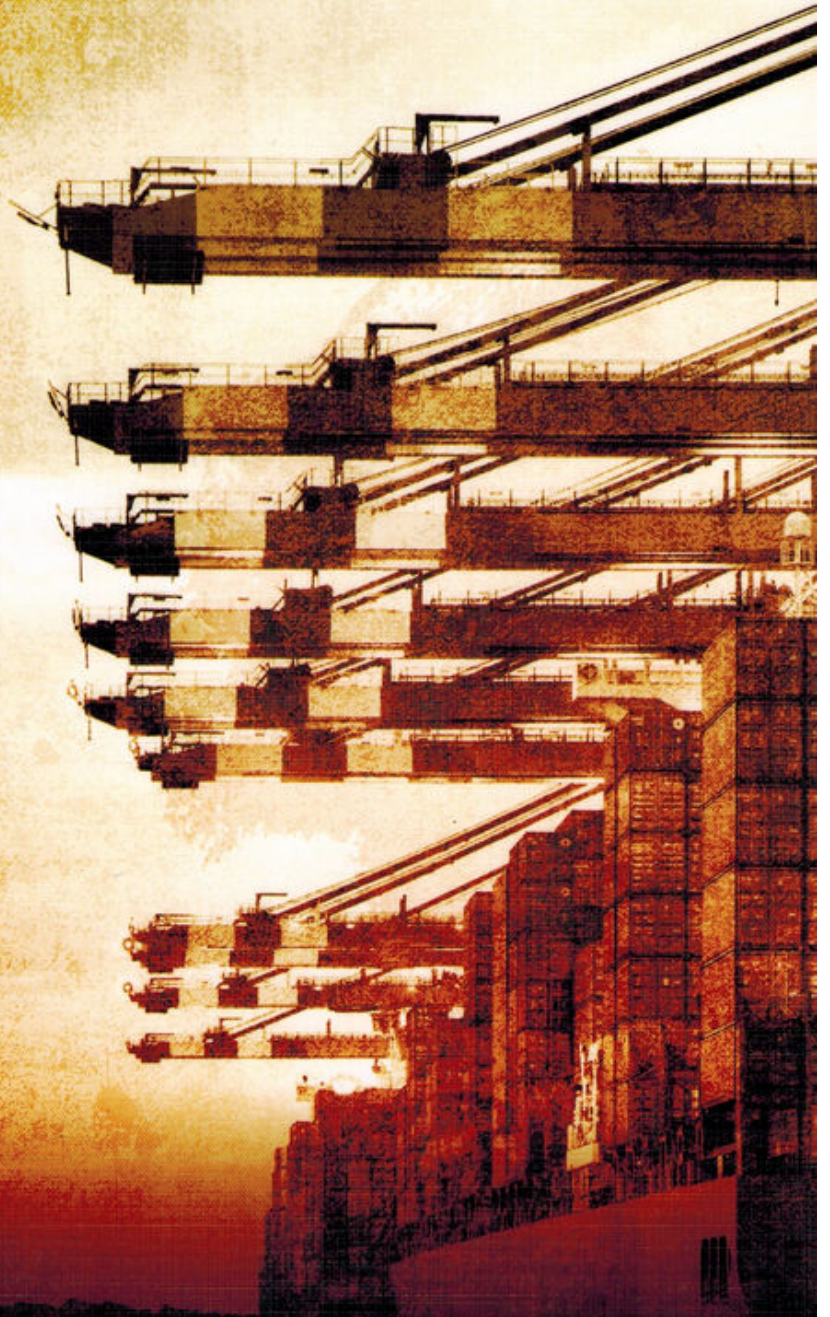


IMDG CODE

INTERNATIONAL MARITIME
DANGEROUS GOODS CODE

2014 EDITION
SUPPLEMENT



MEDICAL FIRST AID GUIDE
FOR USE IN ACCIDENTS INVOLVING DANGEROUS GOODS
(MFAG)

Foreword

The IMO/WHO/ILO *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)* is the Chemicals Supplement to the *International Medical Guide for Ships (IMGS)** which is published by the World Health Organization (WHO), Geneva.

* *International Medical Guide for Ships*, 3rd edition (World Health Organization, Geneva, 2007), ISBN 978-92-4-154720-8.

This revised text of the Guide was adopted by the Maritime Safety Committee in May 1998, for use in association with Amendment 30-00 of the IMDG Code, and will be further amended as and when necessary.

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INTRODUCTION

The IMO/WHO/ILO *Medical First Aid Guide for Use in Accidents Involving Dangerous Goods* (MFAG) refers to the substance, material and articles covered by the International Maritime Dangerous Goods Code (IMDG Code), and the materials covered by Appendix B of the Code of Safe Practice for Solid Bulk Cargoes (BC Code). It is intended to provide advice necessary for initial management of chemical poisoning and diagnosis within the limits of the facilities available at sea.

This Guide should be used in conjunction with the information provided in the IMDG Code, the BC Code, the Emergency Procedures for Ships Carrying Dangerous Goods (EmS), the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code), and the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

The MFAG itself gives general information about the particular toxic effects likely to be encountered. **The treatment recommended in this Guide is specified in the appropriate tables and more comprehensive in the appropriate sections of the Appendices.** However, differences exist between countries on certain types of treatment and where these differences occur they are indicated in the relevant national medical guide.

Treatments in this guide cater for the accidental human consequences of the carriage of dangerous goods at sea. Accidental ingestion of toxic substances during voyage is rare. The guide does not cover ingestion by intention.

Minor accidents involving chemicals do not usually cause severe effects provided that the appropriate first aid measures are taken. Although the number of reported serious accidents is small, accidents involving those chemicals which are toxic or corrosive may be dangerous, and must be regarded as being potentially serious until either the affected person has completely recovered, or medical advice to the contrary has been obtained.

Information on the treatment of illnesses which are of a general nature and not predominantly concerned with chemical poisoning may be found in the ILO/IMO/WHO *International Medical Guide for Ships* (IMGS).

HOW TO USE THIS GUIDE

In any case of exposure, start with Emergency Action and act as advised.

For the convenience of users, and to ensure rapid access to the recommendations in an emergency, this Guide is divided into sections which are grouped to facilitate a three step approach.

Step 1: Emergency Action and diagnosis

Step 2: Tables

Step 3: Appendices

Start here!

The Tables give brief instructions for special circumstances.

The Appendices provide comprehensive information, a list of medicines/drugs, and a list of chemicals referred to in the tables.

NOTE: The **list of chemicals** is limited to those few chemicals requiring special treatment. The list is given both in alphabetical and numerical order (UN No) in [Appendix 15](#) to this guide.

Emergency action

Does the casualty need to be rescued from a polluted atmosphere?

—— YES ——>

Go to [Table 1](#)

NO



V

Has breathing stopped?

—— YES ——>

Go to [Tables 2 and 3](#)

NO



V

Is the casualty unconscious?

—— YES ——>

Go to [Table 4](#)

NO



V

Is the casualty convulsing (fitting)?

—— YES ——>

Go to [Table 5](#)

NO



V

Are the eyes contaminated?

—— YES ——>

Go to [Table 7](#)

NO



V

Is the skin contaminated?

—— YES ——>

Go to [Table 8](#)

NO



V

Has the chemical been inhaled?

—— YES ——>

Go to [Table 9](#)

NO



V

Has the chemical been ingested?

—— YES ——>

Go to [Table 10](#)

NO



V

Is there severe pain?

—— YES ——>

Go to [Table 13](#)

NO

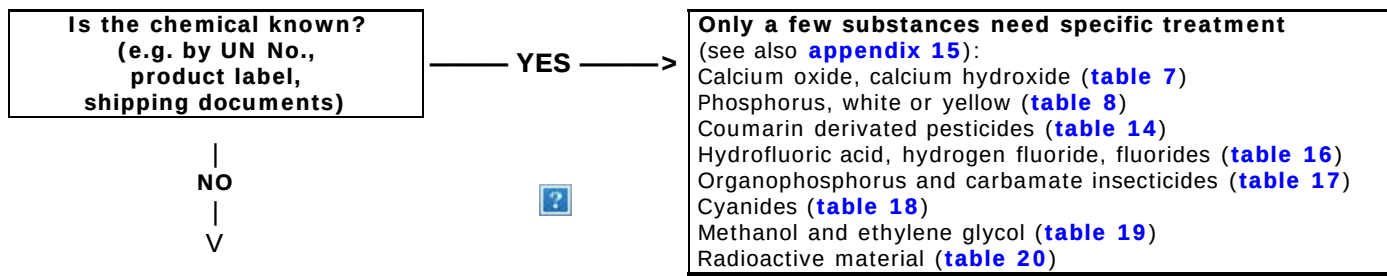
Proceed to diagnosis

Diagnosis

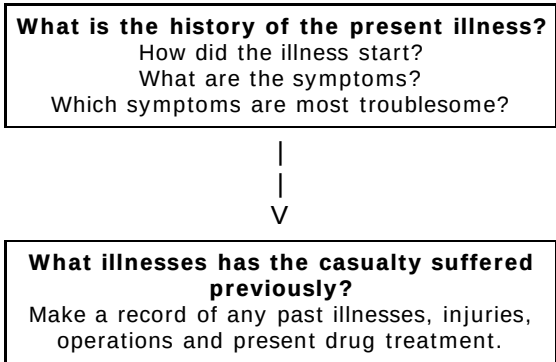


Documents

Document Sharing Hub



What is the casualty's present state?	
Breathing is rapid, shallow, irregular or deep:	—> Table 3 and Appendix 3
The casualty has a cough, wheezing, hoarseness or severe breathlessness :	—> Table 9 and Appendix 9
The pulse is slow, weak or rapid:	—> Table 11 and Appendix 11
Blisters, burns or frostbite are present:	—> Table 8 and Appendix 8
The casualty is in a coma :	—> Table 4 and Appendix 4
The casualty has convulsions (seizures, fits) :	—> Table 5 and Appendix 5
The casualty is vomiting :	—> Table 10 and Appendix 10
The casualty is restless, excited, confused or hallucinating :	—> Table 6 and Appendix 6
The casualty is jaundiced (yellow discoloration of skin or eyes):	—> Table 15
Urine output is decreased or absent:	—> Table 12 and Appendix 12
Blood is in the urine, vomit, or stool; the gums are bleeding; there are small haemorrhages (petechia) in the skin:	—> Table 14



TABLES

TABLE 1
RESCUE

Rescuers must be adequately protected from exposure before entering a contaminated area in order to avoid injury. When a chemical is unidentified, worst-case assumptions concerning toxicity must be assumed.

ARRIVAL AT SCENE

• Upon arrival at the scene, an initial assessment of the situation should be made and the size of the incident should be determined.

Rescuers must **NOT**:

- Enter a contaminated area without using a pressure demand self-contained breathing apparatus and wearing full protective clothing;
- Enter an enclosed space unless they are trained members of a rescue team and follow correct procedures;
- Walk through any spilled materials;

- Allow unnecessary contamination of equipment;
- Attempt to recover shipping papers or manifests from contaminated area unless adequately protected;
- Become exposed while approaching a potentially contaminated area;
- Attempt rescue unless trained and equipped with appropriate personal protective equipment (PPE) and protective clothing for the situation.

QUICKLY ESTABLISH AN EXCLUSION OR HOT ZONE

- Assume that anyone leaving the Exclusion Zone is contaminated and should be assessed and decontaminated, if necessary.
- Do not remove non-ambulatory casualties from the Exclusion Zone unless properly trained personnel with the appropriate PPE are available and decontamination has been accomplished.

INITIAL TRIAGE OF CASUALTIES (SORTING AND PRIORITY)

One unconscious casualty

- Give immediate treatment to the unconscious casualty only, and
- Send for help.

Several unconscious casualties

If there is more than one unconscious casualty:

- Send for help, and
- Give appropriate treatment to the worst casualty in the priority order of:
 - 1 Casualties who have stopped breathing or have no pulse (see [Table 2](#))
 - 2 Casualties who are unconscious (see [Table 4](#)).

Casualty is unconscious but breathing

If the casualty is unconscious or cyanotic (bluish skin) but breathing, connect to portable oxygen.

Neck or back trauma

Apply neck and back support before moving casualty if there is any question of neck or back trauma.

Priority: Airway, Breathing, Circulation (A-B-C)

Initial management of **A**irway, **B**reathing and **C**irculation (A-B-C, see [Table 2](#)) is all that should be undertaken while there is potential for further injury to the casualty or to response personnel.

Gross decontamination

If the casualty is contaminated with chemicals, gross decontamination should be performed.

- Cut away or remove all suspected contaminated clothing, including jewellery and watches.
- Brush or wipe off any obvious contamination.
- Care should be taken to protect open wounds from contamination.
- Every effort should be made by personnel to avoid contact with potentially contaminated casualties. Rescuers should wear protective clothing, if necessary.
- Cover or wrap casualty to prevent spread of contamination.

Removal of casualties from Exclusion Zone

Once gross decontamination has been performed, the casualties should be removed from the Exclusion Zone.

- If casualties can walk, lead them out of the Exclusion Zone to an area where decontamination and further evaluation can take place.
- If casualties are unable to walk, remove them on stretchers. If stretchers are unavailable, carefully carry or drag casualties to an area where decontamination and further evaluation can take place.

DECONTAMINATION

Decontaminate from head down.

- Take care not to introduce contaminants into open wounds.

- Decontaminate exposed wounds and eyes before intact skin areas.
- Cover wounds with a waterproof dressing after decontamination.

For external contamination, begin with the least aggressive methods.

- Limit mechanical or chemical irritation of the skin.
- Wash contaminated area gently under a stream of water for at least ten minutes, and wash carefully with soap and warm (never hot) water scrubbing with a soft brush or surgical sponge.

Reduce level of contaminants

- Remove contaminants to the level that they are no longer a threat to casualty or response personnel.
- Isolate the casualty from the environment to prevent the spread of any remaining contaminants.

Contain runoff, bag contaminated clothing

- If possible, contain all runoff from decontamination procedures for proper disposal.
- Ensure that all potentially contaminated casualty clothing and belongings have been removed and placed in properly labelled bags.

SUMMARY OF TREATMENT OF CASUALTIES

- Assign highest priorities to Airway, Breathing, Circulation (ABC) and then decontamination.
- Complete primary and secondary assessments as conditions allow.
- Obtain information on chemical(s) to which the casualty has been exposed from shipping papers, labels or other documents.
- If there are multiple casualties, direct attention to the most seriously affected individuals first.
- Treat symptoms and signs as appropriate and when conditions allow.
- Obtain RADIO MEDICAL ADVICE when conditions allow.
- Perform invasive procedures only in uncontaminated areas.
- Reassess the casualty frequently because many chemicals have latent physiological effects.
- Delay preventive measures until the casualty is decontaminated.

TRANSFER TO SHIP'S HOSPITAL

- Casualties who have been stabilized (airway, breathing and circulation) and decontaminated can be transported to the ship's hospital for further evaluation.

Further advice: see [Appendix 1](#)

**TABLE 2
CPR (CARDIO-PULMONARY RESUSCITATION)**

Basic life support comprises the "A-B-C" steps which concern the airway, breathing, and circulation respectively.

Basic life support is indicated for:

- A**irway obstruction
- B**reathing (respiratory) arrest
- C**irculatory or cardiac arrest.

Any inadequacy or absence of breathing or circulation must be determined immediately.

Assessment of breathing

- Tilt the head firmly backwards with one hand while lifting the neck with the other hand to relieve obstructed breathing.
- Pull the tongue forward.
- Suck or swab out excess secretions.
- Clean any vomit from the mouth and back of the throat. Remove any loose dentures.
- Listen and feel for any movement of air, because the chest and abdomen may move in the presence of an obstructed airway, without moving air. The rescuer's face should be placed close to the casualty's nose and mouth so that any exhaled air may be

felt against the cheek. Also the rise and fall of the chest can be observed and the exhaled breath heard.

- Look, listen and feel for five seconds before deciding that breathing is absent.



Assessment of heart function

- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation.



FULL ADVICE ON CPR: see [APPENDIX 2](#)

SIGNS & SYMPTOMS

TREATMENT

Breathing, heart is beating, unconscious

- Place casualty in the recovery position.



- Remove any loose dentures.
- Clean any vomit from the mouth and back of the throat.

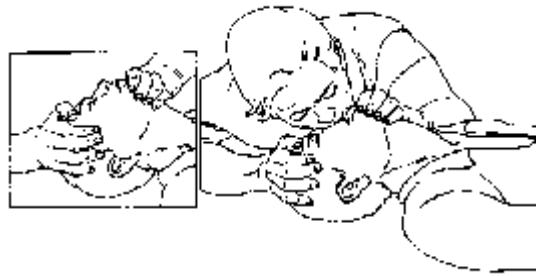
Further advice on the **unconscious casualty**: See [Table 4](#)

- Once a clear and open airway is established, insert a Guedel airway: See [Appendix 3](#)



Not breathing but heart is beating

- Begin artificial respiration; mouth-to-mouth or mouth-to-nose respiration.



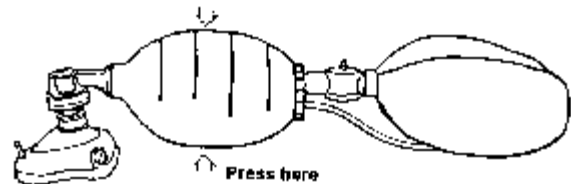
- Give four quick breaths and continue at a rate of 12 inflations per minute.
- Chest should rise and fall. If it does not, check to make sure the casualty's airway is clear and open.



- Do not use mouth-to-mouth respiration if the casualty was exposed to cyanides, organophosphates or radiation to prevent rescuer from being exposed.



- Meanwhile, install bag-valve-mask and oxygen supply for continued controlled ventilation. Give oxygen unless there is a danger of fire or explosion.



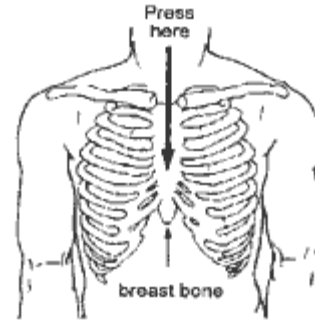
Further advice on **Oxygen Administration**: See [Table 3](#)

Breathing and heart have stopped

- Begin CPR immediately. If possible, use two rescuers. Don't delay. One rescue can do the job.

Locate the pressure point (lower half of breast bone: about 4 cm from the tip of the breast bone).

Depress breast bone 4 to 5 cm (80 to 100 times per minute).



If one rescuer:

15 heart compressions and 2 very quick lung inflations.

If two rescuers:

5 heart compressions and 1 lung inflation.

**TABLE 3
OXYGEN ADMINISTRATION AND CONTROLLED VENTILATION**

Oxygen is necessary for life. Some intoxications may interfere with normal oxygenation of the blood or tissues. In particular, oxygen can be lifesaving to casualties who have inhaled smoke and other toxic gases but it needs to be given with all speed. **Basic training is required to administer oxygen.**

Diagnosis

- There is difficulty in breathing with an increased rate at first (over 30 per minute). Later it may become slow and stop.
- The pulse is rapid, usually over 100 per minute.
- There is blueness of the skin with purple lips and tongue.
- The casualty may be agitated at first but become apathetic, with muscular weakness. Unconsciousness may follow this.
- The pupils of the eyes will react to light at first. If they become large and do not react to light, life is in danger.

Lack of oxygen is an emergency

Treatment

- Give oxygen by means of a face mask. It makes assisted or controlled ventilation possible. It is better to have the casualty well oxygenated with controlled artificial respiration than to have him poorly oxygenated from breathing spontaneously.
- Place a mask over the nose and mouth. It is essential that the face mask is held firmly in place so as to avoid leakage.



- Check that the equipment is correctly assembled according to the manufacturer's instructions and that sufficient oxygen is contained in the cylinder (a cylinder of 2.5 litre capacity, filled under a pressure of 200 bar, delivers 500 litres oxygen).

Full advice on **Oxygen Administration**: See [Appendix 3](#)

The commonest emergency requiring medical assistance on board is **toxic gas inhalation from fires or specific toxic gases**. Combustion in fires on board may well involve substantial release of carbon monoxide and hydrogen cyanide. In these cases oxygen should be given at a flow rate of eight litres per minute.

In life-threatening conditions, such as lung oedema or circulatory failure, oxygen should also be given at a flow rate of eight litres per minute.

Warning: Smoking, a naked flame or light fires must not be allowed in the same room during the administration of oxygen, because of

the risk of fire.

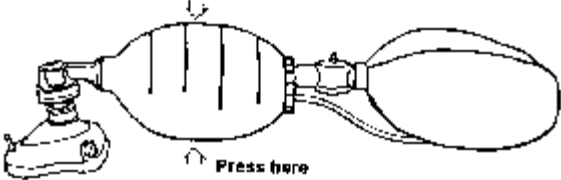
SIGNS & SYMPTOMS	TREATMENT
Not breathing but heart is beating	• Ensure that a clear airway has been established. • A Guedel airway should be inserted. If insertion of an airway cannot be achieved, the chin should be pulled forward throughout the administration of oxygen. If the casualty has seizures due to the lack of oxygen, administration of oxygen may be difficult but is essential.  • Use a positive pressure manual operated oxygen resuscitator in accordance with manufacturer's instruction.  • Give oxygen at a flow rate of 8 litres per minute. The bag should be squeezed steadily and firmly and released about 12 times a minute. • Always maintain a regular check on the pulse in the neck. The absence of a pulse indicates the need for 15 chest compressions to every two inflations. • If gagging occurs, remove the airway. • Once the casualty is breathing spontaneously, put him in the recovery position.
Breathing is difficult	• Make sure difficulty in breathing is not due to airway obstruction: See Table 2 • The casualty should be connected to an oxygen giving set through a simple disposable face mask (non-venturi type) placed securely over the face. • Oxygen should be used at a flow rate of 6-8 litres per minute. • Oxygen should be continued until the casualty no longer has difficulty in breathing and has a normal healthy colour.

TABLE 4
CHEMICAL-INDUCED DISTURBANCES OF CONSCIOUSNESS

Chemicals, whether inhaled, ingested or absorbed through the skin, can either depress or excite the brain. In cases of severe poisoning, the casualty may not only be unconscious but breathing may also be depressed or absent. Fortunately, in most cases, symptoms usually resolve rapidly when the casualty is removed from the polluted environment.

SIGNS & SYMPTOMS	TREATMENT
Drowsy but breathing adequately	• After removal of the casualty from the polluted environment, eye and skin decontamination should be undertaken, if necessary. • After decontamination the casualty should be observed in a place of safety for at least eight hours. Usually no specific treatment is necessary.

Increasing loss of consciousness but breathing adequately

- Place casualty in the recovery position.



- Remove any loose dentures.
- Clean any vomit from the mouth and back of the throat.
- Turn casualty face down, head to one side as pictured; no pillows should be used under the head.
- Clear out any vomit in the mouth as soon as vomiting occurs.
- The casualty must never be left alone or unwatched in case he vomits, has a fit or may fall out of his bunk.
- Turn the casualty gently every three hours and roll him smoothly from one side to the other.

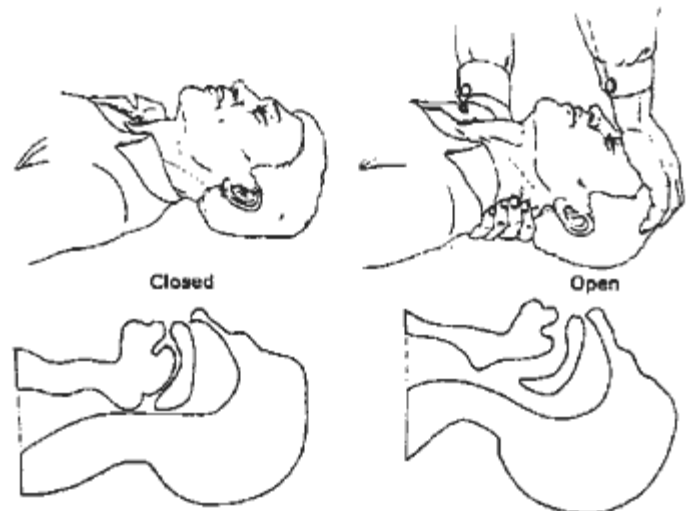


- The head must always be kept back with a chin-up position when actually turning, and, at no time must the head be allowed to bend forwards with the chin sagging.
- If possible insert a Guedel airway.

• RADIO FOR MEDICAL ADVICE IN ALL CASES

Unconsciousness with less than eight respirations of normal depth per minute

- Place the casualty on his back.
- Tilt the head firmly backwards with one hand while lifting the neck with the other hand to relieve obstructed breathing.



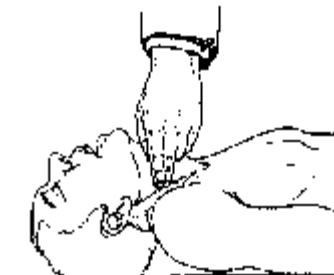
- Once a clear and open airway is established, insert a Guedel airway: See [Appendix 3](#)



- Administer controlled ventilation.

Further advice on controlled ventilation: See [Table 3](#)

- Check for a pulse. The best pulse to feel in an emergency is the carotid. Feel for five seconds before deciding it is absent. If it cannot be felt or is feeble, there is insufficient circulation.



- It should be felt after the first minute of artificial respiration and checked every two minutes thereafter.
- **If morphine has been administered: See [Table 13](#)**
- **RADIO FOR MEDICAL ADVICE IN ALL CASES**

Prolonged coma with or without breathing difficulty

- **RADIO MEDICAL ADVICE IN ALL CASES**

- Regularly assess that breathing is adequate. Give ventilation support with eight litres of oxygen per minute if the victim does not breathe adequately.

Further advice on **care of unconscious casualties**: See [Appendix 4](#)

Toxic mental confusion (agitation, hallucinations)

- If the casualty is difficult to manage give diazepam 10 mg as rectal solution.

Further advice on treatment of agitation and hallucinations: See [Table 6](#)

Convulsions (Seizures, Fits)

- Ensure that there are no hard or sharp objects in the vicinity so that the victim will not injure himself.
- Give diazepam 10 mg as rectal solution.
- **RADIO FOR MEDICAL ADVICE**
- If medical advice is unavailable and seizures continue give a further 10 mg diazepam as rectal solution after 30 minutes.

Further advice on **treatment of convulsions**: See [Table 5](#)

TABLE 5
CHEMICAL-INDUCED CONVULSIONS (SEIZURES, FITS)

The main risk of convulsions is impaired ventilation (leading to inadequate oxygen supply to tissues). During a convulsion the casualty may hurt himself. Convulsions may be delayed for hours after exposure to certain chemicals.



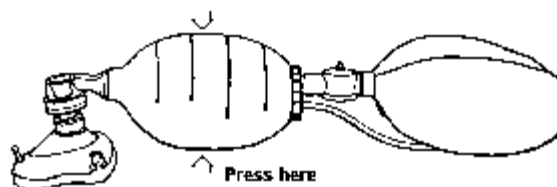
SIGNS & SYMPTOMS	TREATMENT
Single convulsions of short duration Convulsions may also occur in regular heavy drinkers within about two days after sharply decreased alcohol consumption. Other signs such as hyperexcitability, sleep disturbances, or generalized tremor may indicate a withdrawal syndrome.	• Remove the casualty to the ship's hospital. • Prevent the casualty from hurting himself. • Never restrain the casualty forcibly, as this may cause injury. • Ensure that there are no hard or sharp objects in the vicinity so that the victim will not injure himself. • Protect the airway from being blocked by the tongue or secretions. • Surround him with pillows, clothing or other soft material. • After the fit is over, let the casualty sleep it off as he may be rather confused and dazed when he comes round. Reassure him, and do not leave him until you are sure he is aware of his surroundings, and knows what he is doing. • RADIO FOR MEDICAL ADVICE
Frequent or continuous convulsions	• Place casualty in the recovery position.



- Give diazepam 10 mg as rectal solution.
- **RADIO FOR MEDICAL ADVICE**
- If medical advice is unavailable and seizures continue give a further 10 mg diazepam as rectal solution after 30 minutes.
- Stabilize the cervical spine with a collar if trauma is suspected.

Further advice on **convulsions**: See [Appendix 5](#)

- Give ventilation support with eight litres of oxygen per minute if the victim does not breathe adequately.
- Administer controlled ventilation.



Further advice on **oxygen administration**: See [Table 3](#)

- After the fit is over, let the casualty sleep it off as he may be rather confused and dazed when he comes round. Reassure him, and do not leave him until you are sure he is aware of his surroundings, and knows what he is doing.

TABLE 6
TOXIC MENTAL CONFUSION

Exposure to chemicals and solvents including alcohol and illicit substances may result in disorientation in time and space. In these circumstances, the casualty will usually develop the signs and symptoms within 15 to 30 minutes of exposure. Sudden cessation of heavy alcohol consumption may also cause toxic mental confusion.

SIGNS & SYMPTOMS

The casualty confuses the day of the week, the month of the year or where they are at that moment in time

Agitation (Mental agitation, aggressive and sometimes violent behaviour)

Agitation, convulsions

Excessive exposure to chemicals may lead to convulsions (fits).

Hallucinations (hearing voices and/or seeing terrifying images)

Sometimes mental illness may confuse the issue. Schizophrenia often results in hearing voices that are not there.

* Note: If administration of diazepam as rectal solution is not possible, give haloperidol 5 mg intramuscularly. Haloperidol (e.g. HALDOL™) may be available in the ship's ordinary medicine chest.

TREATMENT

- There is a risk of loss overboard. The person should be kept under close observation in a locked well lit cabin and given repeated reassurance.
- After removal of the casualty from the polluted atmosphere no specific treatment is usually necessary.

- If the casualty is difficult to manage, give diazepam 10 mg as rectal solution.*

- Repeat, if necessary, 10 mg diazepam 30 minutes later if medical advice is not immediately available and **SEEK RADIO MEDICAL ADVICE.**

- Protect the airway from being blocked by the tongue or secretions.

- Give diazepam 10 mg as rectal solution.*

• RADIO FOR MEDICAL ADVICE

Further advice on treatment of convulsions: See [Table 5](#)

- If the casualty is difficult to manage, give diazepam 10 mg as rectal solution.*

- Repeat, if necessary, 10 mg diazepam 30 minutes later if medical advice is not immediately available and **SEEK RADIO MEDICAL ADVICE.**

- If there is a history of previous mental illness: **SEEK RADIO MEDICAL ADVICE.**

**TABLE 7
EYE EXPOSURE TO CHEMICALS**

Chemical splashes involving the eye may cause local irritation, inflammation, pain and, in severe cases, blindness. **TREATMENT IS URGENT**

DECONTAMINATION in all cases of eye contact, regardless of symptoms

Eye contamination with solid CALCIUM OXIDE and CALCIUM HYDROXIDE (quicklime; slaked lime)

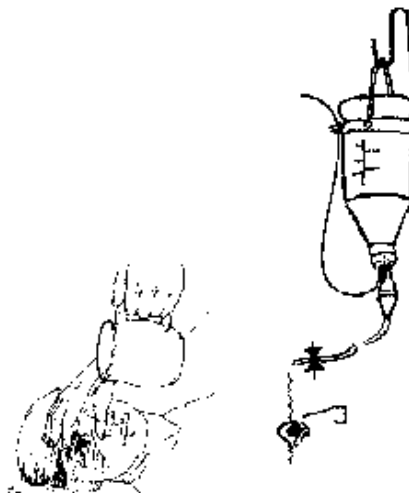
- To avoid "lime burns" try to swab particles mechanically from the eye **before washing.**



A cotton bud, match or similar object is held over the closed eyelid. The eyelid is turned inside out over the cotton bud.

Eye contamination with other chemicals

- **IMMEDIATE** washing of the eye with copious amounts of water:
- Keep the eyelids widely apart as illustrated.
- Remove contact lens.
- Direct water flow from inner to outer corner of the eye. Washing must be done thoroughly for ten minutes, timed by the clock.



- If available, use a 1 litre bag of sodium chloride 0.9% with a drip set to irrigate the eye.
- Don't delay. Use water until drip is ready.

SIGNS & SYMPTOMS

Pain, redness and watering of the eye

Unrelieved severe pain

Loss of vision

TREATMENT

- Anaesthetic eye drops should be instilled in the eye to ensure adequate irrigation of the eye.
- If pain is severe, anaesthetic eye drops should be instilled in the eye to relieve pain.
- If the eye continues to be painful, give two tablets of paracetamol every six hours until the pain is relieved.
- **RADIO FOR MEDICAL ADVICE**
- If severe pain continues despite ten minutes irrigation of the eye with water, repeat the eye wash for a further ten minutes after instilling anaesthetic eye drops and **RADIO FOR MEDICAL ADVICE**.
- Give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.

Further advice on pain relief: See [Table 13](#)

- This is a **MEDICAL EMERGENCY**.
- Irrigate the eye as described above and seek **URGENT** medical advice.

Further advice on the treatment of eye injury: See [Appendix 7](#)

TABLE 8
SKIN EXPOSURE TO CHEMICALS

Skin exposure to chemicals may cause local damage of either chemical burn or frost-bite. Chemical burns resemble thermal burns with redness, irritation, swelling, pain, blistering and ulceration.

The chemical may be absorbed through the skin causing general symptoms of poisoning; these symptoms may be delayed for several hours.

Limited exposure to leaking refrigerator gases, compressed gases or solid carbon dioxide (dry ice) may cause local frost-bite that, in principle, will cause the same damage as chemical or thermal burns and are treated accordingly. No special treatment instructions are needed - referred to chemical burns.

In extended burns fluid loss may be serious.

DECONTAMINATION in all cases of skin exposure, regardless of chemical or symptoms

- Chemical protective gloves and clothing should be used while washing the casualty's skin. After decontamination, it is not necessary to use protective clothing.
- Carefully remove and double-bag contaminated clothing and personal belongings. Cut off the clothes, if necessary.
- If the chemical has affected eyes **and** skin, **the eyes should have PRIOR attention.**
- **IMMEDIATE** washing with copious amounts of water for at least ten minutes while removing contaminated clothing, rings, wristwatches, etc. **Don't delay.**
- Do not use neutralizing substances.
- Remove the casualty to the ship's hospital.
- Continue washing the skin for additional ten minutes with soap or shampoo and water.

Exposure to PHOSPHORUS (WHITE OR YELLOW) which ignites in air

- Keep the injured part of the body under water or covered with wet dressings.
- Using chemical protective gloves remove the phosphorus with a clean spoon or forceps.

Exposure to HYDROFLUORIC ACID

- Using latex gloves, massage exposed area with calcium gluconate gel for at least 15 minutes or until pain is relieved. Leave the gel on the skin. The gel should be re-applied 4-6 times daily for 3-4 days if a chemical burn is present.

Further advice See [Table 16](#)

SIGNS & SYMPTOMS	TREATMENT
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Burning pain with redness and/or swelling of contaminated skin, irritating rash

- After washing with water, wash exposed areas thoroughly (including skin folds, nail beds and hair) with soap or shampoo and water. Clean away from the burn in every direction. DO NOT use cotton wool for cleaning as it is likely to leave bits in the burn.
- Dab gently any remaining dirt using a swab soaked in warm water. BE GENTLE as this may cause pain.
- Cover burns with a sterile dressing (e.g. perforated silicone dressing or vaseline gauze), overlapping the burn or scald by 5-10 cm (2 to 4 inches). Then apply a covering of absorbent material (e.g. a layer of sterile cotton wool) and a suitable bandage.

Chemical burns

Further advice on **chemical burns**: See [Appendix 8](#)

Blisters

- Leave blisters intact.
- If blisters have burst, clip off the dead skin by using a sterilized pair of scissors. Flood area with clean, lukewarm (previously boiled) water from a clean receptacle to remove debris.
- Cover blisters with a sterile dressing (e.g. perforated silicone dressing or vaseline gauze), overlapping the burn or scald by 5-10 cm (2 to 4 inches). Then apply a covering of absorbent material (e.g. a layer of sterile cotton wool) and a suitable bandage.
- Give two tablets of paracetamol every six hours until the pain is relieved.
- If there is very severe pain, give 10 mg morphine sulphate and 10 mg metoclopramide intramuscularly, if advised medically.

Pain

- **SEEK MEDICAL ADVICE**
- If breakthrough pain persists after 15 minutes or more give a second injection of 10 mg morphine sulphate intramuscularly.

Further advice on pain relief: See [Table 13](#)

Blisters and ulcers

Blisters, ulcers covering an area exceeding 9% of body surface (corresponding to 9 times the size of the palm of the hand)

- Dressings should be left undisturbed for 3-4 days unless the dressing becomes smelly or very dirty, or the temperature is raised. Redress such areas as described above.
- Provide adequate relief for continuing pain (see above).
- In addition to normal food and fluid intake give:

The **first 24 hours**: For every 10% of the body surface area with burns give three litres of salted water (1½ teaspoonfuls of table salt in 1 litre) intermittently to help replace fluid loss.

24-48 hours: For every 10% of the body surface area with burns give 1½ litres of fluids (preferably oral rehydration salt solution - ORS) intermittently.

• RADIO FOR MEDICAL ADVICE

After 48 hours the fluid intake should in principle be normal.

- Check for urine output that should be approximately 30-50 ml per hour (approximately 1 litre per 24 hours).

Further advice on **fluid replacement**: See [Appendix 13](#)

FOLLOW-UP

- A patient who has had significant exposure or any symptoms related to exposure should be kept warm in bed and closely observed for 48 hours and **RADIO MEDICAL ADVICE OBTAINED**.
- Emergency transport for on-shore hospital evaluation will usually be required.

TABLE 9
INHALATION OF CHEMICALS

Inhalation of chemicals may cause suffocation (asphyxia) due to

- Obstruction to breathing in the throat or the air passage through spasm of the air tubes or by swelling of the linings of the voice box due to irritant fumes;
- Fluid in the lung air spaces caused by irritant fumes;
- Poisoning of the blood which prevents the carriage or use of oxygen in the body caused by, for example, carbon monoxide and cyanide;
- Poisoning of the mechanism of breathing in the chest (e.g. by organophosphate pesticides) or the brain (e.g. by chlorinated hydrocarbons);
- Gases which do not support life because they replace oxygen in the atmosphere (e.g. carbon dioxide, nitrogen).

Vapours of volatile liquids often have a pleasant or disagreeable odour. They may cause lightheadedness, dizziness, headache or nausea.

A few gases have delayed corrosive effects on the lungs.

For advice on **CPR** in **cases of suffocation**: See [Table 2](#)

For advice on **chemical hazards of fire**: See [Appendix 9](#)

For advice on **chemical hazards of welding**: See [Appendix 9](#)

WARNING: Any casualty who has been gassed and has impaired consciousness must NOT be treated with morphine.

SIGNS & SYMPTOMS

TREATMENT