

CASUALTY CARE and TRANSPORT



The St. John Ambulance Brigade
South Australia District Inc.
21 Austin Street, Adelaide, S.A. 5000

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Dedication

This book is dedicated to the memory of Richard Gilmore Welch, M.B., B.S., F.R.A.C.S., formerly Divisional Surgeon, Unley Nursing Division, South Australia.

Mr. Welch's untimely death in August 1974 was a loss felt by many people, not least by his many friends within the St. John Ambulance Brigade who will long remember his enthusiastic approach to First Aid and ambulance training.

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Many other people have given valuable assistance including St. John Ambulance Brigade members who provided comments about the edition published in December 1975. Particular thanks are due to the following:

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The editors are especially grateful to Mrs. P. R. Lafsky for typing the original manuscript.

Foreword

South Australians are fortunate in that the St. John Council in this State provides a caring and efficient ambulance service.

Four St. John Ambulance Officers all of whom have had considerable practical experience in ambulance work, have banded together to produce this manual. The result is probably the most detailed book yet published in Australia on the care of casualties by Ambulance personnel.

"Casualty Care and Transport" will surely prove itself to be a valuable teaching aid for Ambulance Services both within and beyond South Australia.

Hon. D. H. BANFIELD, M.L.C.
Minister of Health,
Parliament House,
South Australia.

Preface to the First Edition

The aim of this book is simple. It is to provide the reader with knowledge of Casualty Care at a level above that required for gaining the basic St. John First Aid Certificate. This book therefore, is intended to follow and complement the St. John First Aid Manual and readers are expected to be familiar with the contents of that Manual.

Who needs training to this advanced level of Casualty Care? The editors of this book believe that, as a minimum, all who work as Ambulance Drivers or Attendants should be trained to a level above that of a basic First Aid Certificate. Patients today rightly expect more and more sophisticated and expert treatment from their doctors. Similarly they are entitled to more expertise in the care given to them at the scenes of accidents and during transportation to hospital.

If improved patient care results from study of this text then the book will have achieved its aim.

B.J.F.
August 1975.

Preface to the Second Edition

The "Casualty Care and Transport" Manual has now been extensively revised. Additional material in the second edition includes information on the St. John Ambulance Service in South Australia, details of blood pressure recording, the resuscitation of children, Hare traction splints, cervical collars, the stretcher chair, eye injuries and the management of emotionally disturbed patients.

It is hoped that this revised edition will help Ambulance Officers achieve yet higher standards of casualty care.

Comments and enquiries about this manual may be directed to the Officer in Charge, State Ambulance Training, 82 South Road, West Hindmarsh, South Australia, 5007.

B.J.F.
June 1977.

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Introductory Note

THE ST. JOHN AMBULANCE SERVICE IN SOUTH AUSTRALIA

This book is written primarily for Ambulance Officers working within the St. John Ambulance Service in South Australia. As the book may be read, however, by persons interstate or overseas who may be unfamiliar with South Australia or with the traditions of the St. John Ambulance Brigade, the following notes are included as background information.

South Australia is the third largest of the Australian states, occupying an area of over 984,000 square kilometres. It is more than four times the area of the United Kingdom. The State's population is a little over 1,200,000 people, more than 70% of whom live in the capital city, Adelaide, or its suburbs.

All ambulances in the State are controlled by the St. John Council for S.A. Inc. Those in metropolitan Adelaide are manned on week days, day-time only, by paid employees, while at nights and weekends the ambulance service is staffed by volunteer members of the St. John Ambulance Brigade.

Training for all ambulance personnel is standard throughout the State and is under the direction of a Training Department with headquarters in Adelaide. The Training Department is supported by a medical advisory committee. Those wishing to work as ambulance crew members must show proficiency at annual examinations which are based on the Casualty Care and Transport Manual text. The examinations themselves require the candidate to demonstrate practical skills in a correct and efficient manner.

There are some 40 ambulances based in Adelaide and over 100 in country centres throughout the State. Each year they travel, collectively, about 4 million kilometres.

St. John also operates three ambulance aircraft, two of which are based at Whyalla, the other at Adelaide.

In addition there are more than 40 clinic cars in the State. These are station sedans used to transport patients with non-acute conditions to hospitals for routine appointments. If necessary these clinic cars can be converted within minutes to stretcher-bearing ambulance vehicles.

All ambulance vehicles and crew members bear the St. John emblem and no apology is given for briefly tracing the origin and significance of this insignia. The virtues represented by the emblem were revered by the Crusaders nearly 900 years ago. They should be no less relevant to Ambulance Officers today.

In 1023 some merchants from Amalfi, a small republic south of Naples, rebuilt the Christian hospital at Jerusalem after it had been destroyed by Caliph el Hakim. The eight-pointed cross was the device on the flag of Amalfi and it was adopted as the emblem of the hospital. Crusaders took the hospital under their protection in 1099 and formed the Order of St. John. Persons working in the hospital and Knights of St. John fighting to protect the Holy Land for Christianity wore the eight-pointed cross on their clothing.

The four arms of the white cross represent the Christian virtues Prudence, Justice, Temperance and Fortitude. The eight points represent the beatitudes which spring from these virtues—Observance, Tact, Resource, Dexterity, Explicitness, Discrimination, Perseverance and Sympathy.

The emblem is sometimes referred to as the Maltese Cross. This is because the Knights of St. John had Malta as their headquarters from 1530 to 1798, when the island was captured by Napoleon.

A Royal Charter was issued to the Order of St. John in England by Queen Victoria in 1888 and at about this time the Royal Beasts, the lions and unicorns, were added to the cross.

Following representations to the Grand Priory in England a Commandery for The Order of St. John in Australia was formed in 1942. The Order was raised to the status of Priory in 1946.

In the District of South Australia there are more than 3,500 St. John personnel, grouped into approximately 140 Divisions, the Divisions themselves being formed into Corps.

As elsewhere in the world the activities of St. John in South Australia can be categorized as those of the St. John Ambulance Association—that is the teaching of First Aid, and those of the St. John Ambulance Brigade—that is the actual giving of First Aid treatment to the sick and injured by uniformed St. John members.

The St. John Ambulance Service in South Australia operates in a rather unique way with regular and volunteer members. By constantly learning and implementing new techniques and introducing better equipment it continues to fulfil the long-standing motto PRO UTILITATE HOMINUM—FOR THE SERVICE OF MANKIND.

Chapter 1

Examining the Casualty

Frequently throughout this book the patient has been referred to as “the casualty”. It must be stressed immediately that this “casualty” is a person and as such has worries, anxieties, thoughts and feelings which must be considered by Ambulance Officers.

Unlike machines, patients respond to kindness, courtesy and a sympathetic approach. If Ambulance Officers through their bearing and conduct can gain the confidence of their patients, subsequent treatment and transport will often be accomplished more easily for both casualties and Ambulance Officers. Good manners, a few kind words and a smile are the basis of gaining this confidence.

Please remember that certain groups of patients such as the very young, the very old and those undergoing anxiety-provoking treatments such as radiotherapy, may especially need reassurance.

A first-class Ambulance Officer, besides having a good stretcher-side manner, must also have a well disciplined and logical approach to the examination, treatment and movement of the casualty in his care. The logical first step is to diagnose the casualty’s illnesses or injuries. The three points to consider are:

HISTORY
SIGNS
SYMPTOMS

History may be verbal from the casualty himself or from bystanders. In many instances, history can be deduced from the nature and state of surrounding objects or from sources such as a “Medic Alert” bracelet (Figure 1).

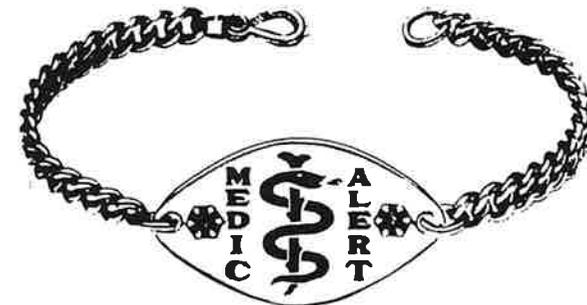


Figure 1 The Medic Alert Bracelet

Signs are the visible evidence of the casualty's injuries or associated complications, for example shock, and symptoms are the sensations such as nausea and pain which the casualty can describe. An Ambulance Officer should check for injuries consistent with the history and he should always be alert for patterns of injuries. As an example, the driver of a car which has crashed may have chest injuries inflicted by the steering wheel and knee injuries caused by impact with the dashboard.

INITIAL STEPS IN EXAMINATION

1. Check that the casualty is breathing satisfactorily and that his airway is clear.
2. Check the casualty's carotid pulse to ensure that his heart is beating adequately.
3. Check that no major bleeding is occurring.

Having carried out these basic but essential steps and having given appropriate initial life-saving treatment as necessary (see Chapter 4), the Ambulance Officer can then proceed with a general examination of the casualty. Individual Ambulance Officers may prefer to conduct their examination in an order different from the one outlined below. This does not matter provided a comprehensive routine is adopted, for the important point is to detect and treat ALL the injuries. Ambulance Officers who do not work to a routine will, from time to time, miss significant injuries to the detriment of the casualty.

GENERAL EXAMINATION OF THE CASUALTY

Begin by checking the casualty's head. Note his level of consciousness and be alert for any changes in this level which may occur during the time the casualty is in your care. As a routine, Ambulance Officers should make a note of the time at which they initially examine a casualty.

Unconscious casualties present particular problems which are discussed in Chapter 9.

If there are no obvious scalp injuries, run your hands over the casualty's head checking for swelling, tenderness or dampness. Inspect the casualty's ears to ensure there is no blood or cerebro-spinal fluid escaping from them. Cerebro-spinal fluid (C.S.F.) is a clear fluid which bathes the surface of the brain and spinal cord. A leakage of C.S.F. from the casualty's ears, for example, indicates that a fracture of the base of the skull has occurred. Appropriate treatment is to position the casualty with the affected side lower-most, having first covered the ear with a sterile dressing to minimise the risk of infection. If the C.S.F. becomes infected, meningitis will result.

Check the casualty's pupils noting their size and whether or not they—

1. are equal
2. react to light.

During daylight the reaction of the pupils to light can be obtained by covering the casualty's eyes for a few seconds and then removing the cover quickly while watching for a change in the size of the pupils. A normal reaction is for the pupils to constrict, that is become smaller, as brighter light impinges on them.

Examine the casualty's jaws for evidence of fractures. Check that there are no foreign bodies in his mouth and again make certain that the airway is clear.

Now check the spine. If the casualty is conscious he may tell you of pain in his back or he may complain of unusual feelings such as a "pins and needles" sensation in his legs. He may even complain of a lack of sensation in his legs or find that he is unable to move his legs. The presence of any one of these clues is an indication to treat the casualty as having a fractured spine. Failure to do so could result in permanent paralysis of the casualty below the level of the spinal cord injury.

In unconscious casualties a fractured spine should be assumed where the nature and violence of the accident suggest that such an injury is possible. Examination of the casualty for a fractured spine involves feeling along the spine for swelling or irregularity. Care must be taken not to move the casualty in a manner which may aggravate a fracture if one is present. In particular the casualty's neck must not be flexed. Neck flexion occurs when the casualty's chin is brought down towards his chest.

The chest and abdomen should now be examined. Feel along the line of both clavicles for evidence of fractures. Look for bruises. Next press gently on the casualty's ribs using the palms of both hands on the front and then the sides of the chest. Gently press on the casualty's abdomen to detect tenderness or abnormal rigidity of the abdominal muscles—features which suggest that there may be internal abdominal injuries. Place your hands on the casualty's hip bones and push backwards and then inwards, checking for pain or abnormal movement which would suggest that the casualty has a fractured pelvis.

Now examine each limb in turn. Work systematically along each one checking for swelling, tenderness or dampness which may represent haemorrhage.

It must be stressed that the Ambulance Officer needs to develop a reasonable sense of priorities. Major life-saving resuscitation, with attention to the casualty's breathing, airway, pulse and any bleeding, must precede a general examination for other less obvious injuries.

THE RECORDING OF BLOOD PRESSURE

Now that St. John Ambulances are equipped with sphygmomanometers (see Figure 2), special mention is made of the technique for recording a casualty's blood pressure. The need for accuracy in recording this observation is especially important.



Figure 2 Inside an Em-Care Ambulance

Blood Pressure is the pressure of the blood against the inside of the walls of the blood vessels. The term refers to the pressure of blood determined by several factors, including the pumping action of the heart, the resistance to the flow of blood in the arterioles, the elasticity of the walls of the main arteries, the quantity of blood within the blood vessels, and the blood's viscosity or thickness. Contraction of the heart, which forces blood through the arteries, is the phase known as systole. Relaxation of the heart between contractions is called diastole.

A sphygmomanometer is used to record the blood pressure. The scale of the sphygmomanometer is usually graduated in millimetres of mercury from 0 to 300.

PREPARATION OF THE PATIENT

See that the patient is comfortable and relaxed, either seated or lying down. If seated, the patient's arm should be slightly flexed and the forearm supported at heart level on a smooth surface.

MEASURING THE BLOOD PRESSURE

The blood pressure is first determined by means of the palpatory method and then by the auscultatory method. It is the auscultatory method which requires the use of the stethoscope.

The rubber compressor bag should be empty of air at the time of application. Remove air by pressing the bag flat.

Place the centre of the rubber bag squarely over the brachial artery. Wrap the cuff smoothly around the arm. Make sure the lower border of the cuff lies about 2.5 cms (1") above the flexure of the elbow.

Neatly tuck in the end of the cuff and smooth out any creases.

1. Palpatory Method

The Ambulance Officer should place the fingers of one hand over the patient's radial pulse. With the other hand, compress the bulb of the sphygmomanometer until the radial pulse disappears. The reading on the sphygmomanometer at this point is the *systolic pressure*.

Deflate the cuff and repeat the procedure to check this reading. After checking the reading, deflate the cuff for about 10 seconds, before taking blood pressure by the auscultatory method. During actual transportation the palpatory method may be the only one suitable as quietness and a vibration free environment are needed for the auscultatory method.

2. Auscultatory Method

The stethoscope is applied over the brachial artery in the bend of the elbow.

The cuff is inflated to a pressure approximately 10 mm of mercury higher than the palpatory systolic pressure.

The cuff is slowly deflated until faint tapping sounds produced by successive pulse waves are heard through the stethoscope. The mercury is held at this point. This is the systolic pressure and is to be recorded as such. Check the reading by repeating the procedure.

The cuff is then slowly deflated. Listen carefully. The sound changes in character to a murmur and finally disappears. The point at which the sound changes in character is the *diastolic pressure*. Check the reading by repeating the above.

RECORDING THE BLOOD PRESSURE

When only the palpatory method is used record as, for example,

Systolic pressure 120 (palpatory).

When the auscultatory method is used record as, for example,

120
—
80

where the figure in the top line represents systolic blood pressure and that in the bottom line represents the diastolic pressure.

PRIORITIES IN TREATMENT

It is again stressed that the Ambulance Officer must develop a reasonable sense of priorities and provide any life-saving treatment needed before attending to injuries of a minor nature.

However, it is also necessary to check so that all injuries are detected and given appropriate treatment. Remember Medic Alert (Figure 3). Look for the

WHAT IS MEDIC ALERT? It is a charitable non-profit organisation. Its services are maintained by a once only registration fee and by voluntary contributions. Additional services such as replacements or additions to bracelets are charged to members at cost.

HOW DOES MEDIC ALERT WORK? The Medic Alert emblem, which should be worn at all times, is recognised the world over. On the back of the emblem is engraved the medical problem, the registration number and the telephone number of the answering service. Doctors, Police, Ambulance and hospital personnel can be given vital information, which could save the patient's life, from the central file 24 hours a day.

WHEN IS MEDIC ALERT IMPORTANT? Whenever a person cannot speak for himself — because of shock, unconsciousness, delirium, hysteria, loss of speech, etc. — the Medic Alert bracelet talks for him.

WHO NEEDS MEDIC ALERT? Persons with any medical problem or condition that cannot be easily seen or recognised need the protection of Medic Alert. Heart conditions, diabetes, epilepsy and severe allergies are common problems. Others are listed on the reverse side. About one in ten persons has some special problem.

WHY MEDIC ALERT? Tragic or even fatal mistakes can be made in emergency medical treatment unless the special problem is known. A diabetic could be neglected and die because he was thought to be intoxicated. A shot of penicillin could end the life of one who is allergic to it. Persons dependent on medicines must continue to receive them at all times.

WHERE IS MEDIC ALERT? The Medic Alert Foundation (International) was founded in Turlock, California, in 1956 after a doctor's daughter almost died from reaction to a tetanus antitoxin sensitivity test. It is now available throughout Australia through the joint sponsorship of Rotary International District No. 250 and the St. John Ambulance Association, Adelaide.

Further information from

MEDIC ALERT FOUNDATION
c/o ST. JOHN AMBULANCE ASSOCIATION
21 AUSTIN STREET, ADELAIDE, S.A. 5000
Phone 223 1316

MEDIC ALERT FOUNDATION
(INTERNATIONAL)

c/o ST. JOHN AMBULANCE ASSOCIATION
21 AUSTIN STREET, ADELAIDE 5000
Phone 223 1316



**THIS
COULD
SAVE
YOUR
LIFE**

Figure 3 The Medic Alert Foundation

Medic Alert bracelet which can lead to the early detection of medical conditions such as those listed in Figure 4.

MEDIC ALERT MEMBERSHIP APPLICATION

FULL NAME Mr. _____ Mrs. _____ Miss _____ **Date of Birth** _____

Christian Names Surname

Street _____ **Phone** _____

Suburb or Town _____ **State** _____ **Postcode** _____

DOCTOR Name _____ **Phone** _____

Street _____ **Suburb or Town** _____ **State** _____

NEXT OF KIN Name _____ **Relationship** _____

Street _____ **Phone** _____

Suburb or Town _____ **State** _____ **Postcode** _____

MEDICAL CONDITION OR PROBLEM		ALLERGIC TO	
<input type="checkbox"/> ASTHMA	<input type="checkbox"/> HYPERTENSION	<input type="checkbox"/> ANAESTHETICS	<input type="checkbox"/> TETRACYCLINES
<input type="checkbox"/> DIABETES	<input type="checkbox"/> IMPLANTED PACEMAKER	<input type="checkbox"/> BARBITURATES	<input type="checkbox"/> *TETANUS TOXOID
<input type="checkbox"/> EPILEPSY	<input type="checkbox"/> MYASTHENIA GRAVIS	<input type="checkbox"/> INSECT STINGS	<input type="checkbox"/> *HORSE SERUM
<input type="checkbox"/> EMPHYSEMA	<input type="checkbox"/> SCUBA DIVER	<input type="checkbox"/> MORPHIA	(TETANUS ANTITOXIN)
<input type="checkbox"/> GLAUCOMA	<input type="checkbox"/> TAKING ANTICOAGULANTS	<input type="checkbox"/> PENICILLIN	<input type="checkbox"/> OTHER ALLERGY
<input type="checkbox"/> HEART CONDITION	<input type="checkbox"/> TAKING CORTISONE	<input type="checkbox"/> STICKING PLASTER	
<input type="checkbox"/> HAEMOPHILIA	<input type="checkbox"/> WEARING CONTACT LENSES	<input type="checkbox"/> SULPHA	

MEDICAL PROBLEM (If not listed above) _____

MEDICINES TAKEN _____

BLOOD TYPE (If known) A B AB O NEGATIVE POSITIVE

IMMUNISATION AND OTHER INFORMATION _____

Signature of Applicant _____

Signature of Doctor _____

* Horse Serum is the allergen in tetanus antitoxin. Please check with your doctor to verify whether you are allergic to tetanus antitoxin or tetanus toxoid or both.

Figure 4 The Medic Alert Membership Application Form

Chapter 3

Kinetic Lifting

A great deal has been written in this book about the care and treatment of the sick and injured casualty. Of vital importance also, is the efficient movement and transportation of casualties to medical aid. In this chapter it is intended to impress on ambulance personnel the necessity of adopting SAFE and CORRECT lifting techniques and practices.

Lifting and carrying are among the activities that subject the body to greatest strain. Very often injuries do not occur at once and may become evident only after cumulative strain, brought about by wrong muscle or body movements over a period of time.

Nearly all lifting injuries arise from the failure of the person involved to :

1. appreciate the nature and mechanics of the body
2. use foresight in assessment of weight and physical surroundings
3. put into practice correct handling and lifting techniques.

The approved methods of manually lifting and carrying casualties range from a simple cradle lift to specialised lifts requiring the use of such aids as spinal boards and the Jordon lifting frame. The decision on which type of lift is to be used must be influenced by factors such as :

- * nature of injuries or illness
- * physical surroundings
- * casualty's weight
- * available manpower
- * personal safety.

The implementation of the various lifting techniques adopted by ambulance personnel should embrace the science of kinetics to achieve the required efficiency. Human kinetics as it is known when applied to manual lifting movements, is the application to the human body of well known mechanical or kinetic principles such as the LEVER, CENTRE of GRAVITY and MOMENTUM. Correct use of these principles reduces the effort in heavy manual lifts thus eliminating or reducing the hazard to the human frame. The following eight key points should be considered before attempting any lifting movement :

1. *SIZE UP THE SITUATION*

As no two people are the same it is impossible to state a load limit applicable to everybody. Make sure you can achieve the lifting task before attempting it. If there is any doubt, get assistance. In addition to weight, careful consideration should also be given to the following factors :

- * position of vehicle
- * placement of stretcher
- * lifting aids available
- * awkwardness of lift due to obstacles within the immediate area.

2. *POSITION OF FEET*

In ambulance work this will vary according to the situation, for example, whether lifting the patient out of a vehicle, off the roadway or on to a stretcher. The over-riding factor in all instances is to have both feet positioned so that the Ambulance Officer's body is balanced and stable throughout the lift.

3. *STRAIGHT BACK*

A straight back is the most important factor in avoiding injuries from lifting. A straight back spreads the load evenly over the surface of spinal discs and does not strain the back muscles. The lower abdomen is not compressed and the risk of hernia is reduced. A straight back is not necessarily a vertical back. Many lifts require you to initially incline forward by bending at the hips (for example, a flat lift from the ground, blanket lift, etc.) but remember to keep your back straight.

4. *KEEP HEAD ERECT AND CHIN IN*

Keep your head erect and chin in as this helps to keep your back straight. (Figure 6.)

5. *KEEP ARMS CLOSE TO BODY*

Your arms are suspension points so keep them as close in to your body as possible. Correct positioning of your arms will help keep the total weight to be lifted as near as possible over your centre of gravity thus reducing the physical effort required.

6. *OBTAIN A FIRM HOLD*

Always use the palm of the hand, ball of the thumb and root of the fingers to obtain a firm secure hold. The use of finger tips only leads to excessive strain and fatigue and could result in the dropping of a casualty.



Figure 6 Correct lifting technique

7. MAKE MAXIMUM USE OF LEG MUSCLES

These are the strongest muscles in the body and are designed to carry weight. Back and abdominal muscles are not as powerful and undue tension on them can cause strains or hernias.

8. USE YOUR BODY WEIGHT

The lift should be made in one easy flowing movement. Use body weight to create momentum and move forward as the lift is made. Practised Ambulance Officers lift at a constant and steady speed, and not with jerky changes of pace. (Figures 7 and 8.)



Figure 7 Correct lifting technique

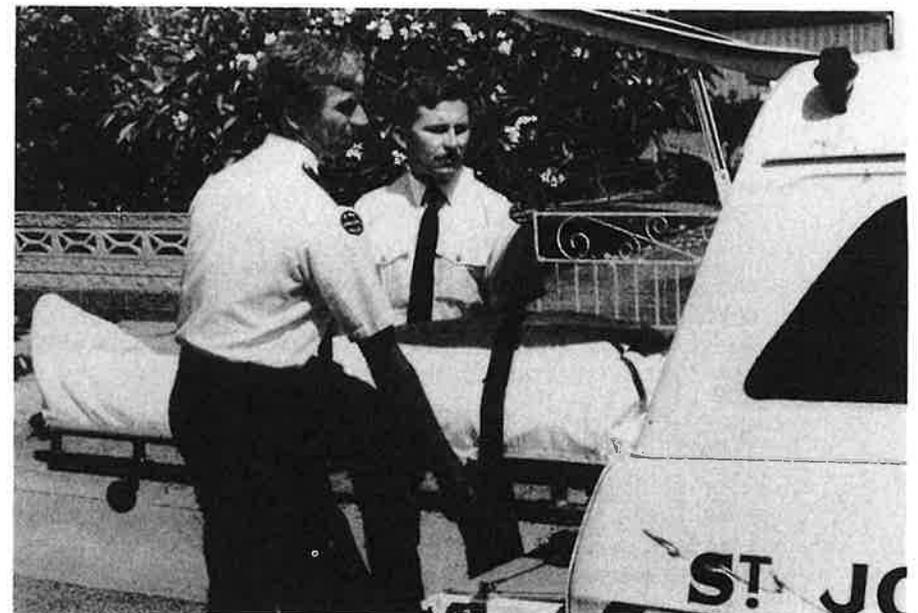


Figure 8 Correct lifting technique

At times awkward situations may make it impossible to apply all of the key points indicated, but keep them in mind and apply as many as possible, thus minimising the risk of injury.

When manually lowering a casualty to the stretcher or a stretcher to the ground, the reverse procedure of lifting applies. Be alert to all the principles involved.

TEAM LIFTING

In the main, casualty movement is undertaken by at least two people, therefore it is essential for a team lifting method to be adopted. The Ambulance Officer when organising or participating in a team lift, should consider the following steps:

1. SELECTION OF TEAM

Wherever possible the personnel undertaking the lift should be approximately the same height. This will help in achieving a level lift with the weight being distributed equally between each person.

2. TRAINED PERSONNEL

For many people a request to participate in a team lift is an indication that brute force is required. The Ambulance Officer must remember his objective is SAFE and EFFICIENT casualty movement. Remember the eight key points of human kinetics. In particularly awkward or hazardous situations the Ambulance Officer may call for further trained assistance. A short delay in obtaining trained assistance is justified if a safe and efficient lift is the result.

3. CO-ORDINATION IN CASUALTY MOVEMENT

Co-ordination in the movement of a casualty is possibly the most important factor in achieving efficiency in team lifting. Identification of a team leader and effective communication within the team are two elements which will produce co-ordinated casualty movement.

4. IDENTIFICATION OF A TEAM LEADER

Every group, regardless of the task to be performed, must have effective leadership. One member of the ambulance crew must accept the role of leader as soon as practicable and establish full control, particularly when using the services of by-standers. Prior to any movement of the casualty the leader should position himself to ensure clear visibility of the total movement at all times.

5. EFFECTIVE COMMUNICATION

The recognised leader should give all instructions. Each instruction must be given in a clear and precise manner to ensure a simultaneous response from all team members regardless of the size of the team.

LIFTING AIDS

Refer to Chapters 6 and 20 for use of lifting aids, for example the short spinal board, the Jordon lifting frame and the stretcher chair.

* * *

A man does not perform well at sports such as golf or football without considerable instruction and practice to develop the necessary skill. A similar statement applies to the lifting of sick or injured casualties. Use of the recommended methods will enable the lifting task to be carried out with less risk to all concerned.

Chapter 4

Resuscitation

In resuscitation, the aim is to restore and maintain the vital physiological functions of circulation and respiration.

Sudden Death (or the equivalent terms cardio-pulmonary or cardio-respiratory arrest) is the sudden and unexpected cessation of respiration and effective circulation. In the definition the words "sudden" and "unexpected" are extremely important considerations, as a patient who gradually dies from a disease such as cancer or chronic heart disease is not dying from "sudden death".

Not everyone who dies is to be considered as requiring emergency resuscitation.

In discussing the physiology of death, the difference between CLINICAL death and BIOLOGICAL death must be recognised. Clinical death occurs at the instant a person's heart stops beating and he ceases to breathe. At this time a Medical Officer may legally sign the death certificate. This point may be called zero, the moment when the last palpable pulse occurs after respirations have ceased. The vital higher centres of the central nervous system of the body remain viable for a further period of approximately three to six minutes. Indeed, much of the body remains "biologically alive" for longer.

The most sensitive and important tissue of the body is the brain. Irreversible changes occur at the cellular level in the human brain between three and six minutes after effective circulation and respiration stop. Resuscitation in the treatment of sudden death is dependent upon this interval between clinical and biological death. After three to six minutes, even though the circulation may be restored, the return to a normal existence is usually not possible. The urgency of re-establishing the oxygenation system of the body, that is ventilation and circulation, within the three to six minutes cannot be over-emphasised.

CAUSES OF CARDIO-PULMONARY (CARDIO-RESPIRATORY) ARREST

The following are examples:

AIRWAY OBSTRUCTION

- Unconsciousness (Tongue blocking Pharynx)
- Inhaled Vomitus

- Laryngeal Oedema
- Bleeding in the Neck
- Inhaled Foreign Body
- Strangulation
- Fractured Larynx

RESPIRATORY CENTRE DEPRESSION

- Drug Overdose
- Poisoning
- Head Injury
- Gassing

RESPIRATORY MECHANISM DAMAGE

- Infections—Poliomyelitis, Tetanus
- Chest Wall Injury

LUNG DISEASE OR INJURY

- Pulmonary Oedema
- Drowning
- Chronic Bronchitis
- Emphysema
- Pneumonia
- Pneumothorax

CARDIOVASCULAR

- Myocardial Infarction
- Pulmonary Embolus
- Haemorrhage
- Electrocution
- Anaphylaxis
- Septicaemia
- Burns
- Prolonged Vomiting
- Diarrhoea

In the emergency situation of sudden death, action must be swift. In the prevention of biological death there are immediate steps to take:

1. *RECOGNISE THE PROBLEM*
2. *PROVIDE ARTIFICIAL VENTILATION OF THE LUNGS*
3. *PROVIDE ARTIFICIAL CIRCULATION OF THE BLOOD*
4. *TRANSPORT TO MEDICAL AID WHILE CONTINUING EMERGENCY TREATMENT*

1. RECOGNISE THE PROBLEM

Unconsciousness
 Absent or gasping breathing
 Absent carotid pulse
 Either cyanosis or extreme pallor
 Fixed dilated pupils

Even if the casualty is fully clothed it should be quickly seen whether or not breathing has stopped. Slight breathing effort may continue for a short period after the circulation stops but these movements are gasping, ineffectual and precede death.

There are normally large and strong pulses in the carotid arteries of the neck and if these are not palpable there is insufficient heart action to adequately circulate blood. A feeble heart action may be present, but unless this heart action is supported, it may soon cease and death will occur.

Within a minute of loss of circulation to the brain, the pupils begin to dilate and within another minute dilation is complete. If the pupils remain dilated when exposed to light, this indicates absence of oxygenated blood circulating to the brain and dictates the immediate need for support of both ventilation and circulation.

It should be noted at this time that respiration may be absent while circulation still persists for three to four minutes, for example after drowning. If however the heart stops first, as with electrocution or in certain types of heart attack, then respiration will usually stop within 30 to 45 seconds.

2. PROVIDE ARTIFICIAL VENTILATION OF THE LUNGS

The most efficient type of emergency artificial ventilation is expired air ventilation. This can be carried out by mouth to mouth, mouth to nose, or mouth to airway techniques. Artificial ventilation can be carried out by an Ambulance Officer using a manual positive-pressure respirator, that is a bag, valve and mask combination for ventilating the lungs with air or oxygen-supplemented air.

2a. EXPIRED AIR VENTILATION

MOUTH TO MOUTH

Open the airway by fully clearing the mouth and pharynx by sweeping out mucus, debris, dentures (if dislodged), blood or any foreign material with your fingers and by tipping the head well back (Figures 9 and 10). Grasp the lower jaw at the chin and pull the jaw forwards. This moves the tongue and lower jaw forward so that they cannot obstruct air passage in the pharynx (Figure 11).



Figure 9 Incorrect positioning of the casualty's head—the airway will be blocked



Figure 10 Correct positioning of the casualty's head



Figure 11 Correct positioning of the casualty's head for Mouth to Mouth Expired Air Ventilation

With the thumb and forefinger of the hand that is pushing on the forehead pinch the nostrils shut. Take a deep breath, open your mouth wide, seal off the casualty's mouth with your lips and blow into the casualty. Watch sideways and see the casualty's chest rise. If the chest does not rise common faults are that either the head is not fully extended or the lower jaw is not pulled upwards sufficiently. Unless expansion of the chest occurs there has not been adequate filling of the casualty's lungs.

At the end of your forced expiration, turn your head towards the casualty's chest, maintain extension of the head and lifting of the jaw, keep the nostrils pinched, and watch the chest fall. Take another deep breath and repeat the cycle. This cycle should be maintained at a rate of 12 breaths per minute, that is one for every five seconds.

The resuscitation of children is discussed on page 30.

MOUTH TO NOSE

Mouth to nose ventilation in the adult is not as easy as mouth to mouth. This is because it is more difficult to seal the mouth with your thumb and still maintain full extension of the head. Remember to break the seal over the casualty's mouth to allow him to exhale and at these times turn your own head away to breathe in fresh air. It is possible to seal the mouth with your

cheek while enclosing the nose with your lips, but this practice is commonly responsible for losing extension of the head and therefore compromising the airway.

MOUTH TO AIRWAY

For the Ambulance Officer, greater efficiency in maintaining an airway to ventilate can be achieved by using an artificial airway, either a regular oro-pharyngeal airway (Guedel-type) or an S-tube airway (Resuscitube, Safar or Brooke type). There are three sizes of regular airway, infant size 00, child size 1 and adult size 3.

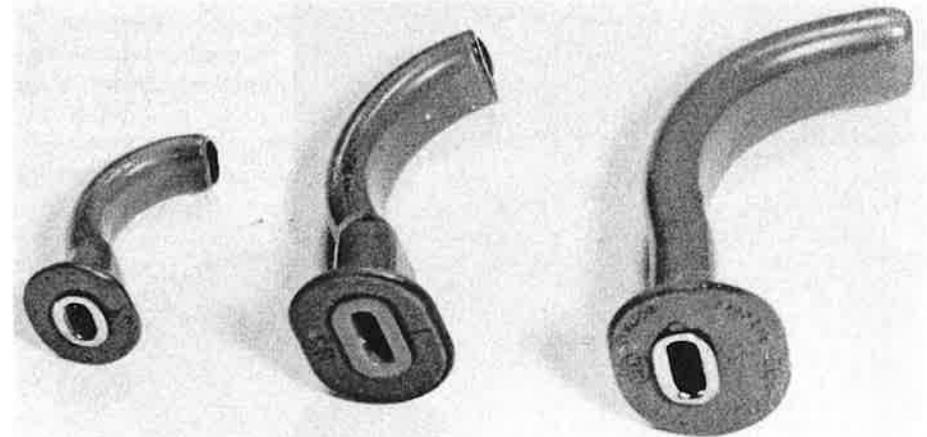


Figure 12 Guedel-type oro-pharyngeal airways

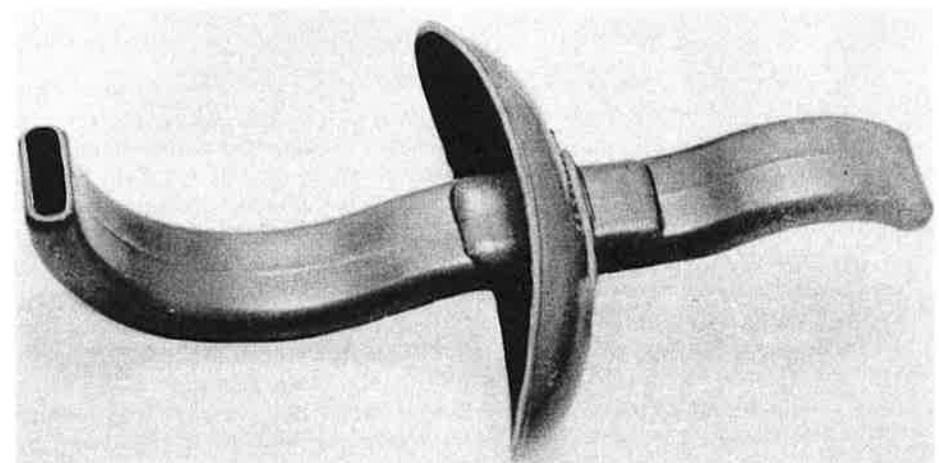


Figure 13 An S-shaped airway



Figure 14
Inserting an
oro-pharyngeal airway

The regular oro-pharyngeal airways (Figure 12) are curved, semi-rigid tubes which are placed between the casualty's lips and lie over the tongue, the end lying in the lower pharynx. The tube is reinforced where it normally lies between the teeth to prevent it being clamped shut. Even with an oral airway in place, the head must be kept in the fully extended position. With the airway in place mouth to mouth ventilation is more readily carried out.

The double-curved airway (Figure 13) is especially designed for expired air ventilation. The double curve enables the airway to be sealed with your lips without coming into direct contact with the casualty's face. This is purely an aesthetic point. The double-curved S-tube has a long and a short curve. The appropriate end is selected according to the casualty's size. When using the short curve for children, make sure you invert the cupped flange which seals the casualty's mouth around the airway. Air leakage is prevented by pinching the nostrils shut and pressing the flange firmly over the mouth. Keep the head fully extended at all times.

To insert an artificial airway, open the casualty's mouth widely using the thumb and index finger of one hand. With the other hand insert the airway between the teeth with the natural curve upside down (Figure 14). Once the airway is halfway inserted, rotate the airway and slide fully in. This twisting manoeuvre prevents pushing the tongue back into the pharynx. The airway must be inserted over the tongue and the natural curve will keep the tongue forward. Ensure that the lower lip is not pinched between the casualty's teeth and the artificial airway.

2b. ARTIFICIAL VENTILATION WITH BAG AND MASK UNIT

The hand operated bag-mask artificial ventilator provides a means of ventilating the casualty's lungs which is less tiring for the Ambulance Officer, does not require face to face contact and allows an oxygen supplement to be added.

A mask of appropriate size is coupled to a non-return valve and a self-inflating bag. (Figure 15.) Squeezing the middle of the bag forces air out of

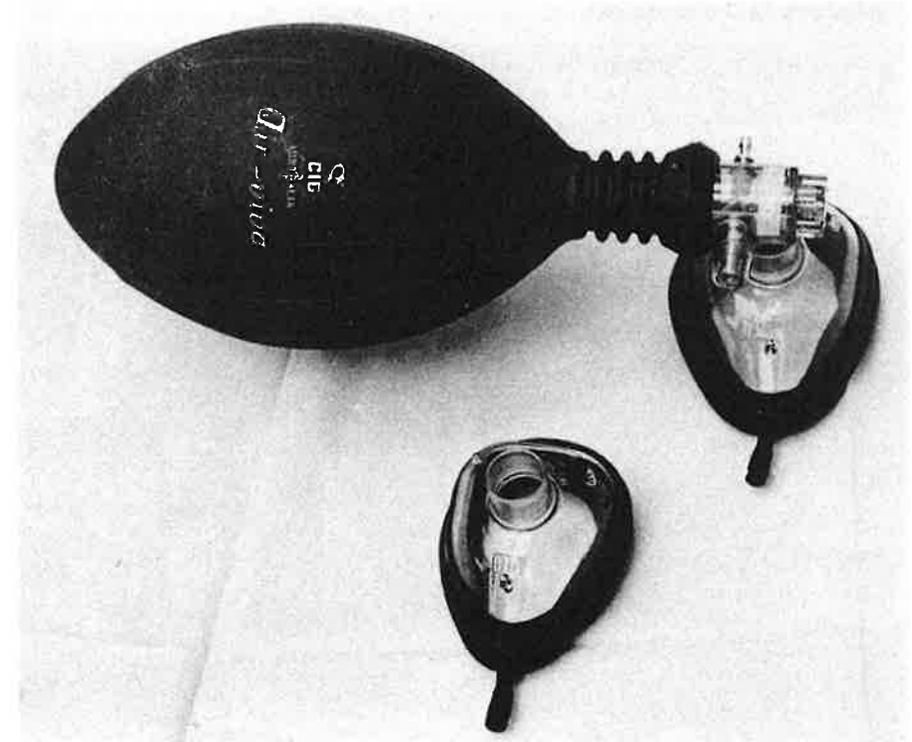


Figure 15 Self-inflating Bag and Mask Unit

the bag through the valve and into the mask. By placing the mask over the nose and mouth and sealing by firm pressure, this air can be forced into the casualty to inflate the lungs. The natural collapse of the chest forces the air out of the lungs and into the mask where it is then released through the one-way valve to the atmosphere.

The mask must be tightly sealed against the casualty's face. Maintaining this seal is the most difficult task in providing this form of ventilation. Press your thumb over the nose part of the mask and your index finger over the chin part; use your third, fourth and fifth fingers to pull the chin upward and backward. (Figure 16.) Take a firm grip, but never force your fingers into the casualty's neck. Do not push the mask down on to the chin, as this is likely to flex the head on the neck and obstruct the airway. It is mandatory to insert a regular oro-pharyngeal airway into the mouth before attempting to ventilate with a bag and mask unit. It may be difficult to ventilate a casualty who has had his dental plate removed. If this difficulty is encountered, try placing the dentures back in the mouth.

Should the casualty begin vomiting, remove the artificial airway and position the casualty so that no inhalation of vomitus occurs. Use the suction equipment as described below.



Figure 16 Method of holding the mask on the casualty's face

Occasionally it may be easier to ventilate an adult casualty with a child's mask. However, in some child masks there is a safety valve (simply a "blow off" hole) on the side of the mask to prevent excessive pressure being developed, that is excessive for a child. If using this mask on an adult the valve must be sealed off with your finger.

With the bag and mask unit an oxygen supplement can be added by connecting a line from an oxygen supply outlet to the bag. The oxygen flow should be started at 8 litres per minute and can be adjusted to lower flow rates according to the casualty's response. A size C oxygen cylinder will last approximately 50 minutes at 8 litres per minute. Do not delay artificial ventilation while obtaining or setting up equipment. Begin immediate ventilation by expired air methods while your assistant gathers and assembles equipment.

SUCTION APPARATUS

As an important aid in maintaining a clear airway the Ambulance Officer can apply suction to remove secretions, blood, vomit or any other fluid which may collect in the upper airway. Solid matter such as partly digested food, loose teeth or any foreign particles must be wiped out of the mouth and pharynx with a sweep of the fingers.

Away from the ambulance a portable foot-operated suction unit can be used to remove fluid from the airway (Figures 17 and 18). A plain, plastic

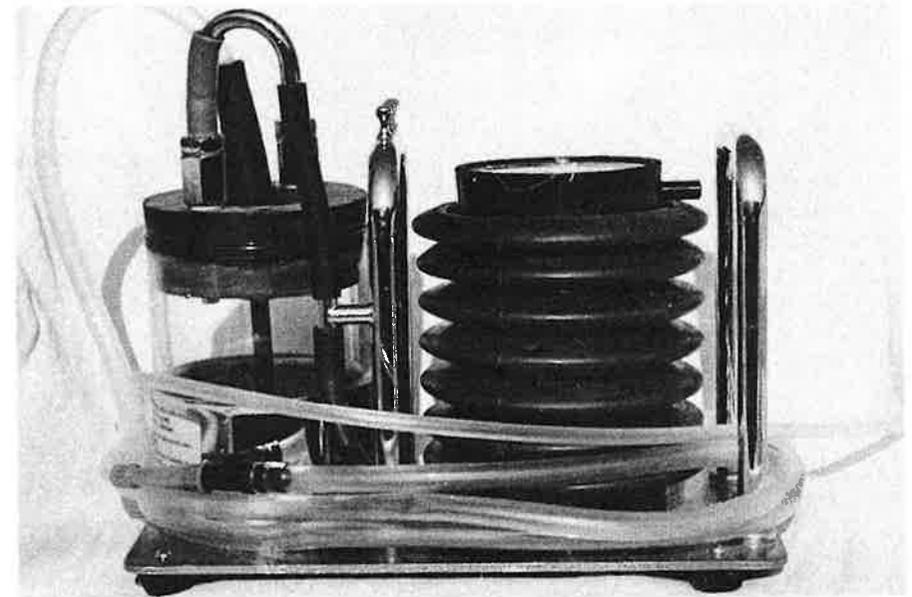


Figure 17 Foot-operated suction unit



Figure 18

Suction unit in use

suction catheter, size 10 for children and size 14 or 16 for adults, is applied direct to the taper connection of the portable unit. Intermittent suction pressure is then developed by the foot pump as desired. It is suggested that the pump be operated at approximately 90 beats per minute.

In the ambulance, the suction provided from the engine manifold is much more effective but it must be remembered that the vehicle engine must be running for the suction to work.

In the vehicle the Y control, plastic suction catheter is used in corresponding sizes. The vehicle unit produces continuous suction. The catheter should be inserted with the Y thumb control open so that no suction occurs at the catheter tip (Figure 19). Once the catheter tip is in the lower pharynx the thumb closes the port in the Y piece and the catheter is slowly withdrawn (Figure 20). A more effective clearance of secretions or fluid occurs if an intermittent suction is produced by opening and closing the Y control with the thumb as the catheter is withdrawn.

To insert the suction catheter, the mouth is opened with the thumb and index finger of one hand and the other hand passes the suction catheter tip as far as possible into the pharynx, some 15 cms (6") in the adult. Suction is created by foot pump or Y control and the catheter withdrawn. Intermittent



Figure 19 Insertion of Y suction catheter



Figure 20 Withdrawal of Y suction catheter

initial suction to clear the airway of blood and vomit must be carried out quickly. Suction should then only be repeated as needed to maintain a clear airway. Suction should not be applied continuously for prolonged periods.

3. PROVIDE ARTIFICIAL CIRCULATION OF BLOOD

EXTERNAL CARDIAC COMPRESSION

Once the circulation has stopped, time is a major factor in successful resuscitation. The casualty must be placed face upwards on a firm flat surface. In the home you should, if necessary, quickly pull the casualty on to the floor.



Figure 21 External Cardiac Compression

Kneeling at the side of the casualty's chest, apply the heel of one hand over the lower half of the sternum, place the heel of your other hand on top of the first and keep your fingers and palms well off the chest. (Figure 21.) With your elbows slightly bent but held rigid, press forcefully downward to depress the sternum approximately 3 to 5 centimetres.

Press vertically downward and then allow the sternum to spring back naturally by completely relaxing your weight on the sternum but do not remove your hands from the sternum. The technique is identical for males and females.

With each compression blood is circulated by squeezing the heart between the sternum and spine. In young adults the ribs will spring with each compression. The elderly have more rigid ribs and a crack may be heard or felt during cardiac compression due to ribs fracturing. This will be of little significance if you carry out the resuscitation procedures correctly.

CARDIO-PULMONARY (CARDIO-RESPIRATORY) RESUSCITATION

Once the problem of cardio-pulmonary arrest has been recognised, the early application of cardiac compression and artificial ventilation is important. When there is only one Ambulance Officer working on the casualty he must ventilate the patient with two breaths and then apply 15 sternal compressions (rate 80 per minute), repeating this sequence.

Once he is joined by an assistant, while one Ambulance Officer should apply one-a-second cardiac compressions and after every five compressions the other should inflate the casualty's lungs once. This sequence continues. Counting aloud helps to co-ordinate activities. While one officer applies cardiac compression, the other should be checking the carotid pulse and the pupils. Check both eyes as sometimes one eye may be diseased or artificial.

If adequate resuscitation techniques are carried out there may be a favourable response in that a pulse will be felt with each compression, the dilated pupils will constrict to normal and the colour of the skin will improve. If this occurs, keep checking for a pulse to return which does not coincide with a chest compression. If a pulse is felt, simply continue ventilating the casualty. If no spontaneous pulse returns but signs of improvement occur, continue cardio-pulmonary resuscitation. After 5 minutes of resuscitation, begin preparations to move the patient into the ambulance. Unless ventilation and cardiac compression are carried out without interruption, further damage to the vital centres will occur.

4. TRANSPORT TO MEDICAL AID WHILE CONTINUING EMERGENCY TREATMENT

When moving the casualty, use the help of available personnel. Ideally, one Officer should ventilate the casualty and the other apply sternal compressions while other helpers move the stretcher. Naturally a slight inter-

ruption is unavoidable as you move the casualty on to the stretcher, but having done this, apply emergency resuscitation again for a minute or two before starting to move the stretcher to the ambulance.

On the move to the ambulance stop every 30 seconds and apply resuscitation for two minutes.

Once in the vehicle it is necessary to continue the smooth sequence of ventilation/compression. One Ambulance Officer will take on this responsibility. He is best situated if he kneels on a pillow on the deck alongside the casualty's chest.

The sequence of 15 sternal compressions and two lung ventilations is employed. This sequence may be briefly interrupted every two minutes to feel for a pulse. Once started, cardio-pulmonary resuscitation must be continued until the casualty is handed over to medical care. It must be continued until a Medical Officer takes over or advises that resuscitation should cease. Do not cease on the advice of any other party once you have recognised the problem and have begun resuscitation.

This emergency treatment will not work every time, but cases have been reported where normal recovery followed lengthy periods of cardio-pulmonary resuscitation. In cases of drowning, do not be put off by statements that the patient has been submerged for as much as fifteen or twenty minutes because the circulation may have stopped only a short time before the casualty was removed from the water.

While you are continuing resuscitation in the ambulance it is necessary for the driver to use all his skill and road sense in making the journey as smooth as possible.

WARNING

The expired air method of artificial ventilation is totally forbidden when treating casualties poisoned with organo-phosphate compounds. In this situation the Ambulance Officer is himself likely to be poisoned and bag and mask ventilation is mandatory (see Chapter 15—Poisons).

THE RESUSCITATION OF CHILDREN

1. EXPIRED AIR VENTILATION

In pre-school children respiratory arrest may occur because of airway obstruction or infection. Examples are inhaled peanuts, drowning and croup. Quickly turn the casualty's head to the side and clear away vomit, mucus and foreign matter. Use a hooked finger to scoop away such debris. Complete airway management by slightly extending the casualty's head and lifting the jaw forward.

Check the breathing and observe the colour of the casualty's skin. If breathing is absent, give four quick breaths using only enough force to inflate the casualty's chest. Be very careful not to overinflate. Over-

inflation may damage the casualty's lungs and will almost certainly cause regurgitation of stomach contents. Check the carotid pulse. If it is present continue expired air ventilation at a rate of 20 to 25 per minute. If the pulse is absent you must combine expired air ventilation with external cardiac compression.

2. CARDIOPULMONARY RESUSCITATION

In this manual children are classified into three groups according to age.

Group 1: Over five years of age.

A normally developed child over five years of age will require compressions delivered with two hands with a technique similar to that used for an adult. Compressions should be gradually increased in size from 2.5 cm (1") for a five year old child to a maximum of 5 cm (2") for a young adult of 18 years. Compressions should be applied at a rate of 100 per minute for young children, reducing to 80 per minute for young adults. The ratio of inflations to compressions is 2:15 when one Ambulance Officer is carrying out the resuscitation and 1:5 when there are two Ambulance Officers.

Group 2: Six months to five years of age.

Remember that small children have only a small lung capacity so give only small puffs of air.

If administering external cardiac compressions to a casualty in this age range use the heel of one hand only. Reduce the distance of compressions from 2.5 cm (1") for a five year old child to 1.25 cm (0.5") for casualties of six months of age. Compress at the midpoint of the sternum for the youngest children in this group as their hearts lie relatively high in the chest.

Group 3: Less than six months of age.

In babies under six months deliver only puffs of air without using force. This can be accomplished after practice by using just the muscular action of the cheeks.

Head extension: It is worth stressing that only slight head extension is needed. Severe damage to the spine may occur if forceful head extension is attempted.

Check the pulse by placing the finger tips over the infant's left nipple.

If external cardiac compression is required a 1.25 cm (0.5") movement is sufficient and should be delivered by two fingers placed over the midpoint of the sternum. The rate of compressions is 100 per minute. The ratio of ventilations to compressions remains the same.

MEDICAL TREATMENT OF CARDIO-PULMONARY ARREST

The same emergency procedures are carried out with ventilation and cardiac compression. An intravenous infusion is commenced and, as soon as

possible, electronic equipment is coupled to the patient to determine the type of arrest. The patient may then receive a number of drugs which have a direct effect on the heart muscle (myocardium). In some cases an electrical shock may be administered to stop fibrillation and to start the heart beating again. This is referred to as "defibrillation".

The basis of successful cardio-pulmonary resuscitation is early and continuing ventilation of the lungs and effective circulation by sternal compression. The aim is to maintain adequate oxygenation of vital brain centres.

CARDIO-PULMONARY ARREST—MANAGEMENT SUMMARY

1. RECOGNISE

Use History (causes) and look for these signs:

- Unconsciousness
- Absent or gasping breathing
- Absent carotid pulse
- Either cyanosis or intense pallor
- Fixed dilated pupils

2. ACT

- | | |
|------------------------|--|
| Ventilate | Expired air or Bag and Mask |
| Circulate | Sternal compression |
| One Ambulance Officer | 2 ventilations then
15 compressions at rate 80 per minute
and repeat this sequence |
| Two Ambulance Officers | 1 ventilation then
5 compressions at rate 60 per minute
and repeat this sequence |

MAINTAIN REGULAR SEQUENCE UNTIL MEDICAL AID IS REACHED.

REMEMBER

- (a) Artificial airway for all unconscious patients and especially if using bag and mask ventilation.
- (b) Use suction apparatus to remove fluids from mouth, pharynx and airway.
- (c) No air can reach lungs while suction of the airway is being carried out.
- (d) Vehicle suction works only while the motor is running.

If the casualty recovers in your care, keep a close watch for any recurrence of cardio-pulmonary arrest. If a pulse returns but no breathing, keep checking the pulse and keep ventilating. If the casualty begins to breathe, support weak breathing by timing your ventilations with those of the casualty.

If the casualty makes a recovery and breathes satisfactorily, administer oxygen by means of a plastic face mask or nasal cannula (see Chapter 11). Keep a close watch for any sign of recurrence of respiratory or circulatory arrest.

SIGNS OF IMPENDING ARREST

- | | |
|--------------------------|-----------------|
| Breathlessness | Pallor |
| Restlessness | Coldness |
| Reduced breathing effort | Rapid pulse |
| Cyanosis | Irregular pulse |
| Tracheal tug | Weak pulse |

Chapter 5

Haemorrhage and Associated Problems

INTRODUCTION

The circulatory system distributes oxygen and nutrients to body cells and removes their waste products.

Among its other functions are the maintenance of body water balance, regulation of body temperature, defence against infection and the chemical co-ordination of body activities.

The average blood volume in adults is 5 litres. The actual volume will vary from individual to individual with changes in weight, height, age and physical condition.

Infants and children have a considerably smaller blood volume. An infant of two or three years of age has approximately 1 litre, whilst a child of ten years has about 2.5 litres of blood.

Blood is transported through the intricate network of the circulatory system and is normally confined within the blood vessels. If these vessels are damaged then blood may escape in a process called bleeding or haemorrhage.

The speed and quantity of haemorrhage therefore has an importance that varies with the age of the injured person. Weight for weight, children tolerate blood loss badly and may die rapidly from what may be negligible haemorrhage in the adult.

Haemorrhage may be external or internal.

SEVERE EXTERNAL HAEMORRHAGE

Blood from a systemic artery is bright red in colour and is discharged from the wound in spurts that correspond with each heart beat.

Blood from a systemic vein is dark red and is seen as a steady flow under lower pressure.

Venous haemorrhage is not as dramatic as arterial but the steady flow can be especially dangerous if unchecked.

When severe haemorrhage occurs, natural blood coagulation (clotting) may not take place due to the continual washing action of the blood.

If this is not quickly rectified blood volume and pressure will drop below a safe level. Profound blood loss causes a reduction in available haemoglobin to the brain, heart, lungs, kidneys, liver and other vital organs which cannot therefore get sufficient oxygen to meet their needs (anaemic hypoxia).

CONTROL

DIRECT PRESSURE METHOD

1. Apply direct pressure over the bleeding part, preferably with a sterile dressing, to provide initial control.
2. Completely cover with a sterile dressing.
The use of sterile dressings will assist natural blood coagulation by trapping blood cells within the meshes of the cloth and will protect the wound from further infection and damage.
For complete protection the dressings must extend well beyond the wound edges.
3. Firm pressure must be maintained. Conforming roller bandages exert firm, even pressure and will do much to stop bleeding.
Triangular bandages folded to narrow or broad form may also be used.
If blood seeps through :
 - (a) Do not remove the initial dressing as this would disturb clotting.
 - (b) Apply a firmer bandage over the previous one.
 - (c) If the wound is located near the extremity of a limb, elevate the part as gravity will then retard the flow of blood.
4. If the wound is near or involving a limb joint it is necessary to completely immobilise the limb.
5. Treat for shock. Shock is usually an accompanying feature of severe haemorrhage.

INDIRECT PRESSURE METHOD

When part of a limb has been severed or badly mutilated it may be difficult to maintain haemorrhage control by the direct pressure method. In this case a standard 6.5 cm (2.5") wide rubber constrictive bandage must be applied with sufficient tension to compress major blood vessels against bone.

METHOD

Whilst a bystander or other assistant stems the blood flow by the direct pressure method :

- (1) Unravel sufficient bandage from the roll to complete the locking turn.
- (2) Progressively increase the tension with each turn.
If the bandage is not tight enough it will only compress the veins and not stop the arterial flow. This will increase the haemorrhage.
- (3) At the second to last turn, insert two fingers and separate the bandage layers.

Continue the final turn around the limb and place the end section into the space made by your fingers. Cover the wound with dressings and secure with a stump bandage.

- (4) Record the time of application of the constrictive bandage and display this time on the casualty.
- (5) Transport as a stretcher patient.
- (6) Frequently check dressings.
- (7) Do not cover the constrictive bandage.
- (8) In this situation do not release constrictive bandage until directed by a medical officer.

ON ARRIVAL AT THE HOSPITAL, INFORM THE DUTY MEDICAL OFFICER THAT THE CONSTRICTIVE BANDAGE HAS BEEN APPLIED.

ASSOCIATED PROBLEMS

CARE OF A SEVERED PART

1. Place the part, without washing it, into a clear thin plastic bag.
2. Seal and make water-tight.
3. Put the bag into a container of cold tap water. You may add a few small cubes of ice to the water. Do not pack the part in direct contact with ice or freeze it. Freezing may destroy tissue and make micro-surgery impossible.
4. Convey the part to hospital with the patient.

OPEN SOFT TISSUE WOUNDS

Various degrees of soft tissue damage may occur involving skin and muscle. These wounds are subject to contamination which may lead to infection.

1. Do not touch the wound.
2. Do not breathe on the wound as this can introduce droplet infection.
3. In the emergency situation do not attempt to clean the wound or apply antiseptics.
4. Completely cover with dry sterile dressings.
5. Bandage firmly or apply an air splint.
6. Check for an associated bone fracture.

SCALP WOUNDS

The scalp is well endowed with blood vessels and even small cuts may bleed profusely. Remember that there may be an underlying fracture of the skull.

1. Examine the wound for small foreign bodies, for example of glass. These can be removed by brushing lightly with a dressing.
2. Close the wound edges together with a dressing held between your thumb and fingers until the haemorrhage is controlled.
3. Cover with a thick absorbent dressing and maintain even pressure by a roller bandage or triangular bandage for the scalp.

The unconscious patient is treated as recommended in Chapter 9.

OPEN FRACTURES

Where there are open fractures a major complicating factor can be the development of infection.

The principles of infection prevention must be enforced to the highest possible degree.

1. Do not touch bone ends or fragments.
2. Do not breathe on the wound.
3. Surround and cover protruding bone with thick sterile dressings.
4. Retain in position with a suitable bandage.

Note: Refer to Chapter 6 for method of fracture immobilisation.

EMBEDDED FOREIGN OBJECTS

Occasionally, objects such as glass or steel slivers, power activated fastener projectiles, pieces of wood, or knives are embedded.

1. Do not attempt to remove the object. This could further damage underlying structures or cause severe haemorrhage.
2. Do not press on the object or even adjacent to it as the line of penetration may be at an angle to the entry point.
3. Use bulk dressings to stabilise the object.
4. Transport carefully to hospital.

THORACIC INJURY

Injury to the chest can be either blunt or penetrating and may result in injuries that range from simple chest wall contusion to damage to major blood vessels and bronchi. Such injuries may include simple rib fracture, pneumothorax, lung contusion, lung laceration and cardiac injury. Injury to the chest cavity may result in profuse bleeding with shock, made worse by decreased alveolar ventilation due to lung collapse. Major thoracic injury is a life threat requiring immediate medical care.

Casualties with chest injury should be promptly assessed to determine effectiveness of respiratory and circulatory function.

Listen to the casualty's breathing.
 Watch the movements of the chest.
 Check the radial pulse.

Good air exchange reduces the possibility of impaired ventilation. If the air exchange is good but the pulse is rapid and weak, bleeding in the chest should be considered.

If the air exchange is poor despite vigorous respiratory effort look for

1. Airway obstruction
2. Open pneumothorax
3. Flail chest

If on inspection the expired air is minimal, the chest wall does not move well and one side of the chest is prominent, a large pneumothorax may be present. The neck also should be examined for the position of the trachea, the presence of surgical emphysema, distended neck veins and evidence of trauma.

PNEUMOTHORAX

Traumatic pneumothorax may follow blunt or penetrating injuries and may be associated with bleeding into the chest.

Pneumothorax is air in the pleural space. The chest wall pleura and lung pleura are normally in contact as moist surfaces. If air can enter through a wound in the chest wall or escape from the alveoli the layers of the pleura separate. Once air enters the pleural space the lung tends to collapse. The degree of collapse depends on the amount of air which can enter the pleural space and whether or not the air is under pressure.

OPEN PNEUMOTHORAX

A most serious form of pneumothorax is the open pneumothorax. The seriousness depends on the size of the wound in the chest wall. A sucking wound of the chest is one in which the air is sucked in and out of the wound with respiratory movements. This air movement is accompanied by a characteristic sound. The disturbance to cardiopulmonary function may be severe. If the wound opening is larger than the larynx, air will enter the chest cavity through the wound rather than through the trachea, posing an immediate life threat.

RECOGNITION

1. Variable degree of respiratory distress.
2. Sucking noise as air is drawn through the wound with respiratory effort.
3. Frothy bubbles of blood in the wound.
4. Possible cyanosis.

As well as lung collapse reducing greatly the oxygenation of the pulmonary blood, pneumothorax causes the mediastinum to move from side to side preventing full expansion of the uninjured lung. It also kinks the great veins returning blood to the heart, in turn reducing cardiac output.

TREATMENT

1. Immediately close the sucking wound by any means. As a temporary immediate measure the Ambulance Officer's open hand should be placed firmly over the wound.
 Closure of the wound with a sterile pad and covering the pad with an aluminium foil dressing taped down to the skin on all edges with broad strips of adhesive tape will prevent sucking. If the foil dressing is not available a large thick dressing bandaged firmly over the wound will also provide an effective airtight seal. A roller bandage, tensioned during expiration will be most effective in maintaining the dressings in place.
2. Make sure the airway is clear.
3. The casualty should be supported in the semi-recumbent (half-sitting) position, lying towards the injured side to immobilize the damaged chest.
4. Give oxygen routinely and make sure that respiratory movements are adequate.
5. Observe the patient continuously. Make sure the wound is sealed adequately.
6. A possible complication of open pneumothorax after an air tight dressing has been applied is the development of tension pneumothorax. If the patient's respiratory distress becomes much worse after treatment of the wound, the dressing should be removed and re-applied in full expiration if possible. If respiratory movements weaken or fail, ventilate the patient with a bag and mask respirator with oxygen supplement.

TENSION PNEUMOTHORAX

In tension pneumothorax air enters the pleural space but is prevented from escaping, resulting in an accumulation of air under pressure. As the pressure continues to rise the lung is completely collapsed and the pressure forces the mediastinum across to the uninjured side further inhibiting the ventilating capacity and cardiac output. This is an extreme medical emergency because of rapidly increasing hypoxia and shock. Untreated tension pneumothorax can swiftly lead to death.

RECOGNITION

1. Extreme dyspnoea.
2. Severe cyanosis.
3. Profound shock.
4. Progressive deterioration.

MANAGEMENT

In the closed chest injury with tension pneumothorax, oxygen by nasal canula and immediate transport to medical aid is mandatory.

When a tension pneumothorax is suspected following the closure of a sucking chest wound, remove the occlusive dressing to vent the chest, and re-apply. Oxygen therapy and immediate transport to medical aid is urgently required.

FLAIL CHEST

Violent impact can cause multiple rib fractures. As a consequence a large portion of the rib cage loses continuity of support.

During inspiration the thorax expands, except for the damaged portion which sinks inwards. Atmospheric pressure forces it inward against the negative intrathoracic pressure. On expiration the reverse occurs for as the rest of the chest wall moves inwards the isolated segment moves outward. (Figure 22.)

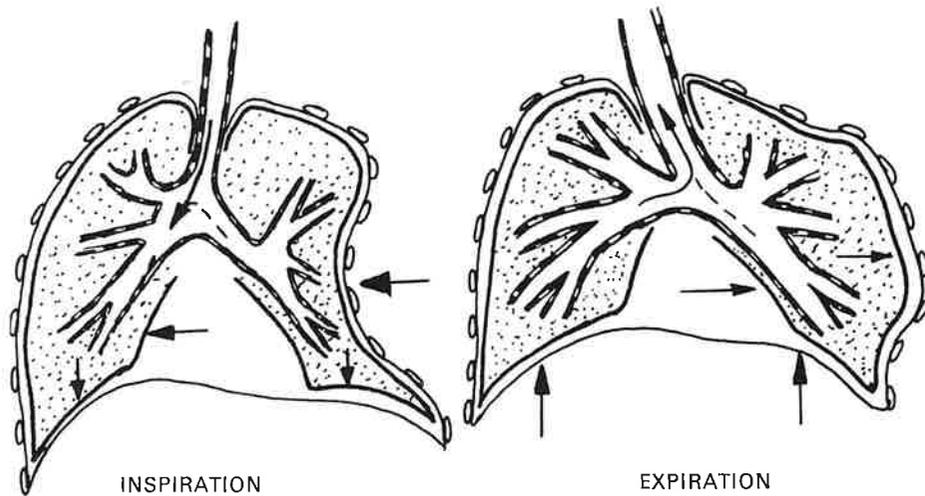


Figure 22 Flail chest

These paradoxical movements prevent the normal movement of air into and out of the lungs.

In severe cases the abnormal pressures described will cause the mediastinum to move from side to side further reducing ventilatory efficiency.

TREATMENT

1. Make sure the airway is clear.
2. Apply initial pressure with the flat of the hand with just sufficient force to stop the abnormal movement. Breathing may be visibly improved at this point.
3. A firm pad made from a universal dressing or folded hand towel is placed to completely cover the unstable segment. Secure firmly with wide bandages.
4. Patients with marked respiratory distress must receive assisted respiration. Positive pressure lung ventilation is maintained in time with the patient's own efforts.

ABDOMINAL INJURY**INTERNAL HAEMORRHAGE**

The possibility of internal haemorrhage must always be kept in mind.

CONCEALED HAEMORRHAGE

Bleeding from the liver, spleen and pancreas may be caused by a bruising, tearing force that has ruptured one of these organs.

The bleeding may be into the abdominal cavity and may remain concealed.

This condition is extremely dangerous and may prove rapidly fatal.

History of a blow to the area, possible winding and a red, swollen area may provide an early indication.

The physiological changes that accompany prolonged haemorrhage are a warning to the observant Ambulance Officer.

RECOGNITION

1. History—seek a description of what happened or what preceded the illness.
2. Signs—look for
 - (a) Evidence of a blow to the area.
Redness and swelling may precede bruising. Particularly check in the region of the liver and spleen.
 - (b) A rapid feeble pulse.
 - (c) Pale, cold and clammy skin.
3. Symptoms—Thirst
Nausea
Anxiety
Restlessness.

VISIBLE HAEMORRHAGE

Blood from any body orifice with the exception of normal menstrual bleeding provides a *VISIBLE* indication of a possible serious internal haemorrhage.

STOMACH—Recent bleeding into the stomach may be indicated by vomited red blood. Blood that has been in the stomach for longer will resemble coffee grounds. Blood-flecked vomitus is less significant if there has been bleeding from the mouth or nose.

BOWELS—Blood from the bowel is usually passed with faeces and from the upper bowel will have a black, tarry appearance. Some medicines produce similar faecal colouring. From the lower bowel blood is more normal in appearance.

KIDNEYS, BLADDER AND URETHRA—Blood is passed with the urine, giving the urine a smoky appearance. There may be a history of a blow to the back and early bruising may be seen. A pelvic fracture may cause damage to the bladder or urethra.

OPEN ABDOMINAL WOUND

Incised wounds to the soft unprotected belly area may cause exposure or protrusion of intestines.

1. Do not touch or attempt to replace the organs.
2. Follow the recommended rules for preventing infection.
3. Cover with a large dry combine dressing.
A universal dressing can be unfolded to a size sufficient to extend well beyond the wound edges.
4. Secure the edges of the dressing to the skin with 10 cm (4") wide adhesive plaster.
5. Do not give anything by mouth.

SUMMARY OF MANAGEMENT

1. Control any external haemorrhage.
2. Treat for shock.
3. Do not unnecessarily disturb patient.
4. Reduce pain.
5. Give oxygen.
6. Do not give anything by mouth.
7. Record blood pressure, pulse and respiration rates on several occasions and the time at which these observations were made.
8. Transport promptly.
9. Notify hospital in advance.

SHOCK

Shock is a condition characterised by an acute reduction in the blood supply to vital tissues. There is a decrease in venous return, a reduction in cardiac output and a fall in blood pressure. As a result of these haemodynamic disturbances tissues do not receive adequate supplies of oxygen and nutrients. Waste products of cellular metabolism may not be effectively removed and this in turn can cause complex and irreversible changes in body physiology.

To counteract the fall in blood pressure, medium and small blood vessels constrict. This vaso-constriction produces a further fall in tissue oxygen levels and a rise in acid waste products. This leads to tissue acidosis and further cell damage.

TYPES OF SHOCK*HYPOVOLAEMIC SHOCK*

This is a common form of shock which occurs in association with

1. Severe external or internal haemorrhage.
2. Loss of plasma at the site of burns or crush injuries.
3. Loss of fluids from the gastro-intestinal tract, as in diarrhoea and vomiting.

PSYCHOGENIC SHOCK

This may be brought about by fear, unpleasant sights or other strong emotional stimuli.

Lying the casualty down and reassuring him is usually sufficient to correct this form of shock.

CARDIOGENIC SHOCK

This term refers to shock caused by inadequate functioning of the heart. Circulation of the blood throughout the vascular system requires the repeated action of normal heart muscle. When muscular impairment occurs as in myocardial infarction, the heart no longer functions well and may be unable to impart sufficient force to drive blood through the system.

NEUROGENIC SHOCK

Paralysis of nerves after spinal cord injuries may cause neurogenic shock. Normally blood vessels are controlled by the autonomic nervous system, and if this is damaged, blood vessels may become widely dilated. The available blood cannot then fill the enlarged vessels, circulation fails and shock ensues.

RECOGNITION OF SHOCK

1. Pale, cold, clammy skin.
2. Profuse sweating.
3. Faintness or giddiness.
4. Impaired level of consciousness.
5. Nausea or vomiting.
6. Thirst.
7. Rapid feeble pulse.
8. Lowered blood pressure.

MANAGEMENT OF SHOCK

1. Lie the casualty down.
2. Establish adequate airway.
3. Ensure effective ventilation.
4. Control severe bleeding.
5. Administer oxygen.
6. Re-check airway and respiration.
7. Splint fractures.
8. Relieve pain.
9. Carefully load on to stretcher.
10. Prevent loss of body heat.
11. Elevate the lower limbs from the hips.
12. Reassure the casualty.
13. Re-check airway and respiration.
14. Transport calmly.

ANAPHYLACTIC SHOCK

This type of shock is different from those discussed above and occurs when an individual who is sensitive to a substance comes into contact with it and reacts violently to it. Anaphylactic shock is the most severe form of allergic reaction.

Examples of substances which may cause allergic reactions can be grouped as follows:

Injections—tetanus anti-toxin, penicillin and other drugs.
—bee stings.

Ingestion—berries, shellfish, some medicines.

Inhalation—pollen or dusts to which the patient may be sensitive.

SIGNS AND SYMPTOMS

1. Collapse.
2. Skin flushed, with burning itching sensation particularly affecting the face, neck and chest.
3. Swelling of lips, tongue and eyelids.
4. Tightness and pain in the chest, with difficulty in breathing.
5. Weak rapid pulse.
6. Sudden drop in blood pressure.

MANAGEMENT

These casualties must be treated for shock, paying particular attention to the maintenance of airway and respiration.

Major treatment can only be undertaken by medical staff and for this reason rapid evacuation to hospital is a prime requirement.

Chapter 6

Fractures

Fractures are among the most common injuries treated by Ambulance Officers.

Fractures may be divided into two basic types (see Figure 23) :

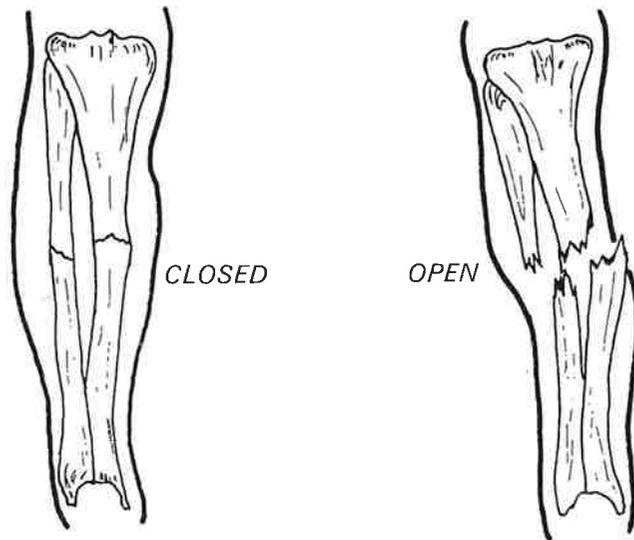


Figure 23 Basic types of Fractures

1. OPEN

There is a wound which allows micro-organisms access to the fracture site.

2. CLOSED

There is not a wound leading to the fracture site.

Fractures may be either :

- (a) *UNSTABLE*—the fractured ends move freely in relation to each other, or
- (b) *STABLE*—sufficiently supported to prevent such movement.

In addition a fracture may be *COMPLICATED*, that is the fracture has caused injury to important surrounding parts, for example an artery, vein, nerve or internal organ.

SIGNS AND SYMPTOMS OF A FRACTURE

SYMPTOMS

1. Pain.
2. Loss of Power.

SIGNS

1. Swelling.
2. Discolouration.
3. Tenderness.
4. Deformity.
5. Shortening.
6. Abnormal mobility.

GENERAL PRINCIPLES OF FRACTURE TREATMENT

1. The first principle is to immobilise the fracture. This may be modified if the casualty's or your life is in danger.
2. In limb fractures effective immobilisation must involve the joint above and the joint below the fracture.
3. When the diagnosis is in doubt, treat as a fracture.
4. If you must move a fractured limb do so gently keeping steady traction on the lower fragment to relieve the pain.
5. When wooden or metal splints are used avoid pressure on bony prominences by using adequate padding.
6. It is important to check repeatedly that the circulation has not been impaired by any bandage which may have been applied too tightly.
7. Many fractures require later treatment under general anaesthesia so do not give the casualty anything to eat or drink.
8. Oxygen must be given to casualties with major fractures.

MANAGEMENT OF AN AIRWAY ALWAYS TAKES PRECEDENCE OVER THE TREATMENT OF A FRACTURE.

INFLATABLE SPLINTS

Inflatable splints, correctly applied, are a quick and effective means of immobilising limb fractures below the knee joint in the leg and below the elbow joint in the arm. (Figure 24.)

Those splints made of clear plastic allow observation of the affected limb.

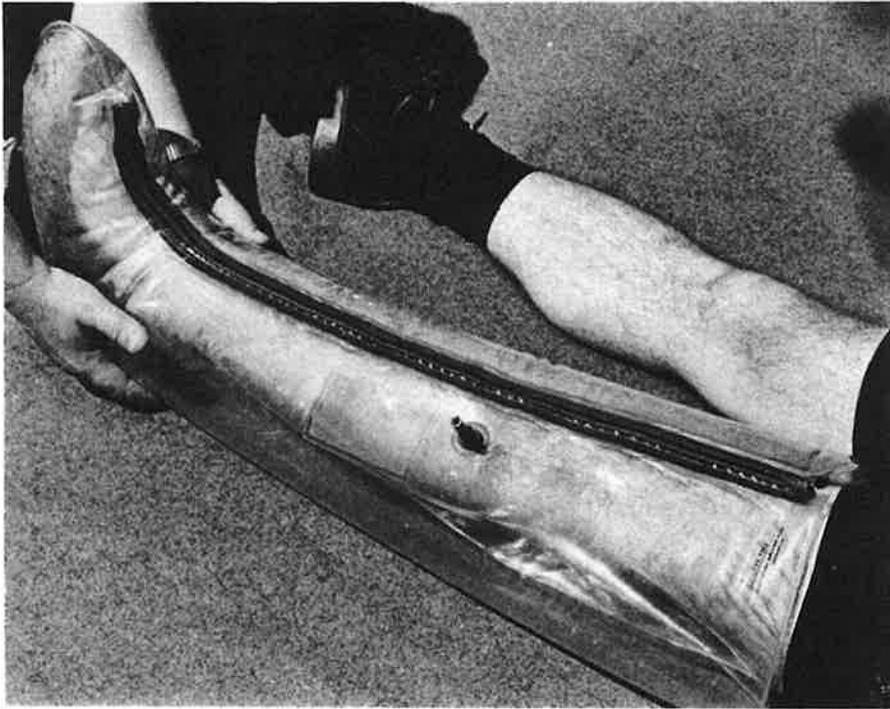


Figure 24 An Inflatable Splint

APPLICATION OF INFLATABLE SPLINTS

1. Select a splint of appropriate size to immobilize the joint above and the joint below the fracture site.
2. Use alternative methods of splinting if a sufficiently large inflatable splint cannot be found.
3. The splint should be applied direct to skin when possible. It may be applied over clothing provided that folds and wrinkles have been smoothed out.
4. A limb deformed by fracture must be straightened with gentle traction and the splint is then applied while traction is maintained.
5. The amount of air pressure required in the splint is largely determined by the casualty, if conscious, who should experience a feeling of comfort and support when the splint is adequately inflated. If pain is not relieved check that the splint is sufficiently inflated.

Laboratory tests show that a pressure of between 20 and 30 mm of mercury is sufficient to provide fracture support without adversely affecting the circulation.

CARE OF INFLATABLE SPLINTS

Care must be taken when storing inflatable splints to ensure that they are rolled and not folded as they may crack at sharp folds.

THE HARE TRACTION SPLINT

This equipment (Figure 25) can provide both splinting and traction. Quick fastening adjustable straps, ankle hitch and a mechanical tension device eliminate the need to fashion improvised splint beds or hitches.



Figure 25 The Hare Traction Splint

It is designed for the treatment of fractures of the shaft of the femur. It may also be used for splinting fractures of the knee, or upper third of the tibia and fibula—provided no traction is applied.

The purpose of applying traction is not to reduce, but to align the fracture and effectively immobilise the bone ends to prevent further damage. Traction splinting will ease pain, reduce shock and help prevent additional nerve, blood vessel and bone damage.

APPLICATION

1. Steady, support and apply traction to the injured limb and maintain until immobilised in the splint.
2. Expose the limb as much as possible by cutting along trouser seam or stocking. Dress wounds as necessary. Loose fitting shoes are best removed.
3. Administer a suitable analgesic, explaining the procedure to the casualty.
4. Place splint parallel to the injured limb, unlock collet sleeves, and adjust to the desired length, approximately 20 to 25 cms (8" to 10") beyond the foot.
5. Slide heel stand along the splint to about 13 cms (5") from the foot and leave in flat position.
6. Position leg support straps (two above knee and two below) and open out all straps (Figure 26).

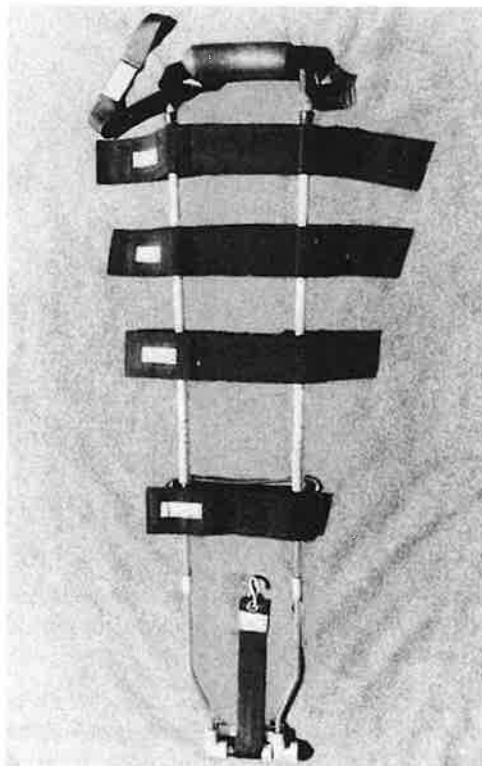


Figure 26 Hare Traction Splint with straps opened out

7. Place tri-ringed ankle strap under the heel, padded side against foot. The bottom edge of the strap must not extend beyond the edge of the heel. Cross the ends over the instep.
8. Grasp all three rings, bottom ring first and apply traction to align leg using slow firm pull (Figure 27).

Steady the foot by placing one hand under the heel, and ensure support especially about the fracture site.

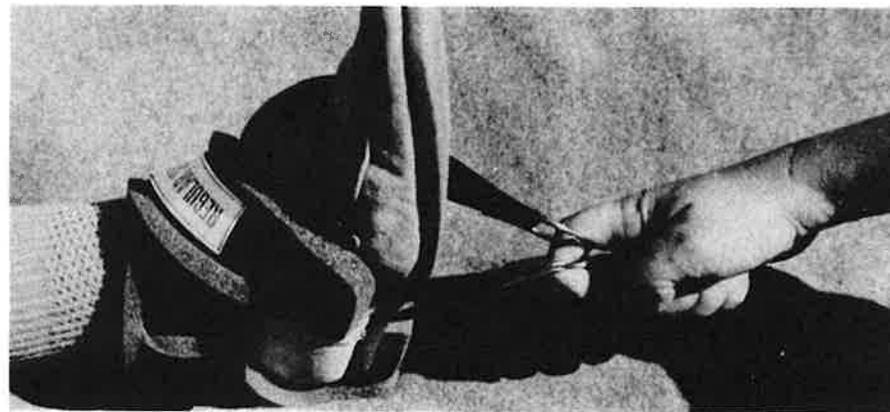


Figure 27 Hare Traction Splint showing traction to ankle

9. Maintaining traction and support. Raise the limb slightly and have an assistant position the splint under the limb. Ensure the ischial pad is placed just below the buttock. Fold heel stand down until it locks into place.
10. Insert S hook into the D rings and turn knurled knob to apply traction until strap is firm.
11. Fasten all velcro straps around limb (Figure 28).

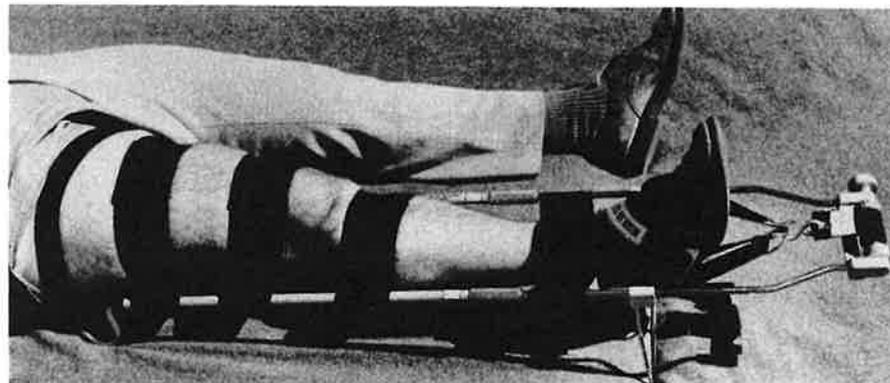


Figure 28 Hare Traction Splint in use

12. If necessary to shorten the applied splint, release collets slightly, and turn knurled knob until approximately 4 cm (1.5") of strap remains. Retighten the collets and adjust final traction by hand.
13. It may be necessary to adjust the location of the heel stand before loading the casualty on the stretcher.
14. Constant observation should be maintained to ensure that circulation is not impeded by straps, dressings or bandages.

FRACTURES OF THE SKULL

Fractures of the skull are classified in the same way as other fractures but with the addition of the category "Depressed fracture". (Figure 29.) Fractures



Figure 29 Depressed Fracture of the Skull

of the skull bones are not in themselves serious but the complications caused by damage to the underlying brain can often have life-threatening results.

CONCUSSION

Concussion is caused by a force being transmitted through the brain tissue and may result in:

1. Temporary loss of consciousness.
2. Some degree of memory loss at the time of injury.
3. Variable memory loss of events before and after the injury.

The patient fully recovers.

CEREBRAL CONTUSION

Cerebral contusion is bruising of the brain tissue caused by a more severe force at the time of injury. There is likely to be a longer period of unconsciousness, with some disturbance of muscle function and possibly respiratory and cardiac dysfunction.

CEREBRAL LACERATION

Cerebral laceration is a further degree of damage due to force. Tearing of the brain tissue with variable degrees of permanent damage results. Laceration is associated with bleeding and further brain damage due to compression.

CEREBRAL COMPRESSION

Cerebral compression may be produced by swelling of the brain tissue by oedema at the site of injury. Alternatively it may be caused more rapidly and with more life-threatening results if a skull fracture ruptures a major artery.

An extradural haematoma may be formed between the skull bones and the dura covering the brain. A subdural haematoma may be formed between the dura and the brain.

The signs and symptoms of skull fracture are the same as those of any other bone fracture. The signs and symptoms of a complicated skull fracture are of more significance.

Headache

Nausea and vomiting

Variable degrees of unconsciousness

Hemiparesis or hemiplegia

Inequality of pupil size

Loss of pupil reaction to light

Loss of bladder or bowel control

Blood or cerebro-spinal fluid issuing from nose or ear give further evidence of possible open fracture of the skull.

Rapid swelling of eyelids and the appearance of sub-conjunctival haemorrhage from behind the eyeball are further evidence of fractured skull.

Disturbance of respiration and a slowing of the pulse rate are important signs of cerebral compression.

MANAGEMENT

1. Early and repeated airway clearance and posture to maintain a clear airway are essential. All unconscious patients must be placed in the coma position, facing the Ambulance Officer, as soon as practicable.
2. Administer oxygen to all unconscious patients and any with a severe skull fracture.
3. Open fractures require covering with sterile dressings, light bandaging and positioning of the casualty to encourage drainage.
4. Transport casualties with skull fractures as stretcher patients.
5. Assess level of consciousness, pulse rate, blood pressure and pupil size and reaction as soon as practicable and record. Repeat assessment as frequently as practicable, at least at 15 minute intervals and record.
6. During handling and transport be constantly alert for vomiting and its threat to the airway.
7. It may be necessary to assist ventilation in patients with severe skull fractures.
8. Obtain a concise history of the accident.
9. Note changes in the condition of the patient during care and transport so that this information can be passed on to the receiving Medical Officer. Make a written report immediately on delivery to medical care if not practicable before.
10. Do not neglect a thorough examination to detect any other injuries which may be present.

FRACTURES OF THE PELVIS

Fractures of the pelvis (Figure 30) are not serious injuries in themselves but may be so by reason of their complications.

They are usually caused by direct injury or by violence transmitted through the femur.

Two groups of fractures are seen :

- (1) Isolated fractures not destroying the integrity of the pelvic ring.
- (2) Fractures with disruption of the pelvic ring.

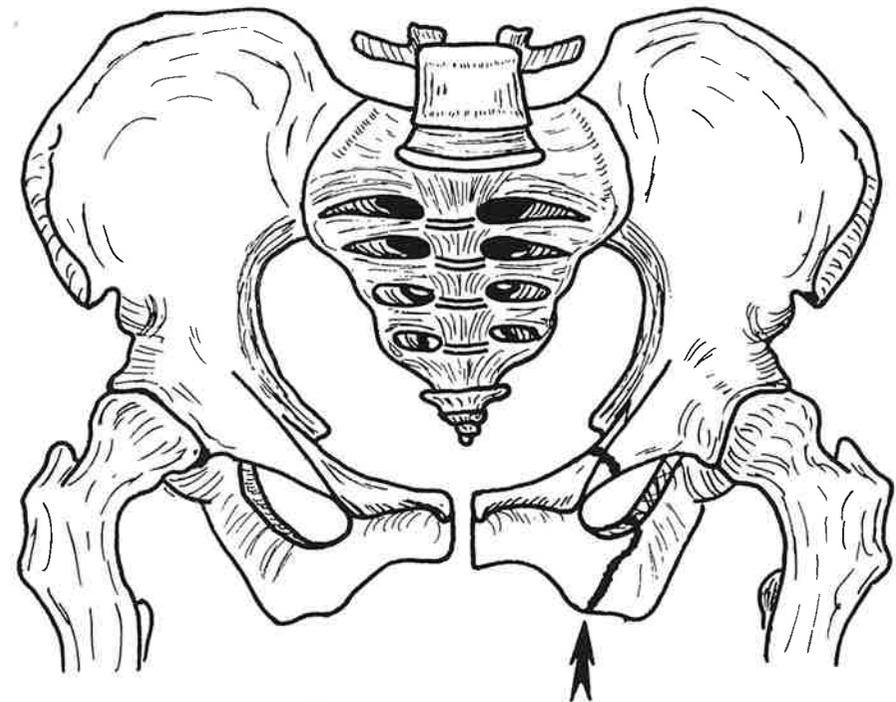


Figure 30 Fractured Pelvis

COMPLICATIONS

- (1) Rupture of bladder. The patient may be anxious to pass urine.
- (2) Rupture of the urethra.

In complications 1 and 2 it is of little value advising patients to avoid passing urine.

- (3) Injury to major blood vessels. Blood loss in these patients may be considerable, shock is to be expected, and early precautions must be taken to reduce or minimise blood loss.
- (4) Injury to the rectum. This is a rare complication.

TREATMENT

The same general principles of fracture management apply. Take care to immobilise the pelvis before moving the casualty to a stretcher.

FRACTURES OF THE SPINE

INTRODUCTION

The spinal cord, which contains nerve fibres in direct connection with the brain, is enclosed and protected by the spinal column which is made up of vertebrae.

If the spine is fractured at any point, the spinal cord may be crushed, cut, or otherwise damaged so that paralysis or death may result.

Any twisting or bending of the spine, whether occurring in the original accident or in subsequent handling, is likely to cause irreparable damage to the spinal cord.

COMMON CAUSES OF A FRACTURED SPINE

1. CERVICAL FRACTURES

- (a) Whiplash injuries.
- (b) Diving into shallow water.
- (c) Falls from a height on to feet.

2. LOWER OR MID-BACK SPINAL FRACTURES

- (a) Falls from heights on to solid objects.
- (b) Direct forces—such as heavy weights across the back.
- (c) Impact, as in vehicle collision.

DIAGNOSIS OF SPINAL INJURIES

The conscious casualty can assist with the diagnosis by indicating:

1. Pain at the site of the fracture.
2. Tingling and numbness in the limbs.
3. Loss of function, for example as shown by inability to move fingers and toes.
4. Loss of sensation.

Remember that a spinal fracture does not always injure the spinal cord, so the casualty is not always paralysed.

If doubt exists, treat as a spinal fracture. Prepare the casualty so that he or she can be transported to hospital without involving further damage to the spine.

THE MEDISHIELD CERVICAL COLLAR

This collar is designed to support and immobilise the cervical region of the spine, without putting pressure on the casualty's trachea.

The collar can be adjusted for length of neck by folding as shown in

Figure 31, to provide four different widths. The velcro fastening enables the collar to be used on various neck sizes.

The major aim in dealing with casualties suspected of cervical spine injuries is to ensure that the condition is not aggravated by movements of the head or neck on extrication from wreckage or during transportation to hospital.

It is possible for a casualty who has sustained a severe head injury to be suffering also from a cervical spine injury. This may not be obvious, particularly if the casualty is unconscious. The cervical collar should always be used whenever there is a possibility of neck injury.

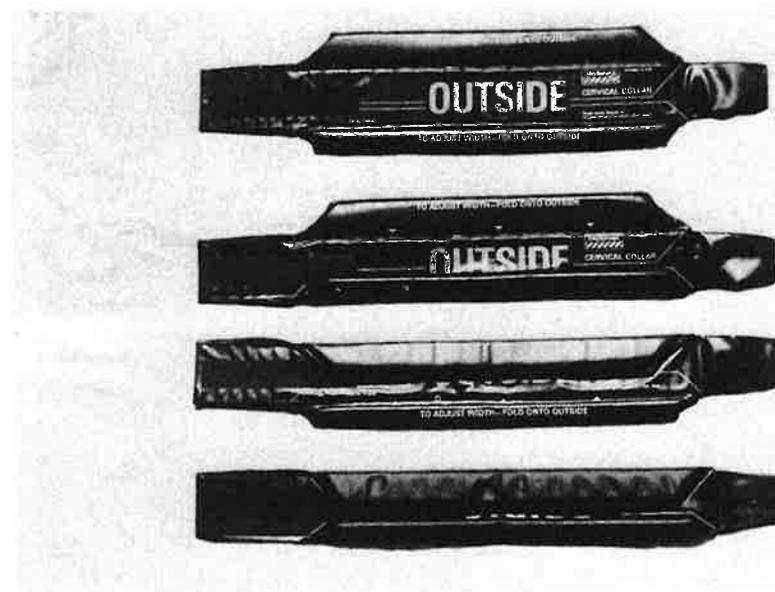


Figure 31 The four widths of the Medishield Cervical Collar

APPLICATION

1. Ensure support of the head and neck. (Figure 32.)
2. Select appropriate width of cervical collar.
3. Mould collar to suite circumference of neck. (Figure 33.)
4. Secure with velcro strapping at back of neck.

Remember that the cervical collar may be left on at hospitals, as it does not interfere with the taking of X-rays.



Figure 32 Support the head and neck

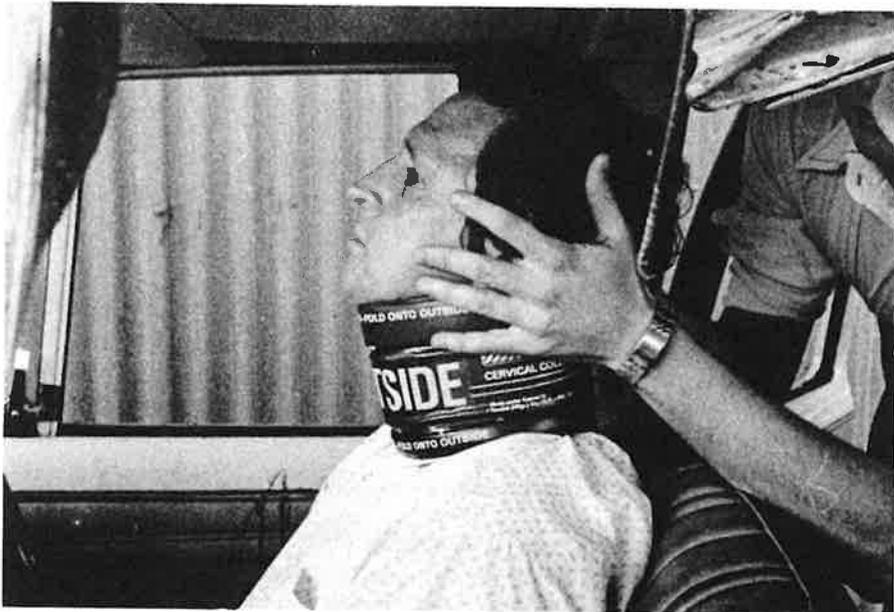


Figure 33 Cervical Collar in use

THE LIFTING OF A CASUALTY WITH SPINAL INJURIES WHEN THE CASUALTY IS LYING DOWN

When the casualty is already lying down and is in a clear space, apply a cervical collar and use one of the following methods of lifting.

The lift described in the St. John First Aid Manual.

The blanket lift.

The lift using a Jordan lifting frame.

THE BLANKET LIFT

This is demonstrated in Figures 34 and 35.

1. An Ambulance Officer positions himself to support the head of the casualty and to apply gentle traction. This Ambulance Officer supervises the lift, using the help of available bystanders.
2. Gentle traction is also applied to the casualty's ankles and his legs are tied together with bandages about the thighs, knees and ankles.



Figure 34 The Blanket Lift

3. A blanket is opened out lengthwise alongside the casualty and one edge is rolled towards the centre of the blanket until two-thirds has been rolled.
4. The rolled section is placed as close as possible to one side of the casualty.
5. Three or four helpers kneel opposite the blanket and, on the leader's instruction, carefully roll the casualty towards themselves.
6. Other bystanders unroll the blanket under the casualty.



Figure 35 The Blanket Lift

7. The casualty is then slowly rolled back. The rolling procedure must be carried out with extreme care to prevent any twisting or bending of the casualty's spine.
8. Up to three bystanders are positioned on each side of the casualty. They are instructed to roll the edges of the blanket in close to the casualty, to grasp the rolled edges firmly and to lift steadily and evenly. Each bystander should have crossed his arms with the one alongside to achieve an even distribution of the weight when lifting.
9. Traction is maintained on the casualty's head during the lift.
10. The stretcher is wheeled in between the lifters' legs at the foot end of the casualty.
11. On command, the casualty is gently lowered to the stretcher.

THE JORDON LIFTING FRAME

This frame can be used to lift an injured person from the ground, using only two lifters and without causing any bending or twisting of the casualty's spine.

The split frame is made of light tubular steel to standard stretcher measurements. Twelve spigots are evenly spaced on the upper edge of each side of the frame to allow for the attachment of the 10 gliders. (Figure 36.) The same frame is kept slightly from the ground by small legs on each side. There is a broad glider for the head end. The gliders can be stored in a vinyl carry bag. (Figure 37.)

The two halves of the frame can be put together around the casualty or the frame can be pre-assembled and then lowered over the casualty. The first spigot should be in line with the casualty's ear. Should the casualty exceed 180 cms (6 feet) in length, his feet (never his head) should extend over the frame.

Starting at the head end, gliders are passed under the casualty and clipped at the single-holed or tapered end to the nearest spigot. The gliders under the casualty's shoulders are crossed to give maximum support. The gliders are then tensioned and the most appropriate of the four holes at the non-tapered end are placed over a spigot.

Having ensured that all gliders are firmly attached, the frame can be lifted and placed on a standard stretcher. The casualty may remain on the Jordan frame during transport to and within the receiving hospital.

THE LIFTING OF A CASUALTY WITH SPINAL INJURIES WHEN THE CASUALTY IS SITTING

Ambulance Officers are often faced with the problem of removing an injured, sitting patient from a crashed car. If spinal injuries are suspected, a short spinal board and a cervical collar should be applied to the casualty before any attempt is made to lift him from his vehicle.

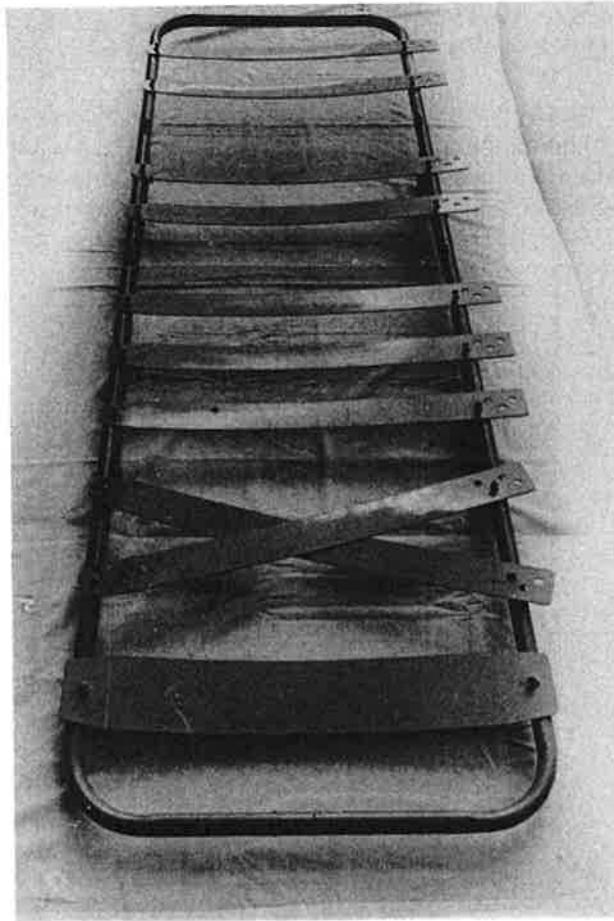


Figure 36 The Jordon Lifting Frame



Figure 37 Carry Bag for Jordon Lifting Frame Gliders

THE SHORT SPINAL BOARD

This board is illustrated in Figures 38 and 39. It is constructed of polished wood and has two belts of different colours attached to the back. These belts can be cleared from the front, or body contact side of the board, during application. The head section has a series of retaining grooves for attachment of the head securing bandage.

When fitted with the board, the casualty should be lifted with the board horizontal. Hand holds are provided on the board to make this lifting easier.

APPLICATION

1. Explain to the casualty what you are about to do.
2. Steady and support the casualty's head and neck, avoiding any forward or backward bending of the neck.
3. Loosen clothing from about the neck.
4. Apply a cervical collar. This should be applied even if the fracture is suspected lower down on the spine.
5. The spinal board is now gently manoeuvred in behind the casualty.
6. The buckle end of the belt is passed over the casualty's shoulder on each side. The lower belt on each side is passed over the hip and around the upper portion of the casualty's thigh as shown in Figure 40.
7. Belt ends of the same colour are then connected together at the front of the casualty and shortened until they fit firmly.
8. The casualty's head is supported against the upper portion of the board by a triangular bandage tied off at the front.
9. Bandages are placed around the casualty's knees and ankles to immobilise his legs.
10. The casualty, secured to the board, can now be moved to a waiting stretcher.

LIFTING

1. If removing a casualty from a car, first apply the spinal board and then gently rotate the still sitting casualty until his feet are pointing towards the door through which he is to be moved.
2. Slowly lower the casualty backwards until he is lying on his back. At the same time bend his legs up to prevent any discomfort from the securing belts.
3. Moving only small distances at a time, lift the casualty slowly towards the exit door.

4. Never attempt to
 - (a) lift when the board is vertical,
 - (b) pull the patient, or
 - (c) slide the board across the car seat
 as these attempts will move the board either up or down the casualty's back.
5. Remember to keep the casualty's legs bent while he is being carried.
6. Once on the stretcher, the buckles can be released and the casualty's legs slowly straightened. (Figure 41.)



Figure 38

Front of Short Spinal Board
(body contact side)

7. If unconscious, the casualty can be placed in the coma position before the buckles are released.
8. Normal blanketing and securing of the stretcher is carried out.
9. The board should remain in position on the casualty until after a Medical Officer has examined him. Always ask the attending Medical Officer for permission to remove the board from the casualty.

Efficient use of the short spinal board requires practice and team work. The great advantage of this method however, is that it virtually eliminates the risk that a casualty's spinal injury may be made worse while he is being extricated from a crashed vehicle.

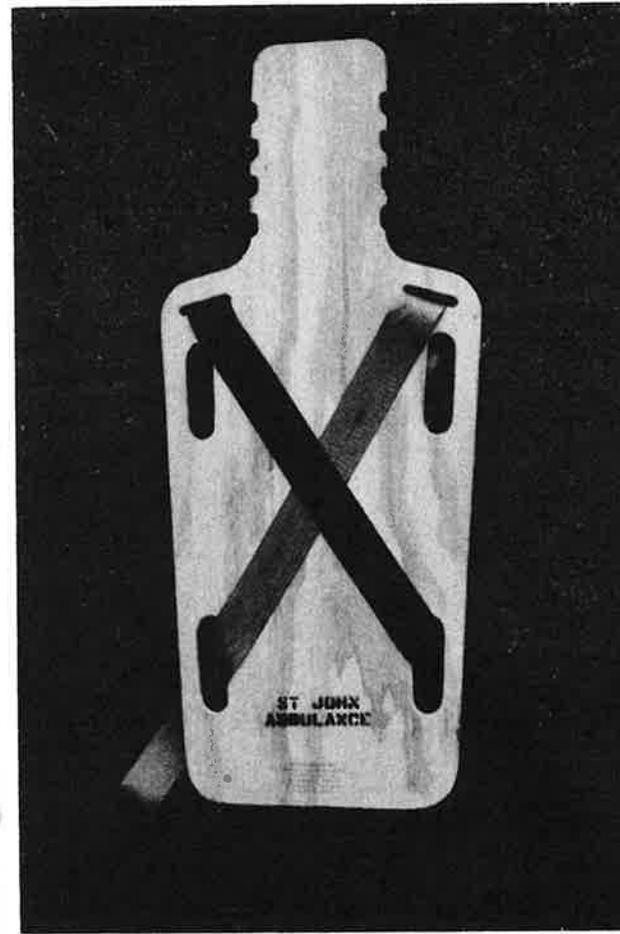


Figure 39

Back of Short Spinal Board



Figure 40 Casualty secured to Short Spinal Board

Figure 41 Placing casualty with Short Spinal Board on stretcher



Chapter 7

Eye Injuries

The eye is a delicate organ and is protected by the bony orbit and the eyelids. It is convenient to classify eye injuries as follows:

EYELIDS

The eyelids close quickly when the eye is threatened and may bear the brunt of the injury. Lacerations, often full thickness, occur as do massive haemorrhages which close the eyelids as a result of bleeding into the loose tissues.

Injuries to the eyelids require careful inspection and the application of an eye pad firmly strapped to the forehead and cheek. (Figure 42.)



Figure 42 Eye pad in place

ANTERIOR PART OF THE EYE

The cornea and the conjunctiva of the eye may be abraded, lacerated or be penetrated by foreign material. Loose foreign particles may be removed from the conjunctiva and from behind the lids. However, no attempt should be made to remove foreign material from the cornea.

In all cases of injury to the cornea and to the conjunctiva, the eye should be covered and firmly strapped. When the cornea or conjunctiva are damaged by liquids of any type the eye must be washed with copious quantities of water and then covered.

INTERNAL STRUCTURES OF THE EYE

Injury to the iris or pupil may result in a haemorrhage into the anterior part of the eye behind the cornea. (Figure 43.) Inspection often reveals a collection of blood in the lower half of the anterior chamber.

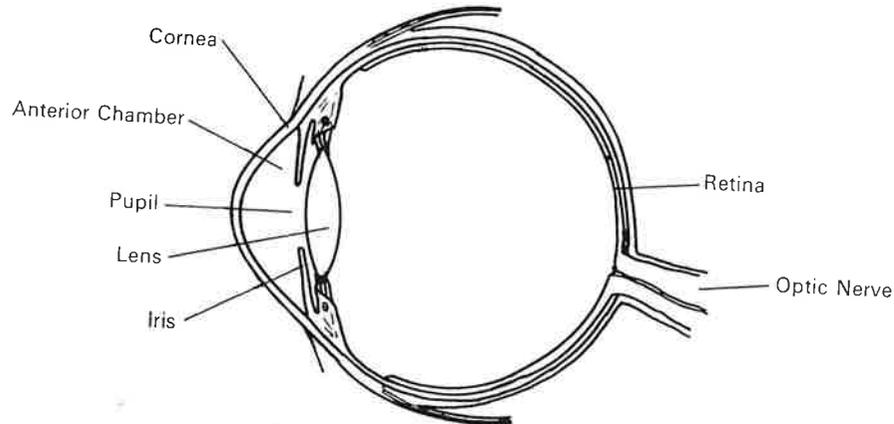


Figure 43 The anatomy of the eye

Careful handling of the patient is necessary to minimise further bleeding. In addition, a pad must be applied to each eye and the patient transported lying flat on the stretcher. (Figure 44.) Injury to other internal structures will



Figure 44 Preparation of casualty with eye injuries for transportation

rarely be apparent to an Ambulance Officer but should be suspected when the casualty complains of difficulty in seeing without signs of injury to the cornea, iris or pupil.

BONY ORBIT

A blow to the front of the eye from a squash ball or racket or any missile travelling at speed may result in a fracture to the bony orbit. The eye which is hit is forced backwards increasing the pressure in the orbital cavity and fracturing it, usually in the floor of the orbit, which is the weakest part. These patients complain of double vision and may be observed to have restricted eye movements. The injured eye should be covered with an eye pad. As a general rule, casualties with eye injuries require an eye pad, gentle handling and transportation to medical care lying flat as stretcher patients. Extreme care is required when bleeding is observed or suspected in the interior of the eye.

Chapter 8

Burns

DEFINITION. A burn is an injury to an epithelial surface and possibly to underlying tissues and is caused by physical or chemical agents.

CAUSES

HEAT

This may be wet (steam) or dry (fire).

CHEMICALS

Acids, alkalis and other substances like phosphorus and iodine can cause burning.

SUNBURN

The ultra-violet component of sunlight burns skin. Burning may occur even in cloudy conditions.

ELECTRICAL

Burns can be caused by electric current and may extend deep into body tissues. Look for burns at both the entry and exit points of the current.

RADIATION

Burns to the skin may be seen after irradiation, for example in people undergoing radiotherapy or in those accidentally exposed to radio-active material.

FRICTION

As for example in rope burns to the hands and injuries caused by rotary metal polishers.

SEVERITY OF BURNS

The main factors to be considered are the surface area burnt, the depth of the burn and the age and general condition of the patient.

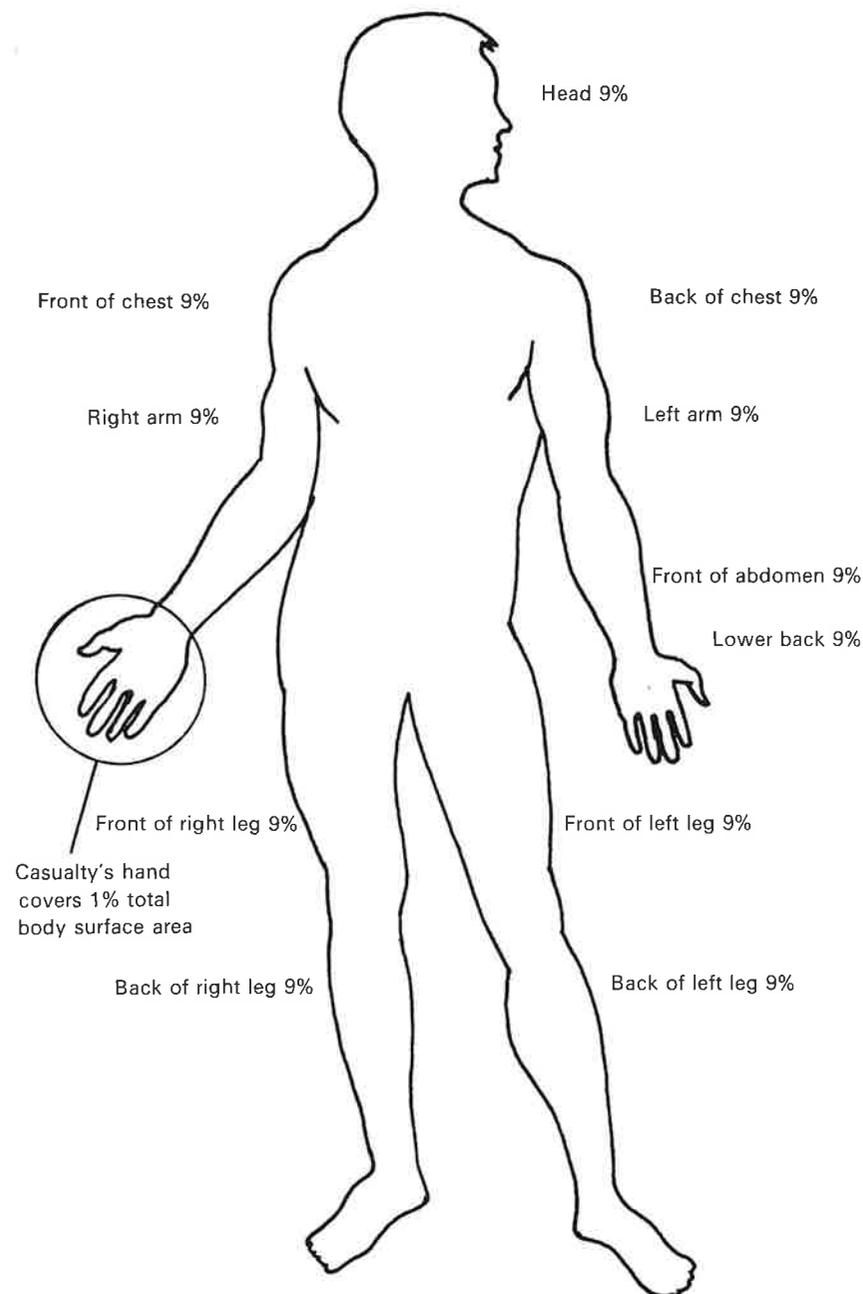


Figure 45 The Rule of Nine for estimating the surface area of burns

AREA OF BURN

This is an important concept in determining the need for urgent treatment. The larger the burn the more fluid will be lost with a consequent greater risk of shock and other complications. An idea of the percentage of the surface area of the body which has been burnt can be gained from the Rule of Nine. (Figure 45.) As an alternative method of gauging the area involved it can be taken that the area of one side of the patient's hand and fingers represents 1% of that patient's surface area, regardless of the age of the patient.

A guide to the severity of a burn in a fit young adult is as follows:

1. A patient with a burn covering 15% or more of the body's surface will need intravenous fluids.
2. Burns covering more than 60% of the body's surface are often fatal.

DEPTH OF BURN

One must consider whether a burn is superficial or deep and in this the history of the burn will sometimes help. Degrees of burn are no longer used. Deep burns in certain body regions, for example the extremities, may result in complete loss of function and deep burns there and elsewhere are as liable to infection as any other deep injury, for example a laceration.

Always regard electrical burns as deep burns.

AGE OF PATIENT

Remember that burns are more serious in old people and in young children. When calculating surface area affected by burns remember that, compared to an adult, a child's head is large in relation to the rest of the body.

TREATMENT

The aims are:

1. Prevent further burning;
2. Relieve pain—Trilene or Entonox can be used;
3. Prevent infection;
4. Transport to hospital.

In preventing further burning it is important to remember that clothing may continue to smoulder and may retain heat (including hot liquids such as tea or oil). Affected clothing must therefore be removed quickly.

SMALL BURNS can be placed in cold water immediately. This helps to relieve the pain and prevent further tissue damage.

LARGE BURNS are best wrapped in sterile or clean dressings and transported quickly to hospital. Oxygen therapy is also required.

Notify the hospital if the burn is serious as prompt treatment is important.

Determine if you can from relatives or from the patient if he has any medical illness which may complicate treatment.

Correct management is particularly important with burns to the face and chest as the respiratory passages may be involved causing laryngeal or pulmonary oedema.

It will then be necessary to administer oxygen to the patient and to carry out other resuscitation procedures as in Chapter 4.

SPECIAL CONSIDERATIONS

ELECTRICAL BURNS

These are always deep and often require surgical excision. Electric currents can cause cardiac arrest in which case cardio-pulmonary resuscitation must be employed.

ACID AND ALKALI BURNS

Copious quantities of water must be used to dilute the acid or alkali and to wash it from the skin.

BURNS TO EYES

These may be caused by acids, alkalis, other chemicals or heat. The treatment is to irrigate the eyes with running water for 15 minutes, cover the eyes and transport the patient to hospital.

TREATMENT OF SMOKE-AFFECTED EYES

In situations such as bushfires numbers of persons may need to have loose particles washed from their eyes with a suitable fluid such as normal saline. Stocks of sterile solution are available in Ambulance Stores for this purpose. (Figure 46.)

Each casualty should be asked to lie down on a stretcher, whilst the Ambulance Officer applies a stream of saline to each of the casualty's eyes. If other stretchers are placed adjacent to the first, a group of ten or more fire-fighters can be treated in a matter of five minutes.

METHOD

1. Remove irrigation set from box.
2. Strip overpouch from saline pack (Solu-Pac), and remove brown rubber stopper from the tube.
3. Strip blue plastic covering from white spear of irrigation set.
4. Push spear firmly into Solu-Pac tube. (Figure 47.)
5. Roll wheel of control clamp forward to prevent free flow of saline.



Figure 46 Eye irrigation set

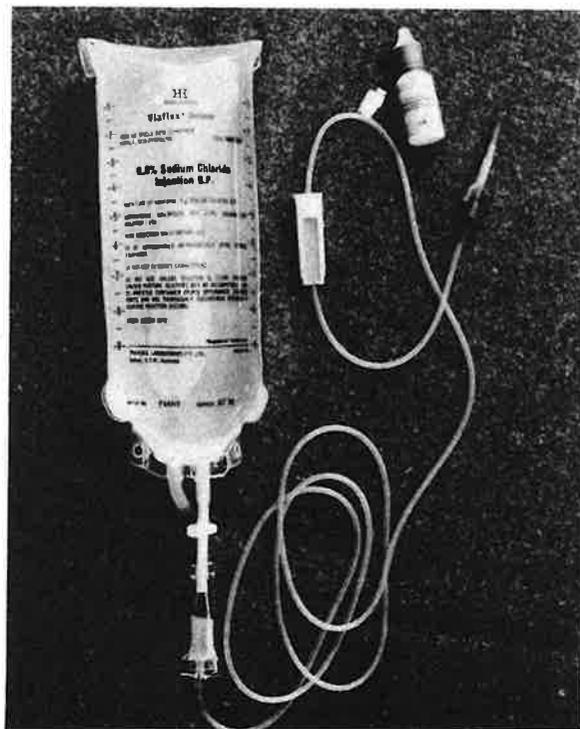


Figure 47

Assembled eye irrigation set

6. Hang pack in a convenient place, with a hook through the hole provided in the flap and strip blue plastic from nozzle and airway on Solu-Pac.
7. When control clamp is opened, saline will flow. Squeeze and release drip chamber until half full of saline.
8. After each eye has been irrigated (Figure 48) instil two drops of $\frac{1}{8}\%$ Neo-Synephrine into each eye. The lower lid can be pulled down and the drops placed in the space between the lower lid and the eye.

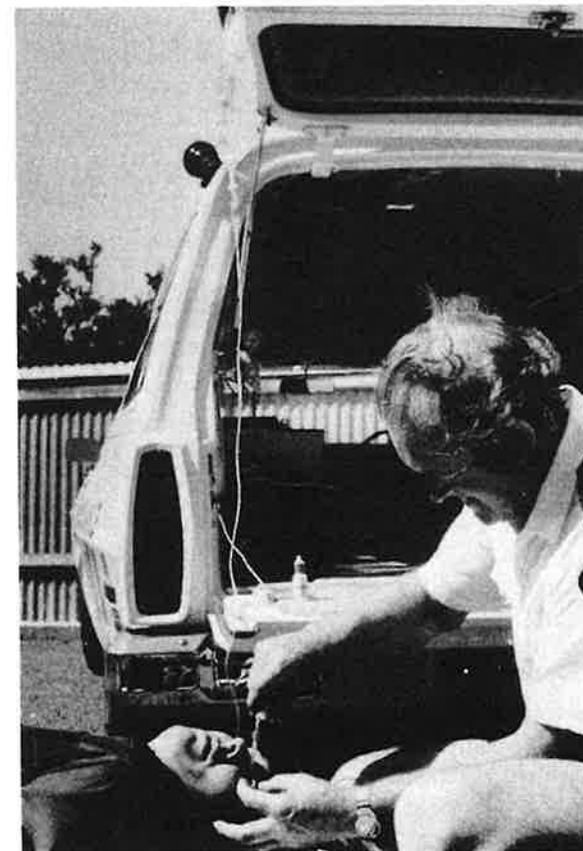


Figure 48 Eye irrigation set in use

9. On return to ambulance base after the fire, discard all opened irrigation packs and replace with new stock.

Chapter 9

Unconsciousness

Ambulance Officers are often called upon to treat unconscious patients. It is important to make a correct diagnosis as this will influence patient management.

The two main requirements in reaching a diagnosis are an account from a witness of the patient's conduct prior to the loss of consciousness and a thorough examination.

CAUSES OF UNCONSCIOUSNESS

The commonest cause is fainting. These patients recover quickly, often before the ambulance arrives.

Common causes confronting the Ambulance Officer are:

1. Head injury. Always remember that a patient becoming unconscious for some other reason may fall and injure his skull.
2. Cerebro-vascular accidents (Haemorrhage, Thrombosis and Embolism).
3. Alcohol and Drugs.
4. Insulin excess.
5. Poisoning.
6. Asphyxia.
7. Epilepsy.
8. Insulin lack.
9. Heat stroke and heat exhaustion.

Unconsciousness is rarely caused by shock even when there is associated severe blood loss. Similarly unconsciousness rarely occurs in heart attacks.

An examination of a patient's pockets or wrist may reveal a clue to the cause of the unconsciousness.

ASSESSMENT OF LEVEL OF CONSCIOUSNESS

The following grading is recommended:

1. Orientated and fully conscious—responds to commands and answers questions sensibly and without hesitation.

2. Confused or drowsy but still conscious—has difficulty in answering questions and slow to respond to commands.
3. Localising responses to painful stimulus—moves purposefully and may either push stimulus away or withdraw from it.
4. Decerebrate responses to pain—legs stiffen and straighten, arms may flex.
5. No response to pain—deeply unconscious.

If the patient is showing an impaired level of consciousness, the pupils should be examined carefully.

EYE SIGNS

Note the size of each pupil and the reaction of each pupil to light. Normally, a pupil constricts (becomes smaller) when a light is shone into the eye. The other pupil constricts at the same time.

Chart the pupil size and reaction whenever the pupils are examined. The following examples are a guide:

- (a) R = L, react briskly.
This means the right pupil equals the left in size and they both react briskly when a light is shone into either eye.
- (b) R > L, react.
The right pupil is larger than the left in size and they both react when a light is shone into either eye.
- (c) R dilated and fixed.
L smaller, reacts.
The right pupil is larger and it does not react to a light source. The left pupil is smaller and reacts by constricting when a light is shone into the left eye.

Sometimes pupillary changes may occur following trauma to an eye. Do not be confused by failure to elicit a response from an artificial eye. Alterations in the level of consciousness and in the size and reaction of pupils are important and they must be recorded and then reported on arrival at the hospital.

MANAGEMENT

The major problems for the patient are:

1. Inability to appreciate danger and to take action to prevent further injury.
2. Interference with the airway.
3. Inadequate supply of oxygen to the brain and other vital organs.

4. Inadequate respiration.

Once the patient has been removed from further danger, quickly check the airway, the carotid pulse and the breathing.

The airway is cleared of obstruction and secretions are sucked out.

If injury to the cervical spine is suspected, apply a cervical collar and modify accordingly the treatment outlined below.

The head is fully extended and the jaw is pulled forward.

If the carotid pulse is absent, commence external cardiac compression.

If breathing has stopped, commence mouth to mouth or mouth to nose artificial respiration.

Once a check has been made for other injuries and any severe bleeding controlled, ensure the eyelids are closed and place the patient in the *COMA POSITION*. (Figure 49.)

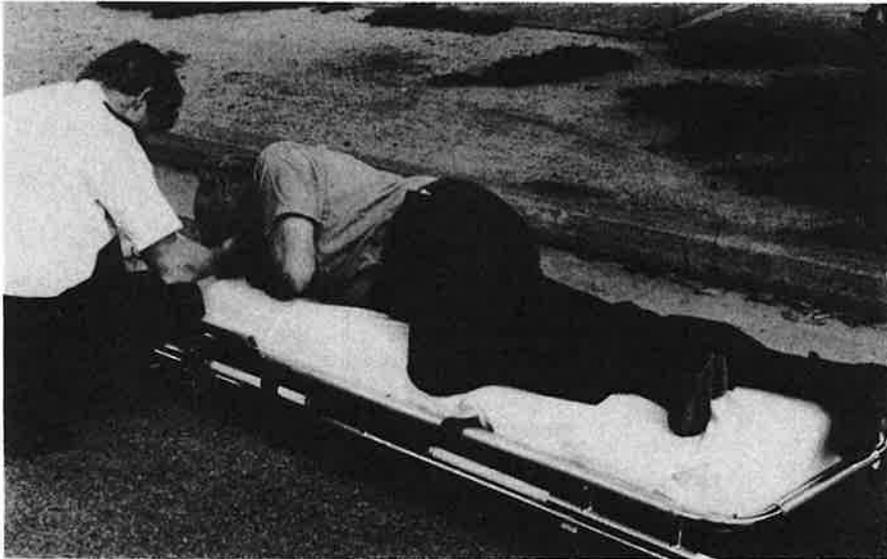


Figure 49 The Coma Position

All unconscious patients must be transported in the coma position unless specifically directed otherwise by a Medical Officer.

Next assess the level of consciousness and record that level and the time of the observation. Variations in the level of consciousness and their timing are of vital importance and must also be recorded. A similar record of eye signs and their changes must be kept.

Oxygen must be administered to the unconscious patient preferably by nasal cannula.

Never give anything by mouth to an unconscious patient.

The patient must not be left unattended in case the airway becomes obstructed or circulation or respiration fail. On arrival at the hospital communicate to the doctor all the facts known to you about the patient. Show the doctor your notes concerning alterations in the level of consciousness and changes in eye signs.

REMEMBER

The unconscious patient needs:

Protection.

An adequate airway.

Oxygenation.

Safe orderly transportation.

Chapter 10

Cardio-vascular and Cerebro-vascular Problems

The cardio-vascular system exists primarily to transport oxygen from the lungs to the body's cells. The pump effect is provided by the heart muscle (myocardium) and the one-way valves of the heart chambers. The heart muscle, being one of the hardest working tissues of the human body, depends on a good supply of blood to be able to work efficiently.

The myocardium has two means of gaining oxygen. It does so to a very small extent by direct diffusion of oxygen from within its chambers. The most important source however, is via the coronary circulation. The coronary circulation consists of right and left coronary arteries arising from the first part of the aorta as it emerges from the heart. The coronary arteries encircle the heart dividing into branches which supply particular areas of the heart muscle. These areas are drained by an almost parallel venous system. (Figure 50.)

The myocardium can fail in either of two ways—acute ventricular failure or congestive cardiac failure. Both can produce an emergency situation. Further, the coronary circulation can be markedly reduced to produce ischaemia, or it can be totally blocked and then part of the heart muscle dies.

MYOCARDIAL ISCHAEMIA

In this condition the coronary arteries are slowly narrowed by an ageing process, usually called arteriosclerosis, until eventually they cannot deliver sufficient blood to the myocardium under certain effort situations. The patient is likely to be affected over a number of years with recurrent chest pain, especially on exertion or excitement. As the coronary arteries become increasingly narrowed, the pains become more frequent and the effort needed to precipitate an attack of pain becomes less.

The pain is referred to as "Angina Pectoris" or sometimes just "Angina".

The pain usually passes off quickly with rest and the use of a variety of nitroglycerin-type compounds in tablet form. The common tablets, "Anginine" and "Trinitrin" are placed under the tongue where they slowly dissolve.

Anginal pain is commonly described as being like a tight belt around the lower chest. It may spread up the neck into the jaw, into the left shoulder and down the left arm and even into the right arm. It causes some shortness of breath (dyspnoea) and induces fear and apprehension in the patient.

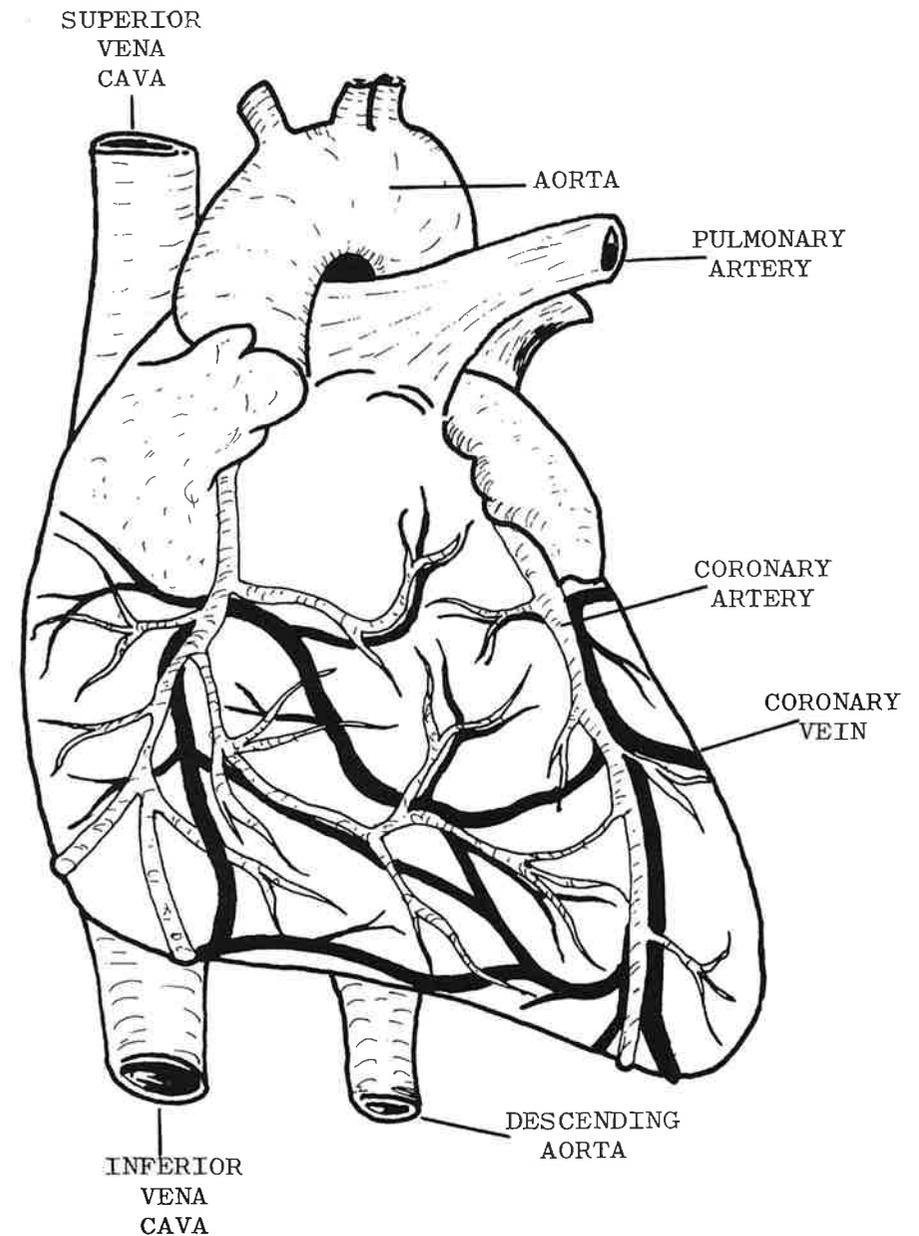


Figure 50 The Heart

Usually the patient stops short in whatever he is doing and must either lean against an object for support or must sit down. The patient may feel light-headed or giddy. With rest, the pain will pass off rapidly and the patient may be able to continue his previous activities.

MYOCARDIAL INFARCTION

This condition can lead to death in minutes. It is caused by a block in the coronary artery leading to death of the myocardium beyond the blocked portion. A common cause of coronary artery occlusion is a blood clot.

The area of the myocardium which dies depends on the site of the occlusion within the coronary circulation and as a result the clinical outcome is variable. Infarction is marked by chest pain, often not unlike angina, but more commonly the pain is felt centrally behind the sternum. It is described as vice-like and may spread up the neck into the lower jaw, into the left shoulder and down the left arm and into the right arm. Unlike angina, it persists even after rest and its onset need not follow exertion.

The patient commonly feels nauseated, giddy and must usually lie down in a semi-recumbent position. He becomes pale, sweaty, cold and may vomit. His pulse is weak and rapid. The patient may then appear to improve for a time but his chest pain may persist. He may become unconscious and show all the signs of shock. The pulse may become weaker and noticeably irregular. Shortness of breath (dyspnoea) is a common associated symptom.

Cardiac arrest is a common sequel to myocardial infarction and is often heralded by the pulse rate becoming very irregular prior to it stopping.

SIGNS AND SYMPTOMS OF ACUTE MYOCARDIAL INFARCTION

1. Shock without haemorrhage—due to heart failure.
2. Fear of impending death.
3. Central crushing chest pain possibly with radiation to upper abdomen, lower jaw and arms.
4. Dyspnoea, but rarely severe enough to stop the patient from lying flat.
5. Weak, rapid, often irregular pulse.

MANAGEMENT

1. Do not move the patient more than absolutely necessary. Make the patient comfortable. Any movements must be performed slowly and smoothly.
2. Regularly check the pulse and breathing and watch skin colour. Be alert for a cardiac arrest.
3. If cardiac arrest occurs, or respiration fails, take immediate action—resuscitate.

4. Administer oxygen by nasal cannula or face mask, whichever the patient more readily tolerates.
5. If signs of shock are increasing, lie the patient flat and elevate the foot of the stretcher.
6. Transport to hospital quickly but smoothly. Avoid rapid changes in speed and direction. Use siren only when cardiac arrest or cardiogenic shock is present.
7. Ascertain if the patient has been seen by a doctor and whether or not any medication has been administered. An injection of Morphine is commonly given, but other substances such as Pethidine, Pentazocine (Fortral), or Lignocaine (Xylocaine or Xylocard) may have been given by injection. This information must be passed on to the doctor at the hospital. In severe cases notify the hospital of your estimated time of arrival.

CONGESTIVE CARDIAC FAILURE (C.C.F.)

This second type of myocardial failure can occur due to long-standing disease causing the heart to become strained. There may be myocardial or valvular disease. Failure is usually a complication of a sudden illness causing further strain on an already weakened heart.

The predominant feature in this type of failure is dyspnoea so severe that the patient is compelled to sit up and gasp for breath. Other activity is superseded by this fight to breathe. This situation is explained by the fact that, as the heart fails, blood banks up in the pulmonary circulation and venous system. Fluid escapes into the alveoli and, in effect, they become waterlogged. Oxygen exchange is then reduced. Venous congestion can also cause swelling of the liver, gut and brain.

CONDITIONS PRECIPITATING CONGESTIVE CARDIAC FAILURE

Myocardial infarction.
Pulmonary embolus.
Anaemia.
Infections—especially respiratory.
Drugs.
Cardiac arrhythmias.

SIGNS AND SYMPTOMS OF CONGESTIVE CARDIAC FAILURE

Dyspnoea and wheezing respiration.
Profuse sweating.
Cyanosis.
Cough, often producing blood-stained sputum.
Agitation.

Confusion.
 Irregular respiration.
 Nausea and vomiting.
 Abdominal pain and distention.
 Weak, rapid pulse which may be irregular.
 Sudden collapse.

MANAGEMENT

1. Always transport as a stretcher patient. Carry the patient to the ambulance even though he must sit up. Make the patient comfortable in a sitting position and move him as little as possible.
2. Administer oxygen by face mask or nasal cannula.
3. Reassure the patient by being confident and efficient in making him comfortable on the stretcher.
4. Transport urgently but smoothly to hospital.
5. Constantly check the pulse and respiration and be alert for cardio-pulmonary failure.
6. If the patient has obvious fluid in his airway, gently remove it with the suction apparatus.
7. Note if he has been seen by a doctor and ask what, if any, medication has been given. Morphine by injection is a drug commonly given and a fluid-removing drug, Frusemide (Lasix), may also have been administered. This information, along with your observation of pulse and general condition of the patient, must be passed on to the doctor at the hospital.

In any case of cardiac emergency where the patient becomes unconscious, place him in the coma position, insert an oro-pharyngeal airway, remove secretions by regular suction of the upper airway and carefully watch for cardiac arrest.

CARDIAC ARRHYTHMIAS

A cardiac arrhythmia is any disorder of the normal heart rhythm. In its least disturbing form no more than an occasional pause in the regular pulse may be noted. In its most severe form there is ventricular fibrillation leading to circulatory arrest.

The arrhythmia may cause symptoms that the patient describes as palpitations in the chest, that is, an awareness of the rapid beating of the heart. This can be quite disturbing at the time. There may also be congestive cardiac failure, precipitated by the rapidly beating heart becoming poorly oxygenated. The coronary circulation is less efficient at very fast heart rates.

Common significant arrhythmias are those where there is a rapid, erratic

(irregularly irregular) pulse or a pulse with coupled beats, that is one in which there are two beats close together and separated from the next two beats by a longer than normal pause.

CEREBRO-VASCULAR ACCIDENT (C.V.A.)

The brain is the prime organ which controls all human functions. The brain's cells are totally dependent on a continuous supply of blood and oxygen. If there is any interference to the brain blood supply for even short periods, the brain cells malfunction and may even die. A cerebro-vascular accident or stroke is the result of an inadequate blood supply to some part of the brain resulting in brain cell damage or death.

CAUSES OF CEREBRO-VASCULAR ACCIDENTS

1. Cerebral Thrombosis. Thrombosis in a cerebral artery occurs as a result of arteriosclerosis, an ageing process. Thrombosis accounts for most cerebro-vascular accidents in elderly patients.
2. Cerebral Haemorrhage. Hypertension frequently causes rupture of a cerebral artery producing haemorrhage into the brain and resulting in a CVA. Haemorrhage from a spontaneous rupture of an abnormal artery may produce a CVA in younger age groups with normal blood pressure.
3. Cerebral Embolus. A detached clot, air bubble or fat globule may lodge in a cerebral artery and cause a cerebro-vascular accident. This form of CVA is more commonly seen in patients with heart disease, but can occur in younger patients with multiple injuries, chest injuries, neck wounds or long bone fractures. In the injured, the CVA usually does not occur until some time after the injury.

SIGNS AND SYMPTOMS

The signs and symptoms of a stroke are variable and depend on the cause and the area of brain affected. The CVA may produce immediate disturbance. The casualty drops to the ground, unconscious, paralysed, and often with respiratory distress. The progression may be slow and subtle however, with the casualty himself noticing weakness, or relatives may notice clumsiness and slurred speech of which the patient is unaware. A cerebro-vascular accident may have any of the following effects:

Numbness or paralysis of the extremities;
 Confusion, dizziness and headache;
 Difficulty in speaking and swallowing;
 Disturbances of consciousness;
 Convulsions;
 Loss of bladder and bowel control.

Numbness and paralysis usually occur together. Commonly only one side of the body is involved. The facial muscles, the tongue and the pharyngeal muscles may be paralysed, leading to swallowing and speaking difficulties. Loss of swallowing may lead to aspiration of saliva causing respiratory problems. The CVA may immediately produce disturbances of respiration due to the respiratory control centre being damaged. Cheyne-Stokes respiration is an example of this.

PATIENT CARE

It must be emphasised that the diagnosis of CVA does not imply hopelessness. Even those casualties with very severe effects can recover and be rehabilitated.

In all cases optimal airway care and good ventilation are necessary. Coma position, airway suction and the use of an oro-pharyngeal airway are mandatory in the unconscious casualty. When lifting and transporting the casualty always protect his paralysed limbs.

All casualties who are significantly affected will benefit from oxygen therapy. Some CVA patients mouth-breathe, and in these it is better to use a face mask than a nasal cannula to deliver the oxygen.

Even though the patient may be unable to speak and may appear to be unconscious, he may be able to hear and understand what is going on around him. In this time of crisis both he and his family need calm reassurance.

SUMMARY OF MANAGEMENT

Maximum airway care.

Coma position for the unconscious.

Oxygen therapy.

Protection of paralysed limbs.

Psychological support for patient and relatives.

Safe, steady transportation to medical aid.

Chapter 11

Oxygen Therapy

Oxygen is a colourless, odourless gas that is found free in the atmosphere. The atmosphere contains 20.95% oxygen at sea level. Oxygen supports combustion and increases the rate at which objects burn. Oxygen is needed to maintain human life. Without sufficient oxygen, cells of the body are damaged and may die. The central nervous system is particularly dependent on an adequate oxygen supply. The heart, kidneys and the liver are other important organs which are frequently damaged by hypoxia.

The term "hypoxia" is used to describe a deficiency of oxygen at the tissue level. "Hypoxaemia" means a deficiency of oxygen in arterial blood.

SIGNS OF HYPOXIA

The clinical sign of cyanosis is a good indication of oxygen lack but it must be remembered that all patients needing oxygen therapy may not be cyanosed. Failure to see cyanosis does not rule out hypoxia. Other effects of hypoxia include dyspnoea and tachypnoea, disturbances in brain function such as drowsiness and headache, and disturbances in cardiac rhythm and blood pressure.

EXAMPLES OF CONDITIONS REQUIRING OXYGEN THERAPY

1. Decreased Lung Function.
 - Pulmonary oedema.
 - Pneumonia.
2. Decreased Cardiac Output.
 - Myocardial infarction.
 - Haemorrhage.
3. Decrease in oxygen carrying capacity of the blood.
 - Anaemia.
 - Carbon monoxide poisoning.
4. Miscellaneous.
 - The patient with multiple injuries.
 - Patients recovering from :
 - electrocution
 - near-drowning
 - cardio-pulmonary arrest.

ADMINISTRATION OF OXYGEN

Before oxygen therapy is initiated, the procedure should be explained to the patient and then the apparatus set up and applied. Some patients may tolerate a full mask, whilst others may feel as if they are choking. Use the type of equipment which best suits the patient.

Oxygen may be administered to the patient by mask, nasal cannula, or by improvised methods. The use of nasal catheters, venturi masks, rebreathing masks, and more elaborate equipment is not recommended in the emergency situation.

1. Simple Face Masks (often referred to as "universal"). These are cup-like devices, which fit over the patient's nose, cheeks and chin. (Figure 51.) There is a simple elastic strap to retain the mask in position. Exhaled air is vented through holes on each side, and oxygen is



Figure 51 Giving Oxygen by Universal Face Mask

delivered to the mask and mixed with air drawn in through the holes. The percentage of oxygen inhaled by the patient depends on the respiratory rate and the oxygen flow rate. In general the flow rate should be set at 8 litres per minute to give an oxygen concentration of approximately 40%.

2. Nasal Cannula (prongs). This is the simplest, most comfortable and most useful means of oxygen delivery in the emergency situation. Even after being fitted with a nasal cannula, a patient can talk, drink, cough and have airway care without interrupting oxygen flow. (Figure 52.)



Figure 52 Giving Oxygen by Nasal Canula

The cannula is simply plastic tubing with two soft plastic tips that insert into the nostrils for about 1.5 cm. A simple elastic adjustable strap retains the cannula in place. The only disadvantage is that the tubing may become twisted and decrease oxygen flow to the patient, but regular inspection should reduce this problem. An oxygen flow rate of 6 litres per minute, if tolerated, will provide an oxygen concentration of about 40% by this method. If the patient finds this rate of flow too uncomfortable, a 4 litres per minute flow rate will provide approximately 30% oxygen concentration.

3. Improvisations. In the event of neither of the above methods being tolerated by the patient, oxygen can be added to the inspired air by holding the end of the hose in the cupped hand near the patient's nose

and mouth. Inspired oxygen concentrations will be variable and maximum flow rates of oxygen will be necessary. This will of course rapidly deplete the oxygen supply.

If the patient is not breathing or is breathing ineffectively, he needs artificial ventilation, preferably by bag and mask. Oxygen can be coupled to a bag and mask unit and the flow rate should then be set at 8 litres per minute. (See Section on Cardio-Pulmonary Resuscitation—Chapter 4.)

POSSIBLE CONTRA-INDICATIONS TO OXYGEN THERAPY

In general, when dealing with casualties with acute injuries, there is no medical contra-indication to giving oxygen. It is known however that oxygen can cause problems in certain patients with long-standing medical conditions, for example chronic bronchitis, if the oxygen is given for a prolonged length of time.

When a patient is to be in an Ambulance Officer's care for several hours as in a journey from country to city, the doctor in charge of initial treatment should be asked for advice regarding oxygen therapy.

OXYGEN CYLINDERS

Oxygen for therapy is supplied in metal cylinders under pressure approximating 13,800 KPa. The common unit in service is the emergency portable cylinder, size C (408 litres). Figures 53 and 54 show the length of time that oxygen can be supplied at 2, 6 and 8 litres per minute flow rates from size C and size D cylinders. Em-care ambulances contain two size D cylinders.

Oxygen flow from these cylinders is governed by regulators of the yoke type. Pin fittings on the yoke are placed in such a way that they will only

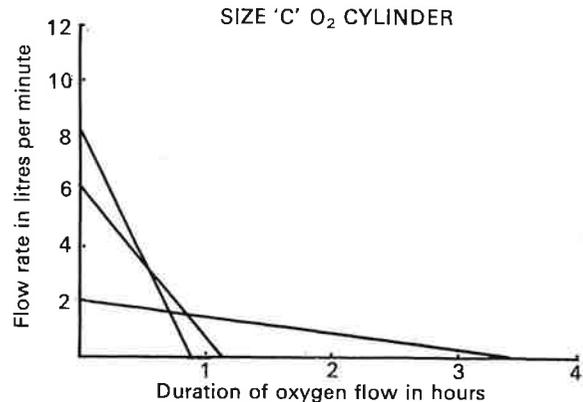


Figure 53 Duration of Oxygen flow at 2, 6 and 8 litres per minute from a size C Oxygen cylinder

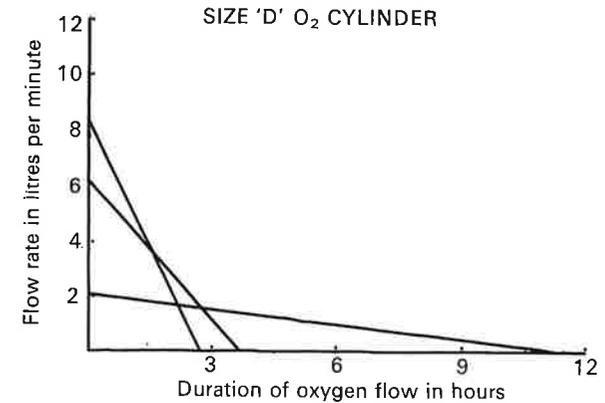


Figure 54 Duration of Oxygen flow at 2, 6 and 8 litres per minute from a size D Oxygen cylinder

match with holes on the valve stem of oxygen cylinders. This is standardised by the Pin-Index Safety System. Additional safety features are permanent labelling on the shoulders of cylinders and colour coding. Oxygen cylinders are black with white shoulders. As with the administration of any drug, the Ambulance Officer must read the label and recognise the coding for added safety.

SAFETY PRECAUTIONS

Oil, grease or other combustible material must never come in contact with cylinders, regulators, valves, gauges, hoses or fittings.

No part of a compressed gas cylinder should be subjected to temperatures above 52 degrees C. (125 degrees F.)

Valves should be closed when the cylinders are not in use, even those on empty cylinders.

Cylinders should always be safely secured to prevent them from toppling over.

Cylinders should be transported in a proper carrier with the retaining device securely fastened. Dragging, sliding and bumping cylinders should be avoided.

The plastic seal on the cylinder outlet should be removed and the regulator applied. Cylinder valves should be opened slowly to prevent sudden escape of high pressure oxygen into the regulator.

Smoking, naked flames or sparks are always prohibited in an area where oxygen is in use or on standby. Always remember the possibility of sparks and naked flames in rescue situations where oxygen may be required.

Never administer oxygen without the use of a safely functioning and properly fitted regulating device. Regulators reduce the high pressure of gas in the cylinder to a safe working pressure (approximately 345 KPa) and control the flow rate from 1 to 15 litres per minute.

Chapter 12

Analgesia

In the Ambulance Service there is a sequence of practical management to relieve pain. Standard techniques of wound care, dressing, bandaging, support, splinting and correct lifting all help to relieve pain. Appropriate psychological support for the casualty also helps. Once physical and psychological causes of pain have been reduced, analgesia (pain relief) can be achieved by the use of inhalational agents.

The common inhalational analgesic agents in use are:

- Trichloroethylene—Trilene.
- Nitrous Oxide/Oxygen—Entonox.

INDICATIONS FOR PAIN RELIEF

Casualties most likely to need pain relief are those with:

1. Crush and soft tissue injuries.
2. Fractures.
3. Burns.
4. Myocardial ischaemia.
5. Chest injuries.
6. Obstetric problems.
7. Animal bites or insect stings.

There is no need to provide pain relief for those casualties who, regardless of injury, do not complain of or show signs of distress from pain. An unconscious patient does not require analgesia.

1. TRICHLOROETHYLENE—TRILENE

This liquid is vapourised in a Hayward Butt Inhaler (Figure 55) and self-administered by the patient. The inhaled vapour is an air/Trilene mixture and the apparatus does not permit supplementary oxygen to be administered. Trilene is a good analgesic, but it has an unpleasant smell and may produce nausea and headache. It takes a little time to reach blood levels which will relieve pain.

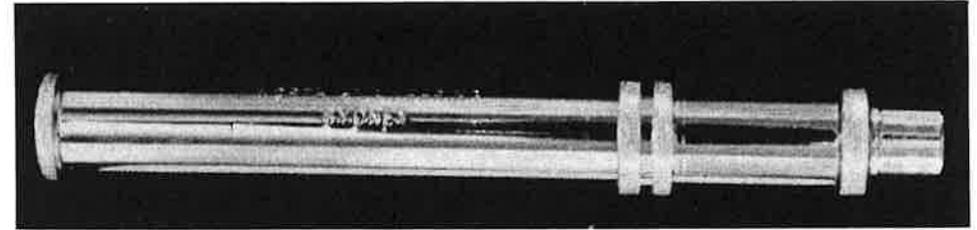


Figure 55 The Hayward Butt Inhaler

As Trilene can sensitise the myocardium to adrenalin it may cause arrhythmias. Trilene must not therefore be used to relieve the pain of myocardial ischaemia. If pain relief is necessary the Ambulance Officer may give the patient Entonox, or a doctor may give another drug by injection (page 83).

When a casualty is given Trilene there is a chance that complications may ensue later if, after reaching hospital, he is anaesthetised using a closed circuit anaesthetic machine. Trilene produces a toxic gas if passed through the soda lime absorber in a closed circuit. Always make sure that the hospital staff know that Trilene has been given to the casualty.

Used in accordance with instructions, Trilene will be safe and effective. As a general rule it should not be given to a casualty who will receive medical care within five minutes.

PREPARATION OF APPARATUS

The inhaler is prepared by loading it with a 4 ml ampoule of Trilene. In this state it can be kept ready indefinitely. Always check that the loaded inhaler is sealed in its rack within the ambulance whenever taking charge of a duty vehicle.

ADMINISTRATION OF TRILENE

1. It is important not to delay unduly the transportation of the casualty to medical aid by persisting with pain relief. Pain relief should also wait until you have adequately assessed the casualty's injuries and general condition.
2. Explain the actions you are about to take with the inhaler and that it will relieve pain. Your confidence will help the patient.
3. Obtain the casualty's verbal consent in the presence of a third party before allowing him to use the inhaler. If the casualty is a minor, obtain parental consent where practicable.
4. After unscrewing the top cap, drive the nozzle downwards until the glass ampoule breaks.

5. Invert the inhaler for approximately ten seconds to allow all the liquid Trilene to be absorbed in the pad. Shake the inhaler to check for any liquid remaining free inside. If free liquid is present, invert again to allow the liquid to run out. Wipe away any liquid on the nozzle.
6. Give the inhaler to the casualty and let him hold it tentatively to his nose for a few short breaths, allowing him to adjust to the smell. Take this phase slowly or he may gag and then refuse to try again.
7. Instruct him to gradually place the nozzle in one nostril and take a few short breaths. When he has become accustomed to the smell, explain how he should then pinch the other nostril with the index finger of the hand holding the inhaler.
8. Continue to encourage the patient, and instruct him to close his mouth and breath slowly and gradually more deeply through the inhaler. Make sure there is a good seal in the nostril with the inhaler and that the other nostril is closed off.
9. Once his pain is relieved, instruct the casualty that he may need only one breath in five from the inhaler to maintain relief from pain.
10. Pain is usually eased within one minute, but it takes about three minutes before maximum effect is gained.
11. At no time should the casualty be allowed to become unconscious. Keep constant watch to avoid this. Failure to respond to simple commands is a sign that the casualty is getting too much Trilene and administration must be stopped by removing the inhaler. Self-administration by the casualty should prevent this situation.
12. During transportation to hospital continue to reassure the casualty and observe his conscious state closely.

AT THE HOSPITAL

Stay with the patient and continue the use of the inhaler until a doctor takes over management. Only remove the inhaler from the casualty on the doctor's request. The casualty will lose the effect of pain relief from Trilene within two minutes of stopping its use, allowing the doctor to make his own assessment.

Make sure the Ambulance Officer's Report is completed, showing Trilene was used. Make sure also that the Trilene Administration Card (Figure 56) is correctly completed and affixed to the casualty as a warning relating to future anaesthesia.

RE-EQUIPPING

Should another emergency situation arise immediately there will normally be sufficient Trilene in the inhaler to achieve satisfactory results with a second patient. Make sure the nozzle is wiped clean before re-using the inhaler.

PRINT CLEARLY ALL INFORMATION ATTACH THIS TO PATIENT	RETAIN THIS BUTT
Patient's Name	I certify that
TRILENE was administered to this patient as an ANALGESIC (not in anaesthetic concentration by Hayward Butt Inhaler)	gave permission to be given Trilene by Hayward Butt Trilene Inhaler on
From a.m. to a.m. p.m. to p.m.	Signed.....
on	Division or Service
.....	Witness
.....	Diagnosis.....
.....	Hospital.....
.....	The patient's pain was/was not re- lieved adequately.
.....	This Butt must be handed in when claiming next ampoule.
*44788 Ambulance Crew Member St. John Ambulance Brigade	

Figure 56 The Trilene Administration Card

After completion of use, take the apparatus apart and dry out the cloth pad. (Figure 57.) Insert a new ampoule and place the instrument back in its rack, under seal, in the ambulance.

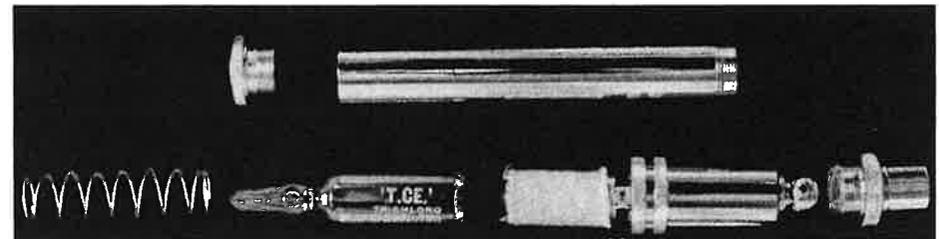


Figure 57 The Inhaler, showing component parts

The Trilene inhaler should operate continuously for approximately 40 minutes on one ampoule. If the inhaler is required to operate for longer than this time, it may be necessary to insert another ampoule. Simply unscrew the base cap and insert a fresh ampoule after removing the old one. Depress the nozzle and allow the pad to absorb all the liquid it can. After recharging, the base cap should be unscrewed to allow excess liquid to escape before giving the inhaler back to the patient.

2. NITROUS OXIDE/OXYGEN—ENTONOX

This vapour has a long history of satisfactory analgesia and can be used safely in all casualties needing pain relief. It is administered with specific

apparatus. Entonox is stored as a compressed gas in standard cylinders (Figure 58). The labelled cylinders are colour-coded blue with white shoulders. A yoke regulator fits the valve stem and has a Pin-Index Safety System. From the outlet side of the regulator a flexible hose connects to a hand piece on which is mounted a standard anaesthetic type face-mask or moulded mouth-piece. On the handpiece there is also an exhaust valve for exhaled air. Opening the needle seal valve delivers Entonox into the regulator. Entonox is delivered to the patient through a demand valve. The patient's breathing effort opens the demand valve and breathing out closes it. The regulator has a simple gas volume gauge mounted on it.

Entonox contains 50% Oxygen and 50% Nitrous oxide and therefore provides relatively high inspired oxygen concentrations to the casualty. The gas is relatively odourless and certainly not unpleasant. The analgesic effect takes place quickly and is not accompanied by nausea. Some casualties feel drowsy once their pain is relieved, but soon become alert again when the gas is stopped. There is no masking of physical signs on stopping administration, and there is no problem with subsequent closed circuit anaesthesia.

Entonox is inflammable and care must be exercised in rescue situations where the possibility of sparks and flames exists. If exposed to freezing temperatures the gas mixture issuing from the cylinders is not in 50/50 proportion. This dissociation can be reduced by shaking the cylinders, but it is better to store them in temperatures above 5 degrees C.

ADMINISTRATION OF ENTONOX

1. Instruct the casualty that you are going to give him the mask to hold and that if he breathes deeply and regularly he will get pain relief.
2. Obtain his verbal consent in the presence of a third party. For minors, parental consent should be sought where practicable.
3. Turn the cylinder on and instruct the patient to place the mask over his nose and chin. The mask must be firmly sealed on to the casualty's face for analgesia to be effective. Keep the casualty's hands and bedding away from the exhaust valve.
4. Encourage the casualty to breathe gently and slowly. Be aware of the problems of over-breathing and if necessary treat as outlined in Chapter 17.
5. Insist on self-administration so that administration is stopped if the casualty becomes unconscious.
6. Whenever possible have the casualty in a coma position so that there is less risk of inhalation of vomitus or secretions should the casualty become drowsy.
7. Entonox is not to be used if the casualty is not fully conscious or if he is plainly intoxicated.

AT THE HOSPITAL

Continue the administration of Entonox until the doctor assumes responsibility. Then remove the mask and close the cylinder valve.

Record the use of Entonox on the Ambulance Officer's Report and check your assessment and diagnosis with the Emergency Department doctor.

Return the Entonox apparatus to its correct storage place in the ambulance, making sure the cylinder valve is closed. Remember to clean the face mask after use.



Figure 58

An Entonox Cylinder

Chapter 13

Intravenous Therapy

In resuscitation or in cases where oral fluid intake is inadequate, intravenous (I.V.) infusion of salt, sugar or plasma substitute solutions, or of blood, may be used as therapy. With increasing frequency the Ambulance Officer is now assisting in starting I.V. infusions and in managing them during transportation.

SETTING UP INTRAVENOUS THERAPY

The solution to be infused may be in a glass bottle or plastic pack. The outlet of the container will have a protective cap under which the outlet bung will be sterile. Do not touch any of the protected area on removing the cap.

The sterile infusion set consists of a large spike needle to which is connected a drip chamber and in some cases a filter. There is a length of tubing ending in a tapered tip which plugs into the needle or other instrument inserted into the casualty's vein. An adjustable clamp is fitted on the tubing and can be moved along its length. The spike and terminal tip are sterile and protected with simple covers. There is also an airway which may be simply a sterile needle, or a needle with a short piece of tubing and a filter. The component parts of the infusion set are illustrated in Figure 59.

The spike cover is removed, taking care not to touch the spike, which is then pushed firmly through the bottle bung. The protective cover is removed from the airway needle and the airway needle also pushed through the bung. Without an airway, glass bottles will not allow fluid to run out. An airway is not required with collapsible plastic packs.

With the bottle and infusion set assembled, the bottle is inverted and fluid allowed to run through the set. Half fill the drip chamber and completely fill the tubing. Care should be taken to exclude air bubbles from the entire length of the tubing.

The Medical Officer will place the needle in the vein. He may need assistance with holding the limb, providing good light, holding equipment, or securing the I.V. needle with strapping. Remember that much of the I.V. equipment must remain sterile, therefore handle with care.

When the I.V. needle is inserted the infusion set tubing is connected to it and fluid is allowed to run in by releasing the tubing clamp. When the fluid is running properly and the limb is secure, the Medical Officer will determine the required rate of flow in terms of drops per minute. If medical orders for rate of flow have not been given the Ambulance Officer must ask for this information.

The rate can be altered by adjusting the tubing clamp. Carefully count the drops per minute in the drip chamber and adjust the clamp to achieve the prescribed rate.

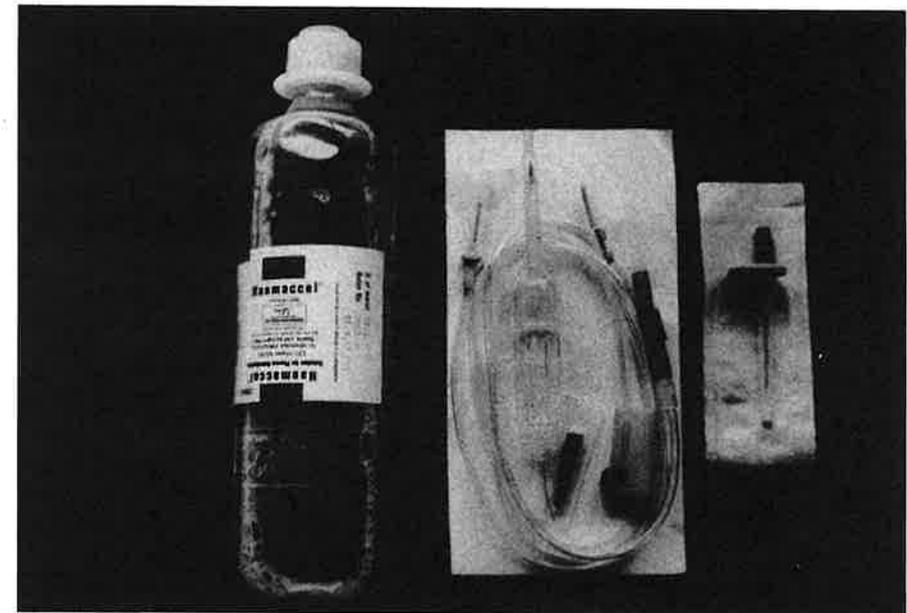


Figure 59 An Intravenous Infusion Set

The bottle must be supported as high above the patient as is practicable. (Figure 60.) In an ambulance, hooks on the roof or an I.V. stand attached to the stretcher will support the bottle at working height. The bottle should be secured firmly to the hook or stand and not be allowed to swing and sway. If necessary the bottle should be tied in position with lengths of bandage.

If a bottle of solution empties and a new bottle is required, the procedure is as follows. Stop the flow, using the tubing clamp. Remove the infusion set spike from the old bottle and push it into the sterile top of the new bottle. The changeover must be done quickly to prevent the needle blocking off with clot. An airway needle will be required in the new bottle. Remember that the bung, spike and airway are sterile and must not be touched. Open the tubing clamp to re-commence the infusion. Re-adjust the clamp for the prescribed rate of flow.

PRECAUTIONS WITH INFUSION

Care must be taken to stop the tubing from becoming kinked or pinched shut. Traction must not be applied to the tubing as this may dislodge the needle from the vein.



Figure 60 Intravenous infusion in progress

The drip rate must be constantly supervised to maintain the prescribed rate of flow. If the drip rate seems too fast it must be slowed down, but it should not be allowed to stop as this will allow the needle to block with clot and prevent further infusion.

The needle should not be handled and as it is commonly in a hand or forearm, movement of that limb should be minimal. Rough handling of the limb may cause the needle to stick through the vein wall and fluid may infuse into

the surrounding tissue. If the needle does do this the drip rate will probably not be maintained and a swelling will occur around the point of the needle. If it is obvious that the needle has become displaced into the tissues, the tubing should be clamped off. The services of a doctor should then be obtained as soon as practicable to re-insert the needle, even if this means breaking a long journey by making an unscheduled stop at another hospital.

TRANSFUSION OF BLOOD

The same infusion apparatus is employed and the same precautions in handling the apparatus to maintain sterility are necessary. Blood is generally stored in plastic packs. The spike of the infusion set plugs directly into the outlet tube of the pack. If the set becomes parted from the inverted blood pack all the blood will rapidly pour away. Always check that the connection is firm. Blood packs do not require an airway as external air pressure causes the blood to flow, the pack collapsing as it empties.

Blood is a more viscous fluid than saline (salt) solutions and hence is more difficult to infuse. In ambulances the limitation on the height to which the infusion pack can be raised above the casualty may prevent the attaining of as rapid a rate of infusion as required. In addition, where a casualty is being transported by air ambulance, lowered atmospheric pressure will further slow the infusion rate. Where there is difficulty in maintaining the prescribed rate of flow it is possible to resort to pressure infusion.

Pressure infusion is safe for ambulance use only when soft plastic packs of blood or fluid are used. There is a specific pressure infusor in the form of a sleeve with an inflatable back and a non-flexible front. This can be inflated to apply pressure to the contained pack, allowing the flow rate to be maintained. The pressure infusor must be pumped up only to the extent necessary to achieve the required flow rate. In the absence of a specific pressure infusor, an improvised pressure infusor can be made using a sphygmomanometer cuff.

SUMMARY

1. Remember that much of the equipment must be sterile and requires careful handling.
2. Fluid must be kept running into the vein at the prescribed rate.
3. Take all measures necessary to protect the intravenous needle.
4. When it is necessary to change bottles, take care to exclude air from the tubing.
5. Only Medical Officers are to prescribe the fluid to be infused, to insert the intravenous needle and to prescribe the rate of infusion.
6. On long-distance transfers, be prepared to break the journey to obtain medical assistance if the infusion is not proceeding satisfactorily.

Chapter 14

The Humid Crib

The normal full-term infant can lead a separate existence immediately after birth but he needs support to maintain temperature and to obtain nourishment. The premature baby, and the neonate at risk because of developmental abnormalities or maternal problems, needs special care to survive. These babies need support in the form of optimal environmental conditions of temperature and humidity. The humid crib is one means of giving the required environmental support. (Figure 61.)

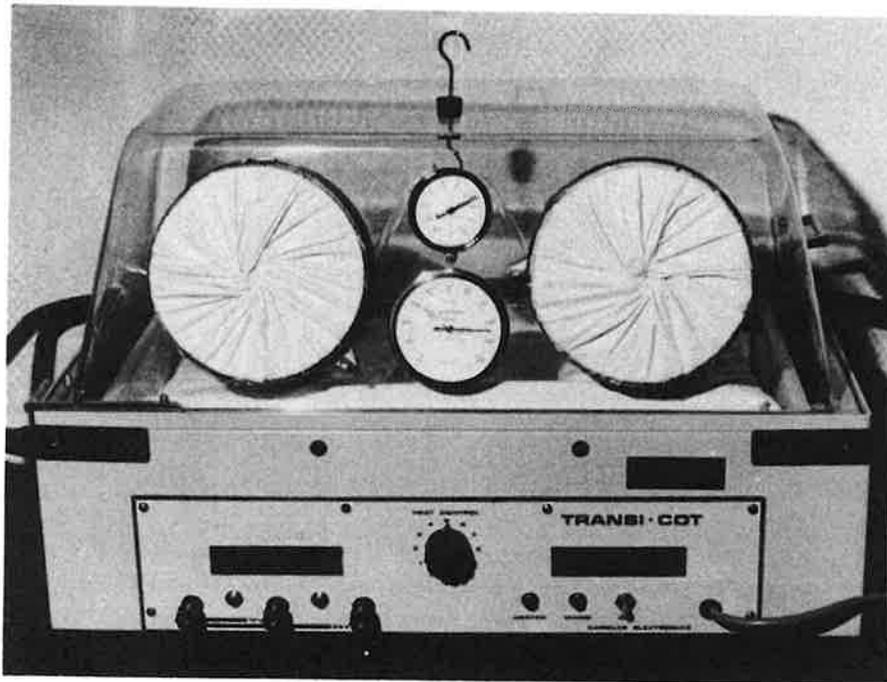


Figure 61 The Humid Crib

The humid crib is a special neonatal carrier for nursing and transporting the neonate at risk. The unit provides a means of maintaining constant temperature and humidity by an electrical heating circuit and a water bath. The water bath

contains sponges saturated in water. Heating is achieved by thermostatically controlled incandescent lamps or by resistance strips.

The neonate crib is a simple moulded tray which is fitted into the base of the carrier and requires only simple bedding for the baby to lie on. To provide a closed environment, a transparent polymer lid is fitted over the base, hinged at one end to allow access to the crib for cleaning and placing the baby inside. A device is fitted to enable the lid to be maintained in the open position.

The lid is fitted with two iris ports which allow the operator to attend the baby with the lid closed to maintain the constant environment. The lid has several small holes for crib ventilation to prevent carbon dioxide accumulation. To allow for the addition of oxygen, there is a tapered inlet in the base which can be connected by normal tubing to an oxygen source. A flow rate of 2 litres per minute should be used for safe operating. Optimum ventilation and satisfactory oxygenation are important in neonatal care but excessive oxygen can be harmful. Oxygen therapy in the emergency situation should be delivered with the aim of maintaining a warm pink infant. Flow rates should be adjusted accordingly.

The units in general use can be electrically operated from normal mains power (240 volts) or with accessory leads from the 12 volt outlet in the ambulance. When connected to the vehicle power, the temperature regulator on the base is not operable. To help with maintenance of the crib temperature and humidity on the journey to collect the baby, the crib should be kept covered with the soft, polythene cover provided. The unit should be sited in the centre of the ambulance, and the vehicle heater operated when the weather is cooler. Remember the twelve volt system has marginal reserve and can only maintain the environment in the crib. The lid cannot be opened without compromising the environment inside the crib.

While operating from mains power the temperature and humidity can be easily maintained and controlled. It is necessary to have the crib operating in a standby mode at the ambulance centre so that correct operating conditions can be subsequently maintained on vehicle battery power. The crib should be moved to and from the vehicle with minimal delay and only opened to place or remove the infant. When arriving at a pick-up point the crib should be operated from mains power until optimum operating conditions are reached and stable, before removing to the vehicle for transportation to destination.

The baby should be placed on his side and positioned so that constant observation can be made of the airway, chest and umbilical stump. Any manipulation of the baby must be accomplished through the iris ports, ensuring that they are closed snugly around the operator's forearms.

Good lighting is essential to provide optimum observation of the baby through the lid of the crib. Do not leave the soft plastic cover on the lid while the baby is in the crib.

The humid crib must be fixed securely on the floor of the vehicle to prevent it moving.

OPERATING CHARACTERISTICS

To be effective, the temperature in the crib should be maintained at 30 to 34 degrees C. (86 to 94 degrees F.) during transportation of the baby. This means that the crib should be held at ambulance centres with its internal temperature at 36 degrees C. as there may be some heat loss when the crib is in use. It is easy to cool the crib if necessary but difficult to raise its temperature when working from ambulance battery power.

The humidity should be set at 80 to 90%.

MAINTENANCE OF THE HUMID CRIB

The humid crib will only give useful service if it is operating correctly. Regular, frequent maintenance is required to ensure efficient function. Vehicle supply cables must be regularly inspected and maintained. Cable terminals must be tight and clean. Vehicle power outlets must also be regularly inspected and cleaned for proper contact.

In the standby phase, the crib should be cleaned and disinfected at least weekly. This will mean dismantling the infant compartment to reach areas where dust may collect.

Simply washing with detergent solution and then wiping down with a recommended antiseptic solution will provide satisfactory cleaning. Infant bedding is best kept in a sealed polythene pack to remain clean for instant use. After every use the crib should be chemically cleaned, exposed to direct sunlight for a time and then fitted out with fresh linen.

The sponges, which are saturated with water to provide humidification, require regular cleaning. To minimise the accumulation of sludge use filtered or distilled water. In emergency operation the sponges may be saturated with warm water to produce optimum temperature and humidification.

NEONATAL PROBLEMS

The humid crib is used for transporting premature, ill, or at-risk neonates. It is not needed for normal full-term babies. It is mostly used for transporting neonates between hospitals and should not be carried to every obstetric case.

The commonest problems requiring crib transfer are :

- Prematurity
- Respiratory Distress Syndrome
- Aspiration pneumonia
- Pneumothorax
- Neonatal jaundice
- Congenital Heart disease
- Infection, for example meningitis
- Multiple congenital defects

These infants require constant observation, oxygen therapy at 2 litres per minute unless otherwise directed by a Medical Officer and in some instances, gentle ventilation with a bag and mask. In an emergency situation be prepared to discard equipment and use mouth to face resuscitation if any difficulty arises with resuscitation equipment.

In line with modern developments in neonatal care, a retrieval service has been established in South Australia and this is based at the Queen Victoria Hospital in Adelaide. The service provides expert medical and nursing care together with the advanced equipment required to treat sick newborn babies. (Figure 62.) Both the personnel and the equipment are transported to the baby and specialised treatment is then given prior to and during carriage of the baby to an intensive care unit.

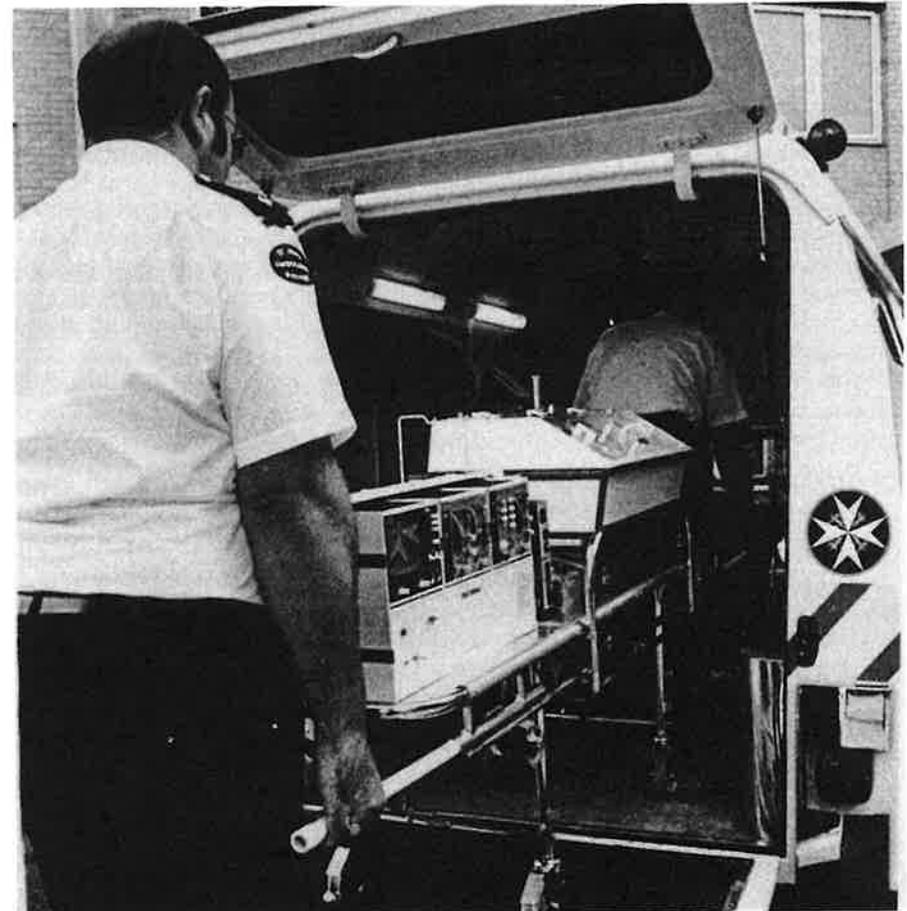


Figure 62 Equipment used by Neonatal Retrieval Service

Chapter 15

Poisons

Poisoning is not an uncommon occurrence and is one which may be either accidental or intentional.

Children between the ages of six months and four years make up the major proportion of the accidental poisoning group, in many instances swallowing substances such as detergents which an adult would find revolting to taste. Poisoning in children is often the result of careless actions by adults, whereby dangerous tablets and medicines are left within a child's reach. Ambulance Officers can play a significant role in preventive medicine by tactfully pointing out this danger when in homes where toxic substances are stored without regard to child safety.

Poisoning in adults is frequently a form of suicide attempt, and sleeping tablets and tranquillizers are often taken in excess. Patients who have attempted suicide in this manner, and who are still conscious, must be observed closely in case they undertake other actions of a self-destructive nature. The management of patients with mental illness, including those with suicidal tendencies, is discussed in Chapter 17 of this book.

When in doubt as to the correct management of a particular poisoned patient, the Ambulance Officer should always seek advice via two-way radio from a hospital or Poisons Information Centre.

Poisons may enter the body in three ways :

1. By mouth ;
2. By way of the lungs ;
3. Through the skin
 - (a) by absorption
 - (b) by injection.

1. POISONING BY MOUTH

Swallowed poisons can be considered in two groups. Poisons may be :

- (a) Corrosive—that is those which are capable of causing chemical burns. In this group are strong acids and alkalis, including some household cleaning agents ;
- (b) Non-corrosive—that is those that do not cause burning. Tablets and medicines taken in overdose are examples of non-corrosive poisons.

MANAGEMENT

In either case it is important for the Ambulance Officer to ascertain the history of the patient as accurately as possible. The patient may be unconscious, and for this or other reasons, unable to give details. There may be witnesses available to give relevant information such as the exact time of the poisoning, and observations on the patient's recent mental state and behaviour. The Ambulance Officer should specifically look for any remaining drugs or poison, and for any container which may have held the poison. These items must be taken to the hospital along with the patient. Any vomited material should also be taken to the hospital for analysis, an investigation which may have a vital bearing on the treatment subsequently given to the patient.

If the patient is unconscious do not attempt to induce vomiting. There is a real danger to any patient who is not fully conscious, but who vomits, that he may inhale some of the vomitus with possibly fatal results. For the same reason do not give fluids to any unconscious patient. He will not be able to swallow properly and the fluid may enter his airway.

Do not induce vomiting if the poison swallowed was a corrosive one. The corrosive nature of the poison may be made evident by the poison container and its label, or by the existence of burns on the casualty's lips and tongue. Always look for this evidence. Vomiting in these patients would cause further burning of the oesophagus and pharynx, and the corrosive substance may enter the larynx and trachea.

Vomiting is not desirable in patients, usually children, who have swallowed petrol or kerosene, as this increases the risk of these poisons being inhaled. Petroleum products cause a pneumonia-like reaction if even minute quantities are brought into contact with lung tissue.

In cases where :

- (a) the patient is conscious ;
- (b) the time interval since poisoning is small ;
- (c) the poison is non-corrosive ;

it may be reasonable to make the patient vomit. This may be done by gently tickling the back of the casualty's throat, taking due care to protect your own fingers. Alternatively an emetic such as Syrup of Ipecacuanha ("Ipecac" for short) will induce vomiting, usually within twenty minutes of being taken orally by the casualty. Ambulance Officers are to administer Syrup of Ipecacuanha only under the direction of a doctor.

The old practice of giving the patient a salt-in-water solution to drink is no longer recommended, as especially in children, the over-enthusiastic use of this form of treatment has led to salt poisoning !

After the casualty has vomited there is an additional treatment available to Ambulance Officers, namely to inactivate any poison remaining by administering the antidote known as "ACTIVATED CHARCOAL". Charcoal itself is an inert substance and will not harm the patient. The mode of action of

charcoal when in a finely powdered (that is "activated") form, is to adsorb other substances including poisons on to its own surface. The charcoal/poison combination is not absorbed from the gastro-intestinal tract into the circulation.

Activated charcoal is not recommended for persons who have swallowed corrosive substances or petroleum products and it must not be given to an unconscious patient. It is however, of great value in treating those who have swallowed toxic amounts of drugs. As examples one gramme of activated charcoal will adsorb:

- 950 mg strychnine nitrate;
- 800 mg morphine hydrochloride;
- 300 mg phenobarbital sodium.

Activated charcoal is supplied in the form of a dry powder which is sealed in a screw-top plastic container. To prepare, simply add sufficient water to form a mixture similar in consistency to a "thick shake" and stir with the wooden spatula provided. Encourage the patient to drink the mixture. Fortunately it does not taste as bad as it looks. The dosage is the same for all age groups, namely the entire contents of the container.

When in doubt as to the correct management of a particular poisoned patient, the Ambulance Officer should always seek advice via two-way radio from a hospital or Poisons Information Centre.

2. POISONING BY INHALATION

Gassing, for example by car exhaust emission, domestic gas supply or industrial fumes is not common, but is always dramatic and requires quick decisive action on the part of the Ambulance Officer.

Both car exhaust emission and domestic coal gas contain carbon monoxide. Natural gas does not. Carbon monoxide is a gas which combines with haemoglobin in the body's red blood cells and prevents those cells from carrying oxygen. Although affected casualties do not become cyanosed, they nevertheless suffer from severe oxygen lack.

Industrial gases include carbon tetrachloride, cyanide fumes, hydrogen sulphide and trichloroethylene. All of these cause drowsiness, cyanosis and loss of consciousness. Cyanide fumes in particular can be rapidly fatal.

MANAGEMENT

A major consideration is to ensure that you, the Ambulance Officer, are not the next victim.

Rescue from a gas-filled environment must be done with extreme caution and where industrial gases are involved the rescue should be performed by especially trained teams using life-lines and suitable respirators.

- Move the patient to fresh air.
- Give oxygen as a routine.

If the casualty has inhaled one of the industrial gases and subsequently requires artificial respiration DO NOT use the mouth to mouth method.

3. POISONING THROUGH THE SKIN

(a) BY ABSORPTION

Poisons absorbed directly through the skin surface are often substances used in agriculture, for example insecticides. Special mention is made of organo-phosphate compounds of which Parathion and Malathion are examples. They are related to the nerve gases of chemical warfare and are found in market gardens and orchards. In these settings they are sometimes applied by aerial spraying. Of greater significance is their now widespread availability for use in household gardens.

Organo-phosphates can gain entry to the body by ingestion, inhalation or absorption through the skin or conjunctiva. Initial symptoms are headache, nausea, blurred vision, increased salivation, a tight feeling in the chest, bradycardia, vomiting, diarrhoea and breathlessness. These may be followed by respiratory paralysis, unconsciousness and death.

MANAGEMENT

If an insecticide has been swallowed then induce vomiting.

If, as is more common, the poison is entering the body by absorption through the skin then remove contaminated clothing and irrigate the affected skin thoroughly with water. The Ambulance Officer must wash his own hands if he touches the contaminated clothing.

For the organo-phosphate group, the antidote is atropine. Any person commercially handling these chemicals should have atropine and directions for its use readily available.

Keep a careful watch on the patient's breathing.

Assisted ventilation USING A BAG AND MASK is often needed together with frequent suction to the airway. Remember that mouth to mouth resuscitation is forbidden in this situation.

(b) BY INJECTION

It is unfortunately increasingly common in Australia for an Ambulance Officer to be called to a drug addict who has collapsed while taking drugs such as heroin, morphine or pethidine. These drugs may markedly depress respiration and artificial respiration may be necessary.

When examining such patients take particular note of pulse and respiratory rates and of pupil size and reaction to light. Look for injection sites.

Remember to collect any containers, drug ampoules or hypodermic syringes found at the scene and take them, with the patient, to hospital.

The Ambulance Officer's responsibility is to the patient and it is not his role to do other than give patient care and transportation to medical aid. Referral to police or other government departments is a step best left to the staff of the hospital receiving the patient.

SNAKE BITE

In Australia, bites from snakes and other venomous creatures are another cause of poisoning by injection.

Always assume that the snake which attacked the casualty was a venomous one. Remember that there may be very little evidence of injury or reaction at the site of the bite. Signs and symptoms, which occur within two hours of the bite, include:

- Nausea and vomiting;
- Drowsiness;
- Double vision;
- Sweating;
- Faintness;
- Muscle weakness.

Muscle weakness may show as ptosis, that is drooping eyelids. Muscles used in respiration may become weak or paralysed, leading to respiratory difficulties. Be alert for this and assist respiration if it is failing.

If the bite was on a limb, immediately apply a constrictive bandage on the single-boned portion of the limb between the bite and the heart. The time at which the bandage is applied should be clearly marked on the casualty's forehead. The bandage must be released within 90 minutes.

Wash any excess venom from the bite site.

Treat the casualty for shock and transport him to hospital where an antivenene may be administered. If practicable, bring the snake for identification.

SPIDER BITE

Bites from red back and funnel web spiders have been known to kill humans. Red back spiders may be found throughout Australia but funnel web spiders are mainly confined to the eastern coast. Treatment is the same as for snake bite. There is an antivenene available for use in treating red back spider bite, but no antivenene is yet available for funnel web spider bite.

BLUE-RINGED OCTOPUS BITE

The blue-ringed octopus can be found in shallow waters around the coast of Australia, including South Australia. Envenomation by this creature may be serious as the venom may cause paralysis of muscles and failure of respiration.

Treat the patient for shock, keep a close watch on airway and breathing and assist respiration if it is failing.

Transport to medical aid without delay.

TRANSPORT TO HOSPITAL

Only in relatively rare instances is it necessary to rush a poisoned patient to hospital with siren wailing and red light flashing. Such measures may be warranted in instances of poisoning by organo-phosphates, arsenic, cyanide and strychnine. Occasionally a doctor may specify emergency transportation when other poisons are involved.

All poisoned casualties should be transported without undue delay, but a few minutes of careful treatment before transportation will be more beneficial than a high speed dash with inadequate treatment.

COMMON POISONS AND RECOMMENDED TREATMENT

<i>POISONS</i>	<i>TREATMENT</i>
Acids	Do not induce vomiting. Give water or milk.
Alcohols	Induce vomiting.
Alkalis	Do not induce vomiting. Give water, milk or lemon juice.
Ammonia	Do not induce vomiting. Give water, milk or lemon juice.
Arsenic	Induce vomiting. Give water or milk.
Aspirin	Induce vomiting. Give water or milk.
Barbiturates	Induce vomiting if conscious. Assist respiration if necessary.
Bleach	Do not induce vomiting. Give milk.
Camphor or Camphorated oil	Induce vomiting if not convulsing.
Carbon Monoxide	Remove to fresh air. Give oxygen, remembering the patient may be hypoxic but not show cyanosis.
Caustic soda	Do not induce vomiting. Give water or milk.
Carbon tetrachloride	Induce vomiting if conscious. Remove from contaminated environment.
Cyanide	Support respiration with bag and mask.
Deodorant blocks	Induce vomiting. Give water but not milk.
D.D.T.	Induce vomiting. Wash skin.
Drain cleaners	Do not induce vomiting. Give water, milk or lemon juice.
Heroin	Support respiration.
Hydrogen sulphide	Support respiration.
Insulin	Give oral glucose or sugar if conscious.

<i>POISONS</i>	<i>TREATMENT</i>
Kerosene	Do not induce vomiting. Give milk.
Malathion	Induce vomiting if conscious. Wash skin. Remove contaminated clothing. Support respiration with bag and mask.
Methylated spirit	Induce vomiting.
Morphine	Support respiration.
Organo-phosphates	Induce vomiting if conscious. Wash Skin. Remove contaminated clothing. Support respiration with bag and mask.
Parathion	Induce vomiting if conscious. Wash skin. Remove contaminated clothing. Support respiration with bag and mask.
Pethidine	Support respiration.
Turpentine	Do not induce vomiting. Give milk.

Chapter 16

Childbirth

Childbirth is a natural physiological event. A basic understanding of the process of childbirth will help the Ambulance Officer to deal with births which occur before or during transportation.

The Ambulance Officer should remain calm and give the mother confidence and emotional support. It is mandatory to ensure an adequate airway at all times for both the mother and the child when it is born.

NORMAL PREGNANCY

The developing baby (foetus) lies within the uterus surrounded by about 2000 ml of amniotic fluid. The baby usually lies head down, with his or her back facing towards the mother's front (Figure 63). The amniotic fluid is



Figure 63

Position of baby within uterus

contained by the amniotic membrane which surrounds the foetus and the umbilical cord linking the foetus to the placenta. The placenta allows oxygen to enter the foetal circulation and carbon dioxide and other wastes to pass back into the mother's circulation for excretion.

LABOUR

Labour is the period of final preparation for birth, together with the actual delivery of the baby and the expulsion of the placenta. Labour begins with rhythmic contractions of the uterus, initially occurring at 3 to 5 minute intervals, with each contraction lasting 30 to 60 seconds. The contractions stretch and thin out the lower part of the uterus and cause the cervix (or neck) of the uterus to become dilated. When the cervix is completely dilated contractions of the uterus push the child's head into the birth canal (vagina). The contractions, helped by the mother's voluntary efforts, combine to deliver the baby completely.

After the baby is born further contractions of the uterus cause the placenta to break away from the inner wall of the uterus and to be expelled down the birth canal. The empty uterus will then usually contract down firmly and prevent any significant bleeding from its raw surfaces.

STAGES OF LABOUR

There are three stages of labour.

STAGE ONE begins with regular contractions of the uterus which become more pronounced, more frequent and produce dilation of the cervix. These contractions may be preceded by or followed by a "show", that is a small flow of blood and mucus. Rupture of the amniotic membrane may occur during this stage with escape of amniotic fluid as a "flood of water". Stage one ends when the cervix is fully dilated ready for the baby to be born.

STAGE TWO begins when the baby's head moves through the dilated cervix. It lasts until the baby is completely delivered.

STAGE THREE begins after the full delivery of the baby and is completed when the placenta is expelled.

EXAMINATION OF THE PREGNANT WOMAN

When a woman believes she is in labour a routine examination is required to determine the most appropriate course of action.

Begin by noting the patient's colour, respiration, pulse rate and if possible blood pressure. Note the level of consciousness and reactions to any pain that may be present. If there is pain gently palpate the abdomen to detect tenderness. A pregnant uterus may be felt as an abdominal mass which firms at the time of pain and relaxes when the pain goes. Determine if there is any vaginal bleeding and check to see whether the vulva and perineum are

bulging due to the baby's head pushing down. If the baby's scalp is readily seen in the vulva, delivery is imminent.

The woman in protracted pain who is bleeding freely or shocked requires priority transportation to medical aid.

The woman who has good colour, normal pulse, normal blood pressure and little evidence of vaginal bleeding but in whom the baby's head is on show requires preparation for the birth to occur in the home.

The woman who states she has an uncontrollable urge to "bear down" and to push with the contractions is usually about to give birth.

MANAGEMENT IN THE HOME

The Ambulance Officer must remain calm and in control of the situation. Reassure the mother. Her discomfort or pain may be relieved by judicious use of Trilene or Entonox.

It is important to have her comfortably placed on a firm bed or stretcher, lying on her back with her legs drawn up and separated. It is wise to place protective coverings under the mother before the actual birth. A relatively sterile area can be provided for the baby by using burn sheets to drape the bed surface between the mother's legs.



Figure 64 Clear the baby's airway

Remember to use sterile dressings to keep the delivery area clean. Any faeces that are involuntary passed as the head descends should be wiped backwards away from the delivery area.

Once the head is delivered, support it gently and use the hand aspirator to clear the baby's nose and mouth. (Figure 64.) Ensure that the airway is cleared of mucus. When delivered, place the baby carefully on its side between the mother's legs without pulling on the cord. Newborn babies are slippery. Grasp the baby's ankles as shown in Figure 65 when moving the baby. If the baby does not breathe initially, then a gentle tap on the heels of the baby's feet is all that is usually necessary to stimulate respiration. Once the baby is breathing, oxygen may be required. Early action to maintain the baby's temperature is mandatory.

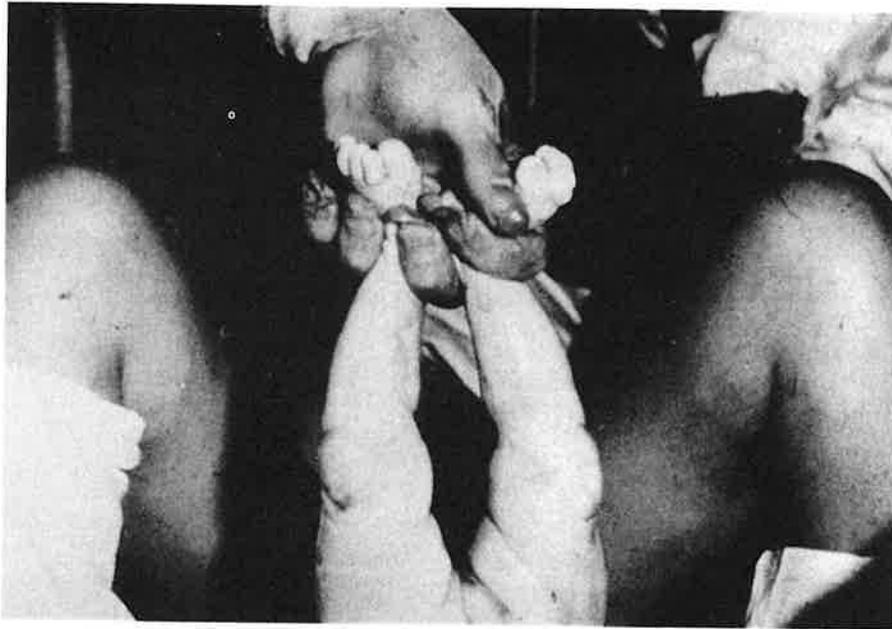


Figure 65 Method of grasping newborn baby

At this time it is appropriate to deal with the umbilical cord. Place two clamps from the maternity kit (Figure 66) close together approximately 30 cm (12") from the baby and place a third clamp 8 cm (3") beyond this as shown in Figure 67. Cut the cord between two outer clamps leaving two clamps attached to the baby's cord stump.

It is important to again state that the baby must have his or her body warmth maintained and he or she should be wrapped in the cloth provided in the maternity kit. In cold weather it may well be necessary to wrap the baby in heat-insulating material such as aluminium foil.

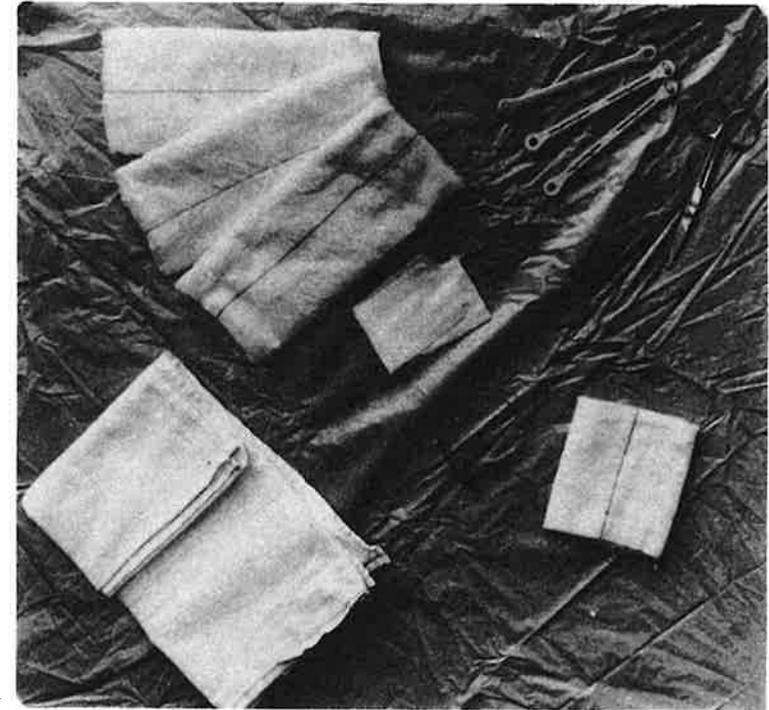


Figure 66
The
Maternity Kit

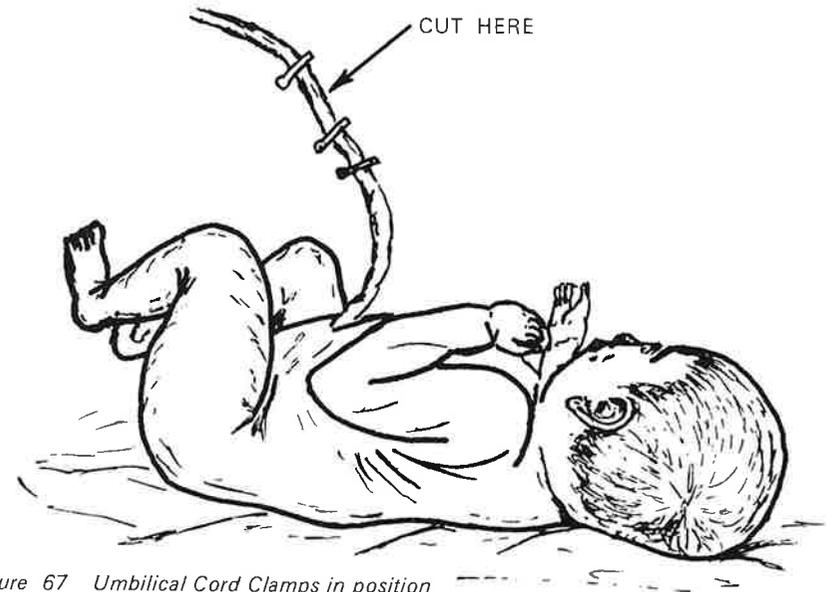


Figure 67 Umbilical Cord Clamps in position

If the child is apparently healthy and breathing well, allow mother to hold him. Adopt a wait-and-see policy during the third stage and do not attempt to deliver the placenta. Never pull on the cord. If the placenta has not been expelled within 15 minutes, transport mother and baby to hospital. If the placenta delivers, place in plastic bag and transport to hospital with mother and baby.

CONDITIONS REQUIRING EMERGENCY TRANSPORTATION

1. Severe bleeding from any cause.
2. Abnormal delivery.
3. Prolapsed cord.
4. Maternal convulsions.

In the metropolitan area these conditions require transportation to a major obstetric hospital where immediate medical care is available.

SEVERE BLEEDING

Severe bleeding occurring before, during or after delivery is a life threat situation. As there is no direct first aid measure which will control haemorrhage from the uterus, emergency transportation to hospital is mandatory. Remember that concealed haemorrhage may occur with the only clue being a patient in shock.

ABNORMAL DELIVERY

When it is known that an abnormal delivery such as a breech presentation is likely to occur then the patient must be transported to hospital as an emergency. It is also possible, but rare, to find that an arm or leg of the baby has been delivered first. This situation also requires that there be emergency transportation to medical aid.

PROLAPSED CORD

This is the condition in which a segment of umbilical cord is delivered before the baby. It often leads to impairment of the baby's oxygen supply as the baby's head may compress the umbilical cord against the pelvis. Prolapse is not common but when it does occur the mother must be transported to hospital as an emergency as the baby is at risk. Placing the mother in a head-down position by elevating the foot of the stretcher will help relieve pressure on the cord. Do not handle the cord that is prolapsed because it may go into spasm, further reducing the supply of oxygen to the baby. Place a large sterile dressing between the mother's legs to protect the cord and continue emergency transportation. Giving oxygen to the mother may in turn provide better oxygenation for the baby.

ECLAMPTIC FITS OR MATERNAL CONVULSIONS

Eclampsia is a complex chemical disturbance in pregnancy in which raised blood pressure and excessive fluid retention are features. An eclamptic fit is a more extreme state with very high blood pressure and convulsions. The same general principles of emergency care apply in the treatment of this condition as in the treatment of any fit. Eclamptic fits are a life threat and need immediate medical care. Emergency transportation is mandatory.

SUMMARY OF EMERGENCY CHILDBIRTH

1. Remain calm.
2. Reassure mother.
3. Relieve pain.
4. Allow natural delivery.
5. Clear baby's airway.
6. Check baby's breathing.
7. Clamp and cut the cord.
8. Give oxygen to baby if required.
9. If baby fails to breathe—resuscitate.
10. Keep baby warm.

MISCARRIAGE OR ABORTION

For the purposes of this book the terms "miscarriage" and "abortion" are synonymous.

Miscarriages commonly occur between eight and twelve weeks of gestation. The earlier they occur the less likely it is that complications such as severe haemorrhage will follow. Place two or three large dressings between the patient's legs and reassure the patient. Unless the bleeding is severe this condition is not an emergency and the patient should be transported quietly to hospital.

Chapter 17

Emotionally Disturbed and Psychiatric Patients

Patients suffering from psychiatric illnesses are people whose feelings are basically the same as ours, but their feelings are of greater intensity and cannot be controlled or contained in the normal way.

Psychiatric patients can, in general, be divided into two main groups—neurotic patients and psychotic patients.

1. *NEUROTIC PATIENTS* are those suffering from a nervous or emotional disorder, but who remain mentally in touch with reality.

These people suffer mainly from "anxiety" symptoms such as headache, palpitations, gastric discomfort and shakiness.

They are usually tense, agitated and fearful, and may become rather depressed. They may need considerable reassurance, but are usually co-operative and are not likely to be troublesome during transport.

Patients may develop:

(a) Hysterical Emotional Reactions

These may occur in association with excessive grief, or on the receipt of bad news. The patient may scream, sob, over-breathe and throw himself around. Tactful, calm, but firm management is necessary. Attendants should be alert for a sudden recurrence. Attempts to jump from a moving vehicle may occur.

Those patients who continue to over-breathe for more than a few minutes may lower their body carbon dioxide level to such an extent that additional signs and symptoms develop. These signs and symptoms include cramps in the small muscles of their hands and feet and a painful "pins and needles" sensation.

The word "tetany" is used to describe these developments. Please note it has nothing to do with the disease tetanus which is caused by bacteria.

Patients who develop tetany are alarmed by the cramps and tingling sensations and tend to react by over-breathing to an even greater extent, thus creating a vicious circle. Such patients find it very difficult to slow their breathing back to a normal rate. They require a great deal of reassurance.

As the condition is usually caused by lack of body carbon dioxide, efforts to increase the carbon dioxide level often constitute effective treatment. The simplest procedure is hold a paper bag gently over the patient's nose and mouth so that he re-breathes his own expired air.

Patients with tetany should be transported calmly to hospital for assessment by medical staff.

(b) Hysterical Fits

These may be very similar to an epileptic fit, but the patient is not likely to pass urine or to harm himself during the fit. Movements are often purposive. The patient will probably resist and struggle with anyone who endeavours to restrain him. The "fit" may take some minutes to subside.

Treatment is mainly to prevent the patient harming himself or others, and unnecessary handling should be avoided. Watch for recurrences.

2. *PSYCHOTIC PATIENTS* have a more severe disorder of the mind, often associated with a loss of contact with reality.

They may suffer from conditions varying from extreme excitation and elation, to severe depression with determined attempts at suicide. There may be hallucinations (when the patient sees or hears something which is not there) or delusions (when he has false or mistaken beliefs, which he holds despite all evidence to the contrary).

(a) Mania

These patients suffer from extreme excitation and elation. There is much disorder of thinking, and hallucinations and delusions are common. Physical activity is often extreme and quite reckless, with no fear of injury or other consequences. The patient may consider himself to be all powerful and is unlikely to take any notice of calming or authoritative words. It may require several men to restrain him. Restraining straps, correctly applied to both ankles and wrists, may be needed throughout transport. The patient may need heavy sedation from a doctor before he can be transported to a hospital.

(b) Schizophrenia and Paranoia

This group of patients also suffers from hallucinations and delusions. The commonest hallucinations are "the voices", while frequent delusions are ideas of being under an outside influence or of being directed to do things by radio. The patients may believe they are being spied on by television. Catatonia, a condition in which the patient remains motionless for hours, occurs at times and these patients seem unaware of and unaffected by happenings around them.

In paranoid patients the delusions tend to become fixed along the line of being persecuted. Anti-social and dangerous behaviour may

develop from these delusions. The patient could regard anyone (including the Ambulance Officer) as being yet another of his persecutors and become antagonistic and aggressive.

Patients from these groups may object to being taken to hospital and may become violent. Tactful handling and persuasion should be tried first. Speak to them in the same friendly manner as you would to others. If the patient rejects this approach, force may be necessary, but this must be reserved for the moment of real necessity, namely, for removal to the ambulance or to prevent escape. It must never be excessive. Strong sedation may be necessary before transportation is contemplated.

(c) Delirium or confusion

This may be due to infections, to the effects of drugs or alcohol, or to diseases of the brain. Delirium may be accompanied by hallucinations (often visual, for example small animals running about the room) and delusions. Fear is commonly experienced and panic due to an imagined danger may make such a patient desperate in his efforts to escape. Hence constant supervision is necessary. Management and removal to hospital is the same as under (b).

(d) Depression

This indicates a change in the patient's mood and mental outlook and may be a reaction to some situation causing grief, fear or worry. Lesser forms of depression are common and are discussed above under "Neurotic patients". The patient may be dejected and uncommunicative. During a phase of severe depression the patient may be actively suicidal or may be awaiting a suitable opportunity to attempt suicide. Constant vigilance is necessary to prevent this. Sharp objects such as knives, razors and scissors should be removed, as should belts and pyjama cords. These patients must be kept under constant observation, even when in the toilet.

A particular type of depressive illness can occur within a few weeks of childbirth. The woman may not only be suicidal but may have the delusion that she must kill her infant. Special care is needed to prevent this.

GENERAL REMARKS

In dealing with patients with any form of nervous or mental illness, it is essential that the initial approach should be made in a natural, calm and friendly manner.

The old tendency to regard those suffering from nervous or mental illness as a class apart is fortunately disappearing.

Many of these patients are aware that they are ill, but fear that they will be treated differently from patients with a physical illness.

Many patients will respond to a calm, reassuring and friendly manner and will present no difficulty during transport to hospital.

Physical restraint or force is seldom necessary and must only be used with those patients who become actively suicidal or who are dangerous to others. Ambulance Officers should be alert for any sudden changes in the behaviour of patients, particularly those with confusion, delusions and depression.

Chapter 18

Ambulance Driving in an Emergency

The purposes of this chapter are to assist Ambulance Officers in deciding how they should drive in an emergency and when to adopt emergency procedures.

To ensure that a casualty has an adequate chance of recovery Ambulance Officers should do things quickly and methodically. Always remember that doing things quickly is not always measured in kilometres per hour, but in the manner most suitable in the circumstances.

Few, if any, emergencies require the use of excessive speed. Along with this, poor driving practices such as swerving, fast turns, and sudden changes often increase the extent of injuries and create adverse effects on the casualty.

The decision to switch on warning devices and to proceed faster than other traffic is a most serious one. In taking it, an Ambulance Officer must realise that he is exercising a right granted to him by the Road Traffic Act. Section 40 of the Act gives certain exemptions to "Any motor ambulance which is being driven in answer to an urgent call or is conveying an injured or sick person to any place for treatment urgently required. There is no exemption from driving with "due care and attention".

EMERGENCY CODES

PRIORITY RED—for emergency.

PRIORITY GREEN—for non-emergency.

The following medical and surgical conditions may warrant classification as "PRIORITY RED".

1. Severe chest injuries.

This does not mean one or two rib fractures but, for example, a crushed or flail chest with associated difficulty in respiration. Open chest injuries and conditions such as pneumothorax and haemothorax may be in this category.

2. Severe shock from any cause.

3. Severe uncontrolled haemorrhage.

This may be internal or external. The Ambulance Officer should be able to control most cases of severe external bleeding. Some casualties may have lost much blood prior to the arrival of the ambulance.

4. Severe respiratory obstruction.

This includes partial blockage caused by inhaled foreign bodies and conditions such as crushed larynx and airway burns where oedema may narrow the airway.

5. Poisoning.

Only those poisons which pose an immediate threat to life are included here, for example organo-phosphates, arsenic, cyanide and strychnine.

6. Anaphylactic shock.

7. Insulin excess when the patient is unconscious.

Unconsciousness may occur due to a reduced blood sugar level. Death will result unless glucose is administered intravenously. Remember that conscious hypoglycaemic patients can be given glucose or sugar orally.

8. Heat stroke.

9. Obstetric complications.

The main such complication is where the umbilical cord emerges before the baby. The cord may be pinched between the baby and the pelvic brim, thus reducing the blood supply to the baby.

Breech births may cause the head to remain within the birth canal, causing asphyxia of the baby.

10. Cardio-pulmonary resuscitation.

Correct techniques and continuity of cardio-pulmonary resuscitation are of vital importance and require a stable, smooth ride. Current medical opinion is that in general the longer the delay in reaching medical aid, the less the chance of survival. Delays must therefore be kept to a minimum.

11. As directed by control.

From information received by control, the controller may direct that a call for assistance be classified as priority red. This permits an Ambulance Officer to drive an emergency ambulance to the scene. The attendant will be responsible for deciding whether the patient's condition warrants:

(a) transportation as priority red, or

(b) re-classification as priority green.

The driver will give the normal mobile call and in addition advise control of the priority rating. For example, the call may be "Car X mobile to X hospital with 1 stretcher casualty, priority red". Recipients of radio messages must repeat the priority rating.

A patient whose condition has deteriorated or who may be in a worse condition than envisaged by control can be re-classified to priority red. Notify control of the reclassification.

12. As directed by the leader of a medical retrieval team.

PROCEDURES TO BE FOLLOWED WHEN DRIVING AN AMBULANCE IN AN EMERGENCY

1. TRAFFIC SIGNALS

- (a) Carefully approach any intersection which has a stop sign or red traffic light directed towards the ambulance. Ensure that the ambulance's warning devices are operating.
- (b) Stop at the stop line.
- (c) Make certain the intersection or junction is clear and that ALL other drivers are "giving way".
- (d) When the ambulance driver is SURE it is safe to proceed he may do so with due care, but if any doubt exists whatsoever, he MUST NOT proceed.

2. RAILWAY CROSSINGS

Drivers must not proceed over a railway crossing when the warning signals are operating.

3. SPEED LIMITS

- (a) Drivers of ambulances driven in emergencies are permitted to exceed normal speed limits by 20 k.p.h., for example such ambulances may travel at 80 k.p.h. in a 60 k.p.h. zone, and at 100 k.p.h. in an 80 k.p.h. zone.
- (b) An ambulance MUST NOT exceed 25 k.p.h. at an operating school crossing.
- (c) The ambulance driver must abide by any stop sign held by a school crossing monitor.

4. USE OF WARNING DEVICES

The driver of an ambulance must not depend on the flashing of the red light or the sound from the siren to guarantee safe passage.

Red light: When no visual obstruction exists, red flashing lights are more effective as warning devices than a siren because they can attract the attention of other road users at a greater distance. They also provide protection at the scene of an accident during casualty rescue and for this reason should be left operating. The ambulance vehicle should, of course, be positioned at the accident site to protect the casualties and those attending them. Remember that warning devices operate on battery power and leaving the ambulance engine running while at an accident scene avoids the embarrassment of a subsequently difficult start should battery power be significantly drained.

Siren: As a warning device the siren has definite limitations particularly now than an increasing number of citizens drive in cars with windows closed and air-conditioners and radios operating.

AMBULANCE VEHICLE ACCIDENTS

Should an ambulance vehicle be involved in an accident, the driver shall:

1. Stop the vehicle.
2. Notify the Communications Centre.
3. Check for the following:
 - (a) Injuries to ambulance passengers and crew and to occupants of other vehicles.
 - (b) Ambulance damage—is the vehicle able to be driven?
 - (c) Damage to other vehicles.
 - (d) Property damage.

After treating and arranging for the transportation of any casualties, the driver will then exchange with the driver of any other vehicle involved the following information, and this information only:

1. Driver's name and address.
2. Name of the owner of the vehicle.
3. Registration No. of the vehicle.
4. Name of Insurance Company.

Under Brigade policy, and as the result of legal advice, the driver is not to give statements regarding the accident to any other party.

The driver should record all details of the accident. This information will assist with the compilation of the accident report form at a later time.

All motor vehicle accidents must be reported to the Police as soon as possible, and in any case, within 24 hours. Any further information regarding the accident may be given only on the authority of the Duty Officer.

VEHICLE CONTROL

In order to minimise the number of ambulance vehicle accidents it is essential that all drivers understand the relationship between speed and reaction time, braking distance and stopping distance.

SPEED is the number of kilometres per hour at which the vehicle is travelling.

REACTION TIME is the period of time from when the driver first sees the danger until he applies the brakes. It is normally seven tenths of a second.

BRAKING DISTANCE is the distance a vehicle travels from the place where the first application of the brakes was made to the place where the vehicle stops.

STOPPING DISTANCE is the sum of:

- (1) the distance travelled during the reaction time, and
- (2) the braking distance.

Stopping distances will vary with the physical and mental alertness of the driver, the speed, weight, type and condition of the vehicle, with special reference to the brakes, and with the type and condition of the road surface.

THE AMBULANCE DRIVER IS ALWAYS REQUIRED TO DRIVE WITH "DUE CARE AND ATTENTION".

Chapter 19

Radio Procedures

The St. John radio network in South Australia consists of F.M. equipment in some 50 base stations and 200 mobile units. The introduction of a fourth radio channel has allowed for direct communication between Ambulance Officers in their vehicles and doctors in the Casualty Departments of Adelaide hospitals.

In the exchange of messages over radio circuits it is essential that a standard procedure be followed. Please adhere to the following instructions.

AIMS

ACCURACY

This is of paramount importance. Incorrect messages may cost lives.

BREVITY

All messages are to be as brief as possible without destroying or altering the context. A set of standard abbreviations are used to save valuable air space. These are listed later in this chapter.

SPEED

Remember the capabilities of the operator receiving your message. You should send the message at a speed which allows him to accurately record it.

SIMPLICITY

Fore-thought must be given to all messages transmitted. A simple concise directive is all that is required.

DEFINITIONS

CALL SIGN

A call sign is allotted to identify the St. John Ambulance Services and is assigned by Telecom Australia. The call sign for St. John in the Adelaide metropolitan area is VL5FT. The call sign is to be used each half hour to identify its origin.

NET CONTROL STATION (N.C.S.)

This is the one station on a network which serves as the Senior Headquarters. The N.C.S. is responsible for efficient clearance of traffic and maintenance of circuit discipline on the net.

SUB STATION

Any station on a net other than the N.C.S.

LINK

Two stations operating on the same channel for communication between each other.

NET

Any number of stations operating on the same channel for communication between each other under the control of the N.C.S.

PHONETIC ALPHABET

To allow greater clarity of message, and so that no mistake in spelling will result, the following phonetic alphabet and numbers are used when a name must be spelt or a number spoken:

Letter	Word	Pronounced
A	Alfa	AL fah
B	Bravo	BRAH voh
C	Charlie	CHAR lee
D	Delta	DELL tah
E	Echo	ECK oh
F	Foxtrot	FOKS trot
G	Golf	GOLF
H	Hotel	hoh TELL
I	India	IN dee ah
J	Juliett	JEW lee ETT
K	Kilo	KEY loh
L	Lima	LEE mah
M	Mike	MIKE
N	November	no VEM ber
O	Oscar	OSS cah
P	Papa	pah PAH
Q	Quebec	keh BECK
R	Romeo	ROW me oh
S	Sierra	see AIR ah
T	Tango	TANG go
U	Uniform	YOU nee form

Letter	Word	Pronounced
V	Victor	VIK tah
W	Whisky	WISS key
X	X-ray	ECKS ray
Y	Yankee	YANG key
Z	Zulu	ZOO loo

Stress the syllables printed in capital letters. Thus in Kilo, pronounced KEY loh, emphasise the first syllable, and in Papa, pronounced pah PAH, the last syllable.

Example.

The word "SYDNEY" would be spelt:

S—See AIR ah, Y—YANG key, D—DELL tah, N—no VEM ber, E—ECK oh, Y—YANG key.

TRANSMISSION OF NUMERALS

	ZE-RO	5	FI-YIV
1	WUN	6	SIX
2	TOO	7	SEV-en
3	THUH-REE or TREE	8	AIT
4	FOW-er	9	NIN-er

In numerals, stress the first syllable, for example, SEV-en. Transmit all numbers by pronouncing each digit separately (except whole thousands).

Where a number includes a decimal point, say the number as shown above, pronouncing the "point" as DAY-SEE-MAL.

THE 24 HOUR CLOCK

To avoid any ambiguous times the 24 hour clock is used, and times are always given as shown in the following examples:

1.00 a.m.—0100 hours	(ZE-RO, WUN, ZE-RO, ZE-RO)
2.23 a.m.—0223 hours	(ZE-RO, TOO, TOO, TREE)
10.45 a.m.—1045 hours	(WUN, ZE-RO, FOW-er, FI-YIV)
1.09 p.m.—1309 hours	(WUN- TREE, ZE-RO, NIN-er)
2.18 p.m.—1418 hours	(WUN, FOW-er, WUN, AIT)
7.30 p.m.—1930 hours	(WUN, NIN-er, TREE, ZE-RO)

PRO WORDS

Pro words are pronouncable words or phrases which have been assigned special meanings to aid in the efficient passing of messages and in raising queries on difficult messages.

AFFIRMATIVE

Yes.

ALL AFTER

The portion of the message which I require is all that follows ...

ALL BEFORE

The portion of the message which require is all that precedes ..

ALL STATIONS

I am calling all stations on this net.

CORRECTION

An error has been made in this transmission.

DISREGARD

Delete all reference to my last transmission.

FIGURES

The following numerals are transmitted.

I SAY AGAIN

I am repeating my transmission.

I SPELL

I shall spell the next word phonetically.

MESSAGE

I require you to write this transmission.

NEGATIVE

No.

OUT

My transmission is ended. No reply required.

OVER

My transmission is ended. I await your reply.

ROGER

Message received and understood.

SAY AGAIN

Repeat all of your last transmission.

SEND

I am ready to receive your transmission.

WAIT

I must pause for a few seconds.

WAIT OUT

I must pause and I will call when ready.

WRONG

That message is incorrect.

HOLD POSITION

Cars directed to hold position must pull over when practicable, stop, and await further instructions.

TRANSMITTING TECHNIQUE

Clear speech is necessary to ensure the receiving operator understands your message.

Another important factor is the depressing of the transmission mechanism. The receiving operator only receives what is transmitted whilst this is depressed. It is good practice for a new operator to silent count to 2 after depressing. Send your message and silent count to 2 before releasing. To avoid interference with other traffic, the user should listen before transmitting to ensure the net is not in use. Allow the base operator time to answer the radio. Do not persist with your calling as he may be speaking on the telephone or attending to another matter. In general, initial calls should be made no more frequently than at 30-60 second intervals. In an emergency, calls should be more often and prefixed by the word "emergency".

The controller should be notified immediately if the crew is called from the station by a person calling at the station. Full details of the case—name of patient, address and nature of case if known—must be given to the controller by telephone, or if the case is urgent, by radio.

VOICE RHYTHM

Any phrase spoken in normal conversation has a natural rhythm making it intelligible. This rhythm should be preserved when transmitting a message by radio.

Speak all words plainly and avoid the running together of consecutive words.

The message should be spoken in a short complete phrase not word by word.

Avoid hesitant sounds such as "er" and "um".

VOICE SPEED

The operator should maintain constant speed of speech and avoid hurrying through less important words.

If the message has to be written, gauge a speed at which you yourself can write.

VOICE VOLUME

The operator must speak at a normal conversation level and must not shout. Every word spoken must be at an equal level and should not fade away on the last few words.

Speak directly into the microphone keeping the microphone between 6 cm and 13 cm (2.5" and 5") from the lips, and maintain this distance constantly whilst transmitting.

VOICE PITCH

Speak with voice pitched at normal conversational level.

EQUIPMENT TESTING

To maintain all the previous standards the equipment itself must be in perfect condition.

To overcome equipment faults an accurate test report should be submitted as soon as a fault is detected.

Reports regarding radio faults sometimes cause confusion when non-standard or non-specific terminology is used. For this purpose an attempt must be made to place the test within the following categories:

Readability

The degrees of readability of a signal are:

1. Unreadable.
2. Barely readable, occasional words distinguishable.
3. Readable with considerable difficulty.
4. Readable with practically no difficulty.
5. Perfectly readable.

Strength

1. Faint signals, barely perceptible.
2. Very weak signals.
3. Weak signals.
4. Fair signals.
5. Fairly good signals.
6. Good signals.
7. Moderately strong signals.
8. Strong signals.
9. Extremely strong signals.

POINTS TO BE CONSIDERED WHEN TESTING RADIO EQUIPMENT

Before commencing a test transmission from any unit, all possible precautions should be taken to avoid interference and communication blindspots.

Test signals should not continue for more than ten seconds and should be accompanied by the call sign of the testing unit, for example "West Torrens 99 testing to VL 5FT".

Chapter 20

St. John Ambulances and their equipment

More than 200,000 patients are transported by St. John ambulances or clinic cars in South Australia each year. Clinic cars, more than 40 in number, are used mainly to convey patients with non-acute conditions to hospital outpatient departments for pre-arranged appointments. The clinic cars are Holden station sedans which can be converted within minutes to stretcher-bearing ambulance vehicles should the need arise.

There are two types of ambulances used in South Australia, the "standard" ambulance and the "Em-care" ambulance.

THE STANDARD ST. JOHN AMBULANCE (Figure 68)



Figure 68 The Standard St. John Ambulance

To produce this one or two stretcher berth ambulance a standard Holden V8 air-conditioned van with automatic transmission is purchased and modified as follows:

1. A portion of the near side of the vehicle body is cut away and a third door is added.
2. An additional seat, which when necessary folds down to allow room for a second stretcher, is fitted.
3. Tinted windows are added to both side panels and the tail-gate.
4. Warning devices, two-way radio and brackets to hold the stretchers and equipment are then secured in place.

EQUIPMENT IN THE STANDARD ST. JOHN AMBULANCE

Resuscitation equipment (in Resuscitation Bag)

Self-inflating bag and mask	(1)	Suction catheter—neonate	(1)
Face mask—adult	(1)	Linkette	(1)
Face mask—child	(1)	Plastic oxygen hose	(1)
Face mask—neonate	(1)	Airway—size 00	(1)
Oxygen mask—adult	(1)	Airway—size 1	(1)
Oxygen mask—child	(1)	Airway—size 3	(1)
Nasal cannulae—adult	(2)	Hand aspirator—neonate	(1)
Suction catheter—adult	(1)	S-shaped airway	(1)
Suction catheter—child	(1)	Portable suction unit	(1)

First Aid Kit (Blue Box)

Triangular bandages	(18)	Universal shears	(1)
Sterile dressings	(12)	Constrictive bandage	(1)
Sterile eye pads	(2)	Safety pins	(6)
Adhesive tape roll	(1)	Roller bandages, 10 cm width	(2)
Disprin tablets	(12)	Roller bandages, 15 cm width	(2)
Bottle of antiseptic	(1)	Bandaid strips	(12)
Forceps	(1)	Packets of cotton balls	(2)

Inflatable splints (Green Box)

Long leg splint	(1)	Long arm splint	(1)
Short leg splint	(1)	Short arm splint	(1)

Miscellaneous equipment (White Box)

Universal dressing	(1)	Activated charcoal pack	(1)
Occlusive dressings	(2)	Ipecacuanha pack	(1)
Restraining straps	(4)	Burn dressings	(4)

Maternity kit containing:

Umbilical cord clips	(3)	Gauze tape	(1)
Scissors	(1)	Sanitary pads	(3)
Neonate suction catheter	(1)	Baby wrap	(1)
Small sterile dressing	(1)	Foil wrap	(1)

Other Miscellaneous Equipment

Standard stretcher	(1)	Urinal	(1)
Emergency stretcher	(1)	Toilet paper roll	(1)
Mattresses	(2)	Plastic sheet	(1)
Sheets	(10)	Kleenex tissue box	(1)
Pillow cases	(5)	Flask of drinking water	(1)
Blankets	(6)	Short spinal board	(1)
Spare pillow	(1)	Antiseptic hand cream pack	(1)
Oxygen cylinders, size C	(2)	Road maps	(2)
Suction equipment		Ambulance Officer's Report	(20)
Sphygmomanometer, portable	(1)	Pad of casecards	(1)
Trilene inhaler	(1)	Hand towels	(2)
Coma pillow	(1)	Jordon Frame	(1)
Fracture pads	(2)	Jordon Gliders	(10)
Telescopic splint	(1)	Hare Traction Splint	(1)
Flood light	(1)	Medishield Cervical Collar	(1)
Receiving bowl	(1)	Torch	(1)
Bed pan	(1)	Spot light	(1)

Rescue Equipment (in Rescue Bag)

12 metre lashings	(2)	Insulated pliers	(1)
All-purpose saw	(1)	Hatchet	(1)
Pinch bar	(1)	Safety helmets	(2)

THE EM-CARE ST. JOHN AMBULANCE (Figure 69)

The Em-care (Emergency care) ambulance is a unit which has been designed and developed by St. John personnel in South Australia. It is constructed on a modified Holden cab and chassis unit fitted with a V8 308 h.p. engine. It has the following features:

1. At the rear of the standard drive axles an additional set of independent rear axles is fitted which allow for extra vehicle length and stability.
2. Total length of the ambulance is 5.87 metres of which the patient compartment occupies 2.97 metres.
3. Access to the patient compartment is via the rear door, the bottom portion which drops down to provide a ramp.

4. A casualty is loaded feet first so that Ambulance Officers have the maximum possible room to administer life-saving treatment at the head of the casualty.
5. Head room in the work area is 1.78 metres.
6. Ambulance Officers can stand either side or at the head of the casualty.



Figure 69 The Em-Care St. John Ambulance

EQUIPMENT IN THE EM-CARE ST. JOHN AMBULANCE

Resuscitation equipment (in Resuscitation Box)

As in standard Ambulance but with the addition of:

Roller bandages, 10 cm width	(4)	Occlusive dressing	(1)
Roller bandages, 15 cm width	(4)	Activated charcoal pack	(1)
Sterile dressings	(5)	Shears universal	(1)
Universal dressing	(1)		

First Aid Kit (Blue Box)

As in standard Ambulance

Inflatable splints (Green Box)

As in standard Ambulance

Miscellaneous equipment (White Box)

As in standard Ambulance, but with the addition of:

Burn dressings	(4)	Adhesive tape rolls	(2)
Large dressing	(1)	Plastic sheet	(1)

Other equipment is distributed as follows:

Bulk head compartments

Spinal board	(1)	Foam pads	(4)
Hare Traction splint	(1)	Pillows	(2)
I.V.T. stand	(1)	Medishield Cervical Collar	(1)
Jordon gliders	(10)	Spare size C Entonox cylinder	(1)
Wooden splints	(4)	Spare size C Oxygen cylinder	(1)
Blankets	(6)		

Stretcher compartment

Oxygen cylinders, size D	(2)	Trilene inhaler	(1)
Portable oxygen cylinder	(1)	Stretchers (see page 140)	(2)
Oxygen flowmeters	(2)	Kleenex tissue box	(1)
Entonox cylinder	(1)	Jordon Frame	(1)

Rear Shelving

Sterile dressing packets	(2)	Adhesive tape roll, 2.5 cm width	(1)
Triangular bandage packets	(2)	Roller bandages, 15 cm width	(10)
Packets of cotton balls	(2)	Roller bandages, 10 cm width	(14)
Safety pins	(12)		
Plastic sheet	(1)		
Adhesive tape roll, 5 cm width	(1)		

Rear Right Cupboard

Sheets	(20)	Spare Suction bottle	(1)
Pillow cases	(10)	Safety Jacket	(1)
Hand towels	(4)		

Rear Left Cupboard

Coma pillows	(2)	Suction bottle	(1)
Fracture pad	(4)	Vomit bowls	(4)
Water bottle	(2)	Toilet paper roll	(1)
Bed pan	(1)	Plastic sheets	(4)
Urinal	(1)		

Resuscitation Board

Self-inflating bag and mask	(1)	Forceps	(1)
Airways, sizes 00, 1 and 3	(9)	Penlight torch	(1)
Oxygen therapy masks	(4)	Stethoscope	(1)
Suction catheters	(4)	Sphygmomanometer	(1)
Aspirator	(1)	Oxygen canula	(3)
Shears universal	(1)	Neonate suction catheter	(2)

Rescue equipment (in Rescue Bag)
As in standard Ambulance

Safety helmets (2)

The Stretcher Chair

All Em-care Ambulances are fitted with a Ferno-Washington Model 107-C stretcher chair. This can be used as a second stretcher (Figure 70) or as a stair chair (Figure 71).

It is proposed to equip Em-care ambulances with a trauma kit. This will contain equipment presently dispersed in several separate boxes.

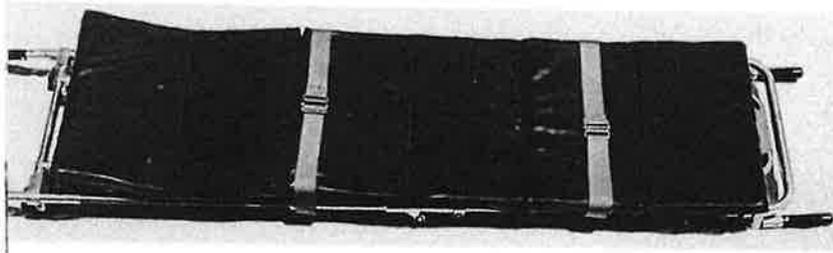


Figure 70 The Em-Care second stretcher



Figure 71

The Em-Care second stretcher in chair configuration

*Chapter 21***Disaster Management****CO-ORDINATION OF ESSENTIAL SERVICES**

It is not feasible or wise for one section of essential services to organise on their own a complete scheme to cope with conditions arising from civil disasters. Although the object of the scheme is to provide medical aid to the injured, its success depends on the co-ordination of all essential services within the area to bring this about.

Local essential services must forward plan by setting up a civil disaster committee to establish a sound master plan from which all can operate. The main points to be considered by the committee are:

1. The types of civil disasters that could happen in their area.
2. The approximate number of casualties that could be expected in such a disaster.
3. The resources readily available to handle such situations.
4. The call-out procedure for emergency services.
5. The allocation of responsibilities to specific essential services.
6. The up-dating of each emergency service's plans.
7. The mechanism for testing plans by communications, token or full-scale exercises. At the conclusion of any such exercise a de-briefing must be held to discuss lessons learnt and to amend plans if necessary.

AMBULANCE SERVICE CIVIL DISASTER PLAN

Experience with actual large disasters and realistic mock incidents has shown that better treatment of casualties results when all Ambulance Officers use a general plan rather than attempting to treat a segment of the large disaster as they would a small incident. The following plan should be put into operation whenever three or more ambulances are required at the scene of an accident, (Figures 72 and 73).

Basically the plan is intended to cope with from 5 to 70 casualties, but can be expanded to handle even greater numbers. In such a case it should blend into any large-scale State or National disaster scheme.

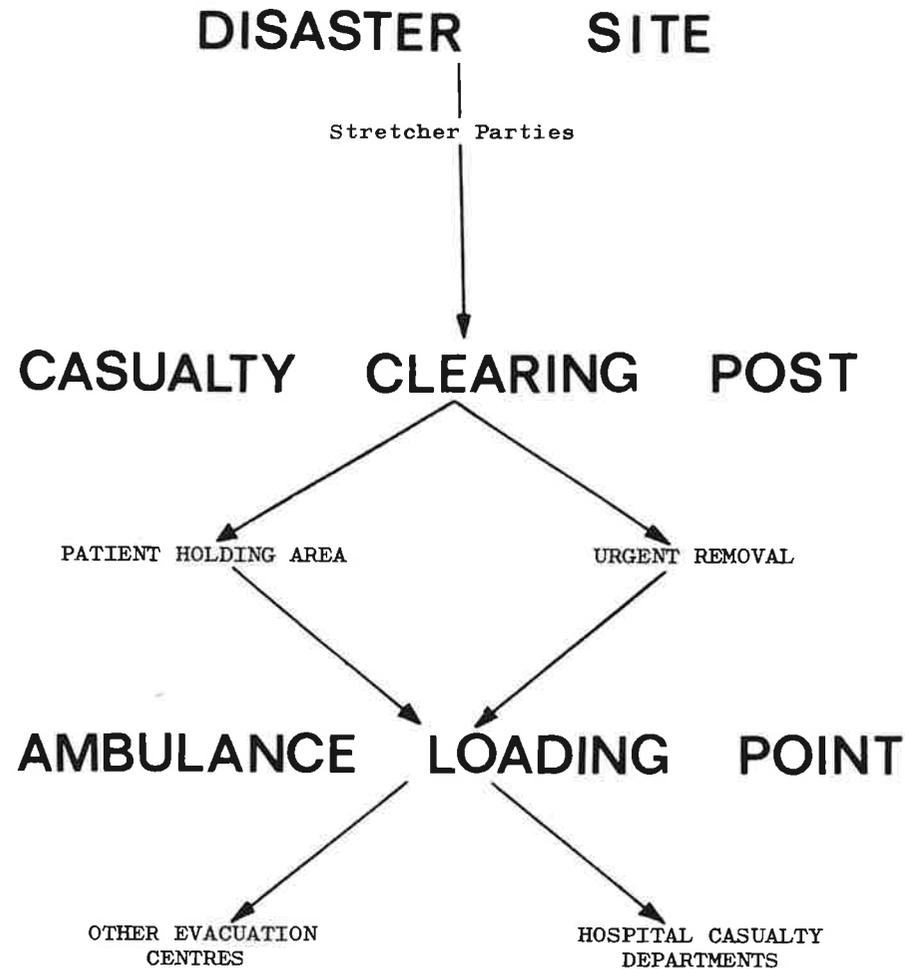


Figure 72 Disaster Plan showing Casualty Flow

AIM

Adequate first aid and continued life support treatment, evacuation and reception of casualties.

PRINCIPLES

The following four basic principles must be observed :

1. Central control.
2. Full use of available resources.
3. Steady rate of casualty evacuation.
4. Appropriate rate of delivery of casualties to hospitals.

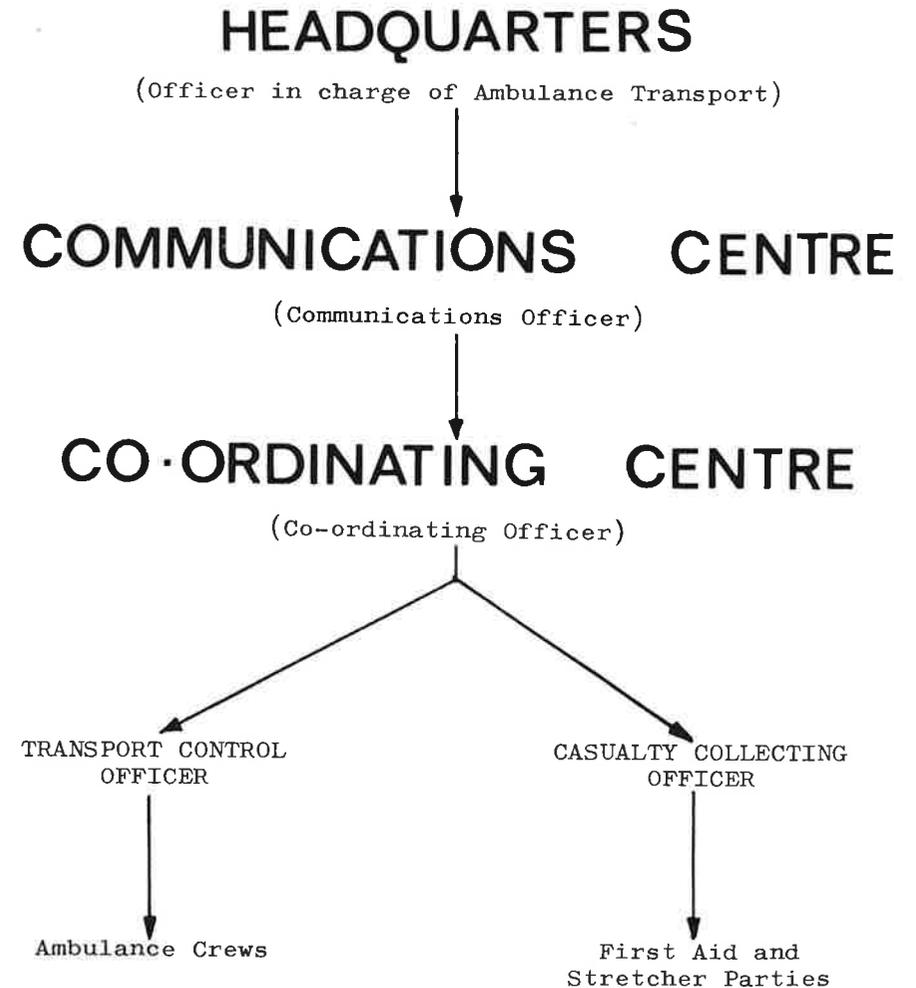


Figure 73 Disaster Plan showing Command Structure

OPERATION

PHASE 1—IMMEDIATE ACTION

ACTION BY COMMUNICATIONS OFFICER

1. Despatch ambulances and Ambulance Officers to the scene, where possible providing one ambulance to every two anticipated casualties, bearing in mind that a percentage of the total number involved will be walking cases and that these may be conveyed by other transport.

2. Notify the Officer in charge of Ambulance Transport who may nominate a senior officer to be sent to the scene to assume the role of Co-ordinating Officer.
3. Check that Police and hospitals have been informed.
4. In country areas, the Duty Transport Officer (Adelaide) must be notified as soon as possible.
5. Withhold information from the press and other news media.
6. If there are insufficient vehicles available to remove all casualties in one lift, despatch suitable vehicles and stores to establish a Casualty Clearing Post. Take such steps as are necessary to send pre-arranged medical aid teams to the scene.
7. Maintain a small reserve to fulfil normal ambulance requirements.

ACTION BY THE FIRST AMBULANCE OFFICERS AT THE SCENE

These men are responsible for early organisation at the scene and for the institution of immediate life saving treatment where required. They will make use of bystanders to assist in stretcher carrying and other relatively unskilled activities.

- A. One will assume the role of CASUALTY COLLECTING OFFICER (C.C.O.). He will :
 1. Quickly assess the number of stretcher and sitting casualties and report this information to Headquarters. (Remember that the casualties are often scattered over a greater area than is immediately obvious.)
 2. Select a suitable site for the Casualty Clearing Post (C.C.P.). All walking patients should be gathered at this point.
 3. Classify casualties into two groups :
 - (a) Those requiring urgent removal.
 - (b) Those whose removal is not urgent.
 The former group may be designated by the pinning of a red tag to their clothing.
 4. Direct trained personnel to the most urgent cases.
 5. Where practicable arrange to have the less urgent patients gathered at the Casualty Clearing Post under the best medical or nursing care available.
- B. Another will assume the role of TRANSPORT CONTROL OFFICER (T.C.O.) and will :
 1. Select a suitable Ambulance Loading Point (A.L.P.).
 2. Select access routes and if necessary establish an Ambulance Holding Point. Police or bystanders should be asked to help in the maintenance of these routes.

3. Ensure that each ambulance is fully and efficiently loaded in turn and that casualty evacuation proceeds at a steady, controlled rate.
4. Select a suitable person to record the name and brief details of each casualty and his destination.
5. Ensure that ambulances are sent to hospitals most suitable for the treatment of the casualty's injuries. Bear in mind that :
 - (a) At any hospital there is a maximum admission rate which cannot be exceeded. For large hospitals this is usually about 30 per hour. For hospitals of 50 to 100 beds it is about 10 to 15 per hour and for small country hospitals may be as low as 3 or 4 per hour.
 - (b) The surgical facilities of smaller hospitals are adequate for such injuries as simple lacerations and minor fractures, but that head and chest injuries must have priority at hospitals with surgeons who specialise in the treatment of injuries of this nature.
6. Ensure that information regarding the number of casualties despatched to each hospital and the number of those still awaiting transport is relayed continuously to the control centre.

ACTION BY THE OFFICER IN CHARGE OF AMBULANCE TRANSPORT AT HEADQUARTERS

This is the most senior officer available at the time from within the ambulance service primarily involved. When a larger service is called in to assist, a senior officer will be designated and despatched to the scene. He will liaise with the existing Ambulance Co-ordinator to ensure efficient management.

Normally his place is at Ambulance Headquarters where he should have the best means of communication with the disaster area, hospitals, police and other services.

1. After assessing the nature of the disaster, alert or call out emergency vehicles, volunteers and/or neighbouring ambulance services as required.
2. Check that the Communications Officer has taken the steps listed above. He may nominate a Co-ordinating Officer as stated above.
3. Obtain accurate information concerning the available patient accommodation of the appropriate hospitals and their estimated maximum rate of admission.

With the assumption of Headquarters control by the Officer in Charge, the operation will enter Phase 2.

PHASE 2—CONTINUING ACTION

THE CO-ORDINATING OFFICER is in charge of the organisation at the scene. He will:

1. Establish a Co-ordinating Centre.
2. Appoint a Transport Control Officer and a Casualty Collecting Officer. In large disasters these positions may be specially selected, but as suggested above, a temporary Transport Control Officer and Casualty Collecting Officer will have been acting already.
3. Establish a communications system with the Communications Officer and with Headquarters, and relay appropriate information from time to time.
4. Contact senior representatives of other services at the scene.
5. Ensure that an effective operation is in progress and develop the plan to maximum efficiency.

The OFFICER IN CHARGE OF AMBULANCE TRANSPORT AT HEAD-QUARTERS will:

1. Accept responsibility for the whole operation.
2. Handle press and public information.
3. Call outside help if required.
4. Maintain communications with the hospitals and with the Co-ordinating Officer, ensuring that the rate of delivery of patients to casualty departments is appropriate.
5. Start early to plan for feeding and relieving crews as necessary.
6. Be available for any other problems that may arise.

THE COMMUNICATIONS OFFICER will:

1. Maintain a link between Headquarters and the scene of the disaster.
2. Co-ordinate and record the movement of all ambulance transport.

MEDICAL AID TEAMS AT THE SCENE

It should be assumed that Medical Aid Teams will not be present and therefore procedures should not be based upon their probable attendance. It is the duty of the Co-ordinating Officer and the Casualty Collecting Officer to point out those patients they consider most likely to benefit from medical attention in the event of arrival of medical aid support.

PHASE 3—CLEAR UP

When all casualties have been evacuated it is the responsibility of the Co-ordinating Officer to make a final check of the scene and to advise Headquarters that all is clear. He is also responsible for the return of all stores and equipment. It may be possible to obtain a check list of persons likely to have been injured and to compare this with the list of casualties evacuated.

Glossary

ABSORB—incorporate into the body.
ADSORB—attract to a surface.
ALVEOLAR—pertaining to alveoli.
ALVEOLI—air cells in the lungs.
ANAEMIA—a reduction in the haemoglobin concentration of the blood.
ANAPHYLACTIC SHOCK—severe allergic reaction.
ANAPHYLAXIS—shock-like reaction due to increased sensitivity to a substance.
ANGINA PECTORIS—pain caused by myocardial ischaemia.
ARRHYTHMIA—lack of rhythm.
ARTERIOSCLEROSIS—a degenerative change in arteries.
ASPHYXIA—suffocation, lack of oxygen.
AUSCULTATORY—listening.

BARBITURATE—a drug used as a hypnotic or sedative.
BRACHIAL ARTERY—the main artery of the upper arm.
BRADYCARDIA—slow heart rate.
BREECH PRESENTATION—in childbirth when the baby's buttocks emerge first.
BREECH PRESENTATION—in childbirth, when the baby's buttocks emerge first.

CARDIAC—pertaining to the heart.
CARDIO-VASCULAR—pertaining to the heart and blood vessels.
CAROTID—an artery in the neck.
CENTRAL NERVOUS SYSTEM—the brain and spinal cord.
CEREBRAL COMPRESSION—compression of the brain within the skull, for example by haemorrhage.
CEREBRO-VASCULAR—pertaining to the blood vessels in the brain.
CERVICAL—pertaining to the neck.
CHEYNE-STOKES RESPIRATION—breathing characterised by periods of noisy respiration interrupted by periods when the patient does not breathe for a time.
CLAVICLE—collar bone.
COAGULATION—clotting.
COMA—state of unconsciousness.
CONCUSSION—severe shaking of the brain which may result in temporary loss of consciousness.
CONJUNCTIVA—membrane covering the front of the eye.
CONTUSION—a bruise.
CORONARY—pertaining to the heart or the arteries which supply it.
CYANOSIS—blue discolouration of the skin.

DIASTOLE—the period between heart beats when the heart muscle is relaxed.
DIASTOLIC—relating to diastole.
DILATED—stretched open.
DURA—one of the layers covering the brain and spinal cord.
DYSпноEA—difficult breathing.

ECLAMPSIA—a condition which may occur during pregnancy and which is characterised by high blood pressure and fluid retention in the mother.
ECLAMPTIC FIT—a convulsion occurring during late pregnancy.
EMBOLUS—a portion of foreign material present in the circulation. It may be a blood clot, an air bubble or a fat globule.
EMPHYSEMA—a lung condition characterised by distension of the air spaces.
EPITHELIAL—relating to the skin and the lining of the respiratory, digestive and urinary tracts.
EXTRADURAL—outside the dura.

FEMUR—thigh bone.
FIBRILLATION—irregular twitching of muscle.
FIBULA—the thinner and more lateral of the two long bones of the lower leg.

GLOSSARY—a collection of explanations of the hard words.
GLUCOSE—a form of sugar.

HAEMATEMESIS—the vomiting of blood.
HAEMATOMA—a collection of blood in the tissues.
HAEMOGLOBIN—the oxygen carrying pigment in the blood.
HAEMOPTYSIS—the coughing of blood from the lungs.
HAEMORRHAGE—bleeding.
HAEMOTHORAX—blood in the pleural space.
HEMIPARESIS—weakness of one side of the body.
HEMIPLEGIA—paralysis of one side of the body.
HERNIA—abnormal protrusion of an organ outside its normal containing cavity.
HYPERTENSION—high blood pressure.
HYPERVENTILATE—to take rapid deep breaths.
HYPOGLYCAEMIA—low blood sugar level.
HYPOVOLAEMIC—low blood volume.

INTRATHORACIC—within the thorax.
ISCHAEMIA—reduction in blood supply due to obstruction of an artery.
ISCHIAL—relating to the ischium.
ISCHIUM—the part of the bony pelvis upon which the body rests when sitting.

LACERATION—a cut.
LARYNGEAL—pertaining to the larynx or voice box.
LATERAL—to the side.
LITRE—1 litre = 1000 ml = 1 $\frac{3}{4}$ pints.
LUMBAR REGION—the lower part of the back.

MEDIASTINUM—the tissues supporting the heart and extending from the sternum to the vertebral column.

MENINGES—the membranes, including the dura, covering the brain and spinal cord.

MENINGITIS—an inflammation of the meninges.

MENSTRUAL BLEEDING—the normal recurrent monthly discharge of blood from the uterus.

MYOCARDIAL—pertaining to the heart muscle.

MYOCARDIAL INFARCTION—death of heart muscle due to blockage of a coronary artery.

MYOCARDIUM—heart muscle.

NEONATE—a baby less than one month old.

NORMAL SALINE—saline of 0.9 per cent strength.

OEDEMA—an abnormal accumulation of fluid in the tissues.

OESOPHAGUS—the gullet, the food tube which extends from pharynx to stomach.

OPEN PNEUMOTHORAX—air in the pleural space as a consequence of a penetrating injury to the chest wall.

ORO-PHARYNGEAL—pertaining to the mouth and pharynx.

PAEDIATRIC—relating to children.

PALLOR—paleness.

PALPABLE—capable of being touched or felt.

PALPATORY—using the sensation of touch.

PHARYNX—the air space behind the mouth and nose.

PLEURA—the membrane lining the outside of the lungs and the inside of the chest wall.

PLEURAL SPACE—the space (normally non-existent) between the lung and chest layers of the pleura.

PNEUMONIA—lung infection.

PNEUMOTHORAX—air in the pleural space.

PROLAPSED CORD—the condition in which part of the umbilical cord is delivered before the baby is born.

PULMONARY—pertaining to the lungs.

PUPIL—the aperture (black central hole) of the eye.

SALINE—salt solution.

SEPTICAEMIA—disease produced by germs in the blood stream.

SPHYGMOMANOMETER—instrument for measuring blood pressure.

STERNUM—the breast bone.

SUB-CONJUNCTIVAL—underneath the conjunctiva.

SUBDURAL—beneath the dura.

SURGICAL EMPHYSEMA—an abnormal collection of air in the tissues beneath the skin.

SYSTOLE—the period during a heart beat when the heart muscle is contracted.

SYSTOLIC—relating to systole.

TACHYPNOEA—rapid breathing.

TENSION PNEUMOTHORAX—air under pressure in the pleural space.

TETANY—a condition which may be caused by hyperventilation and which is characterised by cramps and "pins and needles" sensations in the hands and feet.

THORACIC—pertaining to the chest.

THROMBOSIS—the formation of a blood clot.

TRACHEA—wind pipe.

TRACHEAL TUG—jerking movement of the trachea seen in casualties with gasping respiration.

TRAUMA—injury.

URETHRA—the tube leading from the bladder to the exterior.

UTERUS—womb.

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