate must also be faster—100 compressions/minute in the infant and 80 compressions/minute in the child.

Cardiac compression must always be accompanied by rescue breathing and the two should be coordinated. The ratio of compression to ventilation is 5:1. For a single rescuer after each fifth compression, the rescuer positions himself at the head, opens the airway, and breathes for the victim. When two rescuers are available, the ratio is maintained at 5:1 with the ventilation interposed between two compressions.

Compressions should be counted out loud by the rescuer performing the cardiac compressions as follows: infant—one, two, three, four, five, breath . . . ; child—one and two and three and four and five, breath . . . .

To summarize, the infant requires one breath every 3 seconds or 20 breaths/minute and 100 compressions/minute. The child requires one breath every 4 seconds or 16/minute with 80 compressions/minute. The adult requires one breath every 5 seconds or 12/minute with 60 compressions/minute. In each of the above the ratio of five compressions to one ventilation is maintained.

ADVANCED CARDIAC LIFE SUPPORT

Ventilation

Masks. The standards recommend that mouth-to-mask ventilation with supplemental oxygen be used until an endotracheal tube or esophageal airway is in place. The Conference emphasized the skill required to perform proper bag-valve-mask ventilation and recommended that bag-valve units be used whenever possible in conjunction with an endotracheal tube or esophageal airway.

Esophageal airways. Because of isolated reports of complications related to the use of the esophageal obturator airway the standards reemphasize the importance of proper training in, and use of, this device. Critical considerations are (1) use the tongue-jaw lift with one hand while inserting the airway with the other hand and (2) never use force during insertion of the tube; if there is difficulty in advancing the tube into the esophagus withdraw it slightly, improve the tongue-jaw lift, and then readvance the tube.

Adjuncts for artificial circulation

The pneumatic anti-shock garment has been added to the standards, with emphasis on its role in hypovolemia and its potential hazards in patients with elevated pulmonary capillary wedge pressure, which is usually the situation in cardiogenic shock. However, the rapid reversibility of adverse effects that may follow garment inflation in such patients is pointed out.

Drug therapy

There has been a reclassification as well as a considerable expansion in this section of the new standards. Only a few of these modifications will be highlighted here.

For lidocaine an alternative method of administration in initiation of therapy is included. This is a multiple-bolus technique in which a 75 mg bolus is injected initially, followed by a 50 mg bolus every 5 minutes in the presence of ventricular ectopic activity to a total of 225 mg. An infusion can be started at 2 mg/minute and increased by 1 mg/minute after each bolus up to 4 mg/minute. Lidocaine infusions should be administered by means of infusion pumps whenever possible.

Bretylium has been added to the section on antidysrhythmic drugs, emphasizing that at the present time it is not being presented and included as a first-line therapy of ventricular fibrillation or tachycardia.

Dopamine, dobutamine, and sodium nitroprusside have been added to the section on drugs used to control cardiac output. Because of the efficacy and frequency of use of dopamine, in particular, this drug is discussed in some detail.

Two drugs of great importance to EMT-P's—epinephrine and sodium bicarbonate—are given considerable update. The tracheobronchial route of injection of epinephrine is emphasized if an intravenous route cannot be established quickly. The recommended dose for this route of injection is 10 ml of the 1:10,000 solution, or 1 mg. For sodium bicarbonate there is a detailed emphasis on the role of adequate alveolar ventilation in the regulation of acid-base homeostasis. By assuring adequate alveolar ventilation a major component of depressed pH (respiratory acidossi) can be managed without sodium bicarbonate. The recommended dose is 1 mEq/kg initially and no more than one-half this dose given every 10 minutes of continued arrest. The previous recommendation that the initial dose can be repeated once has been deleted in light of data published since the previous standards.

Defibrillation

Defibrillation, along with appropriate drug therapy, is discussed in a detailed section on patient management, which is oriented around the care of patients with specific types of cardiac disorders for which the previously discussed pharmacology, along with defibrillation, becomes clinically applicable. For example, the management of patients in ventricular fibrillation is approached in the following sequence:

If the development of ventricular fibrillation is observed or if ventricular fibrillation is identified in a patient who has been in cardiac arrest for less than 2 minutes, an initial defibrillation countershock (200 to 300 joules delivered energy) should be administered as soon as possible. If the patient has been in cardiac arrest for an undetermined period of time, with ventricular fibrillation identified as the underlying dysrhythmia, it is recommended that basic life support be initiated and performed for at least 2 minutes before an initial attempt is made to terminate ventricular fibrillation. The following procedure is suggested for treating ventricular fibrillation:

1. Initiate basic life support and summon defibrillation equipment and assistance.

2. Continue basic life support while the cardiac rhythm is evaluated. If adequate help is available, an intravenous life line should be started at this time and supplemental oxygen administered.

3. The following steps should be accomplished without interrupting basic life support for more than 10 seconds: (a) Apply conductive, low resistivity paste or jell to the paddles. (b) Select appropriate energy level and charge the capacitor. The initial attempt at defibrillation should be made using 200 to 300 joules delivered energy. (c) If this is unsuccessful, a second defibrillation should be attempted using 200 to 300 joules delivered energy. (d) If a second defibrillation attempt is unsuccessful, it is then recommended that basic life support be continued with supplemental oxygen. Epinephrine should be administered. Sodium bicarbonate should be administered at this time if metabolic acidosis is documented by arterial pH and Pco_2 determination. If these determinations are not immediately available, the decision to administer bicarbonate should be based on clinical judgment of the duration of cardiac arrest. A third defibrillation attempt should then be made using a delivered energy not to exceed 400 joules. For frequently recurring ventricular fibrillation the use of lidocaine, bretylium, or procainamide may be helpful, Following successful defibrillation to a supraventricular rhythm, a lidocaine infusion should be started. For recurrent ventricular fibrillation, it is not necessary to increase the defibrillation energy on each successive shock. Effective defibrillation depends on adequate current traversing the myocardium. Paddle placement on the chest should therefore be a position that will maximize current flow through the myocardium. There are two accepted procedures for paddle placement, The standard placement is one paddle just to the right of the upper sternum and below the clavicle and the other paddle just to the left of the left nipple in the anterior axillary line. The alternative approach is to place one paddle anteriorly over the precordium and the other posteriorly behind the heart Paddles should be applied to the chest with firm pressure on each paddle. Following delivery of the electrical current, the electrocardiogram and pulse should be assessed to determine the effectiveness of the defibrillation attempt.

When defibrillation is to be performed with the electrodes directly applied to the heart during open-chest resuscitation, defibrillation current between 5 and 20 joules delivered energy should be used beginning with the lower energy levels.

Definitive, post-resuscitative care is also discussed, with special care management details as they apply to the respiratory, cardiovascular, renal, central nervous, and gastrointestinal systems. These of course are in-hospital intensive care procedures. Other updated and/or expanded sections of the new standards include medical/legal considerations and emergency cardiac care systems.

SUMMARY

The new standards for CPR and ECC can be viewed as a compilation of the various components of the current state of the art of the practice of medicine identified as emergency cardiac care. Many important insights and advances since the publication of the previous standards have contributed to the development of the new standards and, indeed, are the very basis for them. It is evident that CPR and ECC are now truly in a dynamic and ever-changing state of progress. The new standards incorporate those areas of progress that have undergone scrutiny and evaluation in the scientific community and have found acceptance there. EMT's will find the new standards in their entirety to be a source of fresh and exciting information that will find practical application in their care of patients in need of CPR and ECC.