BASIC MEDICAL CONSIDERATIONS

A structural collapse incident can cause multiple victims to be injured in a variety of ways and locations. Utilizing some basic medical care and safety procedures during the rescue operations will greatly assist in providing the most victims with the best possible chance for recovery.

It is imperative that rescuers not lose sight of their primary objectives in responding to structural collapse incidents. Rescuers must be able to stabilize or maintain the existing situation and access, stabilize, and remove victims without further harm.

Before beginning rescue operations, the IC should establish a location to place injured victims. This location is often known as a casualty collection point (CCP) or treatment area. If rescue operations begin before establishing a CCP, victims from the incident are often gathered and placed at different and multiple locations that makes triage, treatment, and transport more difficult. Use established triage procedures to sort multiple victims to do the most good for the most people with the limited resources available.

Determine Likelihood of Victim Survival

Another consideration of the IC is the potential for survival of the victims, based on the type of collapse situation and on the length of time the victim has been trapped. Research done after several earthquakes with entrapped victims has illustrated that survival is proportional to the length of time a victim is entrapped. The greatest chance of survival occurs within the first 24 hours, and 80% of those who can be saved will usually be rescued within that time period.

Typical survival rates of trapped victims:

- 30 minutes 91 % survive
- 1 day 81 % survive
- 2 days 36.7 % survive
- 3 days 33.7 % survive
- 4 days 19 % survive
- 5 days 7.4 % survive

INJURIES ASSOCIATED WITH STRUCTURAL COLLAPSE

A collapsed structure places significant forces on a victim's body and the contents of a structure have tremendous potential to cause injury in a collapse.

Types of Injury

The time of day of the structure collapse can be a possible indication of the type of injury rescuers may encounter. A higher instance of head, neck, and back trauma can be expected during the day and early evening when people are normally found in standing and seating positions. A higher instance of broken bone, soft tissue, and crushing injuries can be expected during the late evening and early morning hours when people are normally laying in bed or trying to escape with less than adequate clothing or protection.

Other Medical Concerns

Hypothermia, or decreased body temperature, is a concern in cold temperatures when the patient may have been exposed to the environment for extended periods of time. Wet clothing, lack of normal heating and insulation systems, building components that absorb heat, inability of the patient to move,

and existing weather conditions 'all increase the possibility of hypothermia. Rescuers must protect the patient from the environment during the rescue effort.

Hypovolemia, or a loss of blood volume, can occur as a result of impacts and injuries to the body as a structure collapses. Shock as a result of hypovolemia is a life-threatening problem. Rescuers must stop the bleeding and provide oxygen and intravenous fluid replacement if possible.

Inhalation injuries result from many sources during a structural collapse. Large quantities of dust are a significant irritation to the respiratory system and may even suffocate the patient. Rescuers should be prepared to protect both themselves and patients from dust.

Other respiratory problems can result from hazardous atmospheres created by the escape of normally contained products. Examples include natural gas and onsite hazardous materials. It is important to protect both the patient and the rescuer from these hazardous environments throughout the rescue effort.

Dehydration, or inadequate fluid intake, becomes a concern based on the environment and the length of time the patient is trapped. Drinking fluids is the best way to improve hydration but in many cases this in not possible. In these situations, the best solution to the hydration problem may be an intravenous line (IV) started by advanced life support personnel before removal of the patient from the structure.

Nutrition also becomes a concern, especially as the length of time of the incident increases. This should be addressed by advanced life support personnel trained to deal with this type of situation.

Compartment syndrome can occur when a patient's limb has been trapped for over four hours. The limb swells until the skin is stretched to its maximum. These patients will need advanced life support care and aggressive surgery to relieve the pressure to save the limb and possible amputation to save the victims life.

Crush syndrome occurs as a result of crushing pressure on certain parts of the body, typically the lower extremities. Blood flow to and from the injured area is absent for over four hours. Then the injured tissue dies and gives off toxins. A sudden release of pressure allows the toxins to flow into the bloodstream, where they could have an effect on other organs in the body and possibly cause death. Crush syndrome has been called the "grateful dead" syndrome because the patient is appreciative and talking to the rescuers while trapped and during the extrication, but once freed the toxins are released and the patient dies.

Most importantly, rescuers must be able to recognize crush syndrome as a possibility and provide treatment prior to patient extrication.

Contact Consult Medical Resources

If available, advanced life support personnel familiar with crush syndrome should provide treatment for the patient. High-flow oxygen by non-rebreather mask, large volumes of intravenous fluids, cardiac monitoring, and certain medications are appropriate for treatment before releasing the weight load off the victim.

The longer a patient is trapped, the greater the long-term effect; the greater the entrapment time, the lower the chance for long-term survival. Compartment and crush syndromes become concerns after four hours and a certainty after six hours.

Personnel on scene must contact and consult with available medical resources. Structural collapse incidents are long in duration (typically greater than eight hours). Patients' conditions may be unstable, and rescuers may not be able to move them because they are trapped. Compartment and crush syndromes require specific advanced life support medical treatments. This treatment must be administered or supervised by trained personnel familiar with structural collapse injuries. Moving a patient may require very careful handling to minimize the possibility of further injury.

Potential Treatment by Rescuers

- High-flow oxygen by non-rebreather mask
- Cervical spinal immobilization
- Monitor cardiac activity
- Administer certain advanced life support medications
- Immobilize and package the victim for removal
- Maintain body temperature
- Protecting the victim from the environment. Consider helmet, eye protection and dust mask or oxygen mask for victim.
- Protect the patient from rescue activities. Sparks, breaking and breaching debris, and accidentally dropped tools and equipment.

Victim Movement over Debris Piles

If possible, rescuers should not walk over uneven, unstable, or slippery surfaces while carrying victims. Rescuers should secure footing, form a human chain, and pass the victims from rescuer to rescuer. Placing a victim on a backboard or other stable stretcher type device will provide a secure platform with good handholds for the rescuers.

BASIC INFECTIOUS DISEASE SAFETY

If a victim does not have a disease prior to injury or death, they do not become infectious because of the injury or death. Rescuers should take basic infectious disease safety precautions, which includes wearing the same PPE to protect themselves from other types of structural collapse hazards. PPE for cuts, abrasions, eye, and respiratory protection. Additional PPE is needed for potential contact with body fluids. Rubber latex gloves put under the leather work gloves will prevent damage to the rubber gloves during work activities. If significant contact with body fluids is expected due to the rescue operation, the rescuer should wear a moisture barrier over their work clothes such as a Tyvec disposable coveralls and shoe covers often used at hazardous material incidents.

General Infectious Disease Safety Rules

- If it is warm and wet and not yours, get if off you as soon as possible.
- If contact with body fluids, wash with soap or mild disinfectant as soon as possible.
- Wash your hands and face before eating anything.
- Remove and wash clothing with soap and water as soon as possible if contact with body fluids.
- Immunizations against hepatitis and tetanus should be kept current.
- If contact with a significant amount of body fluid has occurred, rescuers should consider decontaminating boots, gloves, and outerwear with soap and water or a mild disinfectant.