dextran 70 is added to the solution. Despite its transience, this improvement in flow results in increased survival, probably by delaying some of the deleterious effects of hemorrhagic shock—such as increased lactate and myocardial depressant factor activity.

The theoretic risks of administering hypertonic-hyperoncotic solutions have not been seen clinically in humans. Bleeding abnormalities and difficulties in cross-matching due to dextran, neurologic abnormalities, clinically significant hypokalemia, and rebleeding from injured vessels have not been seen in prehospital patients given a 7.5% sodium chloride and dextran 70 solution. The administration of hypertonic (3%) saline solution reduced intracranial pressures in hemorrhaged dogs with closed head injuries and was associated with less cerebral edema than the use of standard solutions.

The use of hypertonic-hyperoncotic solutions in the early resuscitation of trauma patients appears to be a promising addition to our ability to care for the severely injured in the difficult circumstances of the prehospital environment. Further data from current clinical trials should add considerably to our understanding of their role.

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Rapid Air Transport of Critically Ill Patients

THE DOCUMENTED medical benefits of the rapid delivery of critically ill patients to definitive care available only at tertiary care facilities has led to an increased emphasis on rapid aeromedical transport. Health care provision has been regionalized in urban and rural emergency medical systems in such subspecialty areas as trauma, obstetrics and gynecology, pediatrics, and cardiology. Despite the almost uncontrolled growth of helicopter programs and concerns about expense and safety, medical literature documentation of the benefits of aeromedical transport, and the desire of tertiary centers to expand their geographic referral base, has resulted in phenomenal expansion nationwide. There are 231 medical evacuation programs operating in 46 states and the District of Columbia. These include 156 hospital-based programs and more than 60 run by either the military or state and local governments.

Although data have been conflicting, no area of helicopter transport has been more closely studied than the effects of air transport on improving survival in multisystem trauma patients. Studies have shown a statistically significant survival advantage in patients with serious injury transported from an accident scene by helicopter versus ground transport. The benefits to patient survival appear to be multifactorial, including not only rapid transport to definitive care but important therapeutic interventions such as endotracheal intubation, the transfusion of blood, and high-volume infusion.

Evolving higher standards of care for a patient sustaining an acute myocardial infarction and the small window of time in which such procedures as percutaneous transluminal angioplasty can be done or thrombolytic agents administered after an acute myocardial infarction have led to a closer evaluation of the safety of helicopter transport for cardiac patients. Despite documented increases in plasma catecholamine levels during transport, numerous studies during the past three years have found infrequent in-flight complications that were managed en route. Transient hypotension is the most common preflight and in-flight complication, followed by third-degree atrioventricular block and nonsustained ventricular tachycardia.

High-risk neonatal survival increases when delivery occurs in a perinatal center compared with survival when local delivery is followed by transfer. While many air-ambulance programs provide pediatric transportation for critically ill children, there is continued debate over the transfer of high-risk obstetric patients. A nationwide review of 315 helicopter transports of women in active labor revealed that, despite the fact that 72 were in the accelerated phase, there were no instances of in-flight delivery.

As studies increasingly define areas of possible benefit to critically ill patients, the optimal staffing of air ambulances and medical indications for air transport will be carefully delineated to further improve patient outcomes and safety in aeromedical transport.

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Update on Amphetamine Abuse

THERE HAS BEEN a disturbing increase in the illicit production and abuse of amphetamines. One of the endemic areas for this increase has been the West Coast of the United States, particularly California.

Amphetamines have become the drug of choice for adolescents in some communities. In one inpatient adolescent drug treatment unit, methamphetamine was listed as the drug of choice by about 80% of patients recently admitted. The reasons given for this preference include availability, low cost, and a longer duration of action compared with cocaine. Both oral and intravenous use are well documented in the literature. Less well documented are the users' preference to snort or smoke methamphetamine, and, as with "crack" cocaine, smoked methamphetamine is rapidly absorbed through the lungs.

Amphetamines obtained illicitly may contain D-amphetamine, methamphetamine, related amphetamine compounds such as 3,4-methylene dioxymethamphetamine, phenylpropanolamine, ephedrine, caffeine, and nonstimulant substances. Central nervous system effects may occur with minimal dosing, and an excessive amount of drug causes systemic catecholamine hyperstimulation. Amphetamines stimulate the release and block the reuptake of central catecholamines such as dopamine. Although the mechanism of action is similar to that of cocaine, some sites of action differ, and the half-life of amphetamine-induced euphoria is four to eight times longer than that of cocaine. Methamphetamine can be easily synthesized from ephedrine with inexpensive equipment. The end product of this synthetic process is a white to brown powder that can be snorted, smoked, injected, or swallowed. Because the synthesis process is usually clandestine, however, the product may contain a number of impurities. Such impurities can include toxic concentrations of lead, complex organic compounds that may be carcinogenic, or numerous amphetamine-related compounds.

Symptoms of acute intoxication are variable and can include hyperexcitability, confusion, hallucinations, and tachycardia. In severe cases, seizures and occasionally death have occurred. Amphetamines may produce a state mimicking paranoid schizophrenia and induce agitation and violence. In San Diego County in 1986, 40% of all homicides were methamphetamine related; cocaine was involved in 12% to 15%. This represented a 52% increase in methamphetamine involvement over the previous year. In San Bernardino County, the number of coroner's cases involving amphetamines is twice that of cocaine. Some emergency departments treat twice as many amphetamine-related problems as those of cocaine.

The treatment of an acutely intoxicated amphetamine patient should be directed toward ensuring an adequate airway and other supportive measures. Agitation should be controlled with the use of haloperidol, and cardiovascular hyperactivity responds to propranolol hydrochloride administration. Both of these drugs have been established as effective amphetamine antagonists in studies of animals. Although other agents such as diazepam have been used with success clinically, there are no controlled studies to validate their efficacy.

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Hydrofluoric Acid Burns of the Hand

HYDROFLUORIC ACID is one of the most dangerous acids found in the workplace. Unlike other corrosives, a considerable amount of hydrofluoric acid remains undissociated when dissolved in water. In this uncharged state, it can penetrate deeply into tissues. Injury is mainly due to the interaction between fluoride and calcium, disrupting calcium-dependent processes and producing deep tissue necrosis and severe pain. This unique injury does not respond to standard burn therapy. Instead, current treatment involves applying calcium or magnesium after decontaminating by copious water irrigation. The choice of vehicle and the technique of administration depend on several factors: the surface area involved, the concentration of hydrofluoric acid, and the duration between exposure and treatment.

A minor burn is defined as an injury involving a few square centimeters of tissue (sparing the nail and nailbed), contact with a hydrofluoric acid concentration of less than 20%, and treatment soon after exposure. Treatment consists of bathing the hand in a 10% to 25% solution of magnesium sulfate and massaging the burn with a 2.5% calcium gluconate gel for at least 30 minutes. If pain persists after one to two hours of this therapy, the injured area is cautiously injected with a 10% calcium gluconate solution using a 27-gauge needle. The area infiltrated should extend 5 mm beyond the burn edge. A dose of 0.5 ml per cm^2 of involved tissue is recommended. For digital burns, no more than 0.5 ml per phalanx should be injected to avoid pressure necrosis.

A more aggressive approach is required for exposures involving hydrofluoric acid concentrations of greater than 20%, tissue contamination of more than a few square centimeters, or a long delay between contact with any concentration of hydrofluoric acid and treatment. Here, deep tissue injury is likely, and ointments or solutions cannot diffuse far enough to be effective. The initial management consists of calcium gluconate infiltration as described earlier. If the nailbed is affected, the nail must be removed before the calcium gluconate can be administered. Any bullae or necrotic tissue must be debrided.

In severe burns, those involving large areas of the hand, or if more than one nailbed is contaminated, infiltration with calcium gluconate becomes impractical. Instead, an intra-arterial infusion of calcium gluconate is the treatment of choice. A radial arterial line is established using a standard aseptic technique. Two grams of calcium gluconate are dissolved in 200 to 250 ml of a normal saline solution and infused by pump over four hours. The line is then maintained with heparinized saline for four to six hours. Should typical hydrofluoric acid pain return during this period, the patient is re-treated. After the second infusion, if avascular-appearing tissue remains, conservative debridement is carried out. This may include nail removal if the nailbed does not show improvement. This process continues until the patient is pain-free.

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Prehospital Intubation of Trauma Patients

ESTABLISHING AN AIRWAY is the foremost priority in resuscitating any acutely injured patient. Most blunt trauma victims who require airway intervention have either sustained a major head injury or have respiratory distress due to thoracic trauma or hypovolemic shock. Establishing an airway in these patients can be lifesaving by alleviating hypoxia, lowering the intracranial pressure, and preventing aspiration.

Although there has been a trend in the prehospital setting to "scoop and run" with these patients, limiting the prehospital time expended, there is evidence that airway intervention in the field may increase survivability. Unfortunately, the need for establishing an airway in the field for a blunt trauma victim poses a dilemma to prehospital care providers. Although orotracheal intubation may be lifesaving, it has