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சுகாதார, போசணை மற்றும் சுதேச வைத்திய அமைச்சு
Ministry of Health, Nutrition & Indigenous Medicine

General Circular No: 01 - 29 / 2019

To
Deputy Director General, National Hospital of Sri Lanka,
Directors of all Teaching, Provincial General and District General Hospitals,
All Provincial Directors of Health Services/Regional Director of Health Services,
Medical superintendents of all Base Hospitals

Management of Survivors of Chemical Incidents in Hospitals

It is important that hospitals in Sri Lanka are prepared to respond to chemical incidents. In addition to chemical accidents in an industrial and commercial setup, toxic chemicals could be used as weapons. In some instances, chemicals used in industries could also be used as weapons. Irrespective of the intention, the principles of the management of the patients following a chemical incident are the same. This circular is issued to provide the basic guidelines for the management of patients brought to a hospital following a chemical incident.

1. A chemical attack may be suspected if a lot of casualties from the same area complain of an array of similar medical symptoms. In addition, you may hear about a chemical accident which occurs in the drainage area of your hospital.
2. The management of chemical incidents in the field, search and rescue of patients and primary decontamination must be done by specially trained persons, with necessary personal protective equipment, adhering to the standard operating procedures. The Fire Brigade and the Chemical, Biological, Radiological and Nuclear (CBRN) units of the

Tri Forces and the Police should be contacted in a chemical incident (See Annexure 1 for a list of CBRN contact numbers). In such instances, the patients following decontamination may be handed over to the pre-hospital or hospital ambulances for safe transportation.

3. However, there is also a possibility of patients contaminated or intoxicated by a chemical accident will reach hospitals by themselves, or accompanied by other persons, without going through the decontamination process. In such an instance, decontamination at the hospital before the patient reaches the Emergency Treatment Unit is essential. However, saving the life of the patient should take precedence over decontamination. Hence, lifesaving procedures should not be delayed due to decontamination.
4. If the chemical of the incident is known, as in case of an industrial accident, the management of the patients must be based on the Management of Poisoning by Professor Ravindra Fernando (2018) Fifth Revised Edition (The Red Book). Any information about the management of a patient contaminated or intoxicated by a chemical could be obtained by contacting the National Poisons Information Centre, National Hospital of Sri Lanka, Colombo Tel; 011-2686143 or 0112691111 Ext. 2430. The Safety Data Sheets (SDSs) (formerly MSDSs or Material Safety Data Sheets) for each hazardous chemical could be requested from the chemical manufacturer, distributor or importer to downstream users to communicate information on these hazards. SDSs could also be found online.
5. In case of an incident where chemicals are used as weapons, the exact chemical may not be known, at least in the initial stages, hence symptoms and signs are used to guide the diagnosis and the management.

Three categories of chemicals used as weapons could be identified:

- A) Choking agents
 - 1) Displacement of oxygen from the air (simple asphyxiants)
 - 2) Interruption of pulmonary diffusions (respiratory irritants)
 - 3) Interruption of oxygen transport in blood (blood agents)
 - 4) Interruption with oxygen utilization (chemical asphyxiants)
- B) Nerve agents
- C) Vesicants

Details of the above three categories are as follows:

CHOCKING AGENTS

Simple Asphyxiants

Mode of action:

Reduces the FiO_2 (Fraction of the inspired oxygen-Fraction of O_2 in the volume of air/gas the patient inspires) FiO_2 of Normal air is 21%)

Signs & Symptoms:

- At FiO_2 less than 16%: Air hunger, tachypnoea and changes in level of consciousness
- At FiO_2 less than 10%: Loss of consciousness, seizures and vomiting

Causative agents:

CO_2 , H_2 , N_2 , He, methane

Management:

- Remove the patient from the source.
- Provide humidified Oxygen via non-rebreather bag (Increase FiO_2).

Pulmonary Irritants

Mode of action:

These highly water-soluble vapours rapidly react with respiratory tract and produce symptoms

Signs & Symptoms:

Cough, throat burn and bronchospasm, skin and eye burn

Causative agents:

Ammonia, Sulphur dioxide, Chlorine, hydrogen sulphide and hydrogen chloride, Hydrogen Fluoride

Management:

- Remove from the source
- Provide humidified oxygen
- Monitor Vital signs and pulmonary status (SPO_2 , Respiratory rate, blood pressure)
- Suspected Hydrogen Fluoride exposure - Monitor Serum calcium and administer Intravenous Calcium

Blood Agents

Mode of action:

Interference of oxygen transport

Signs & Symptoms:

Headache, nausea alteration of consciousness, angina and seizures

Causative agents:

Carbon monoxide, Methylene Chloride and Nitrites, Pyridium

Management:

- Provide 100% oxygen in the non-breather bag
- Give hyperbaric oxygen if possible
- Consider Methylene Blue for suspected Methemoglobinemia (0.1ml/kg of 1% Methylene Blue solution)

Chemical Asphyxiants

Mode of action:

Interrupt electron transport in mitochondria thus causing anaerobic oxygenation

Symptoms:

- Headache, alteration of consciousness, severe acidosis seizures and Coma
- *Cyanide poisoning* – Almond smell, Cherry red skin colour, hyperventilation, hypotension, bradycardia and low GCS.

Causative agents:

Cyanide, Hydrogen Sulfide, Phosphine, and Sodium Azide

Management:

- Remove the patient from the source.
- Provide 100% oxygen
- Flush the skin and eyes with copious water/ N. Saline
- Give activated Charcoal in Cyanide ingestion as follows. (Give orally for Patients who are alert presents within 1 hour. If the patient is unconscious, secure the airway and give Charcoal via NG)
- In Cyanide poisoning
 - First, give IV. 3% Sodium Nitrite solution 300mg in 5 minutes (10 ml) (In case of exposure to smoke inhalation CO exposure Use Hydroxycobalamine

- Then give IV. 25% Sodium Thiosulfate solution 12.5 g (50 ml) (repeat half dose for non-responders)

OR

- As an alternative give IV. Hydroxocobalamin 5g over 15 minutes. It can be repeated once. (Especially when there is a concomitant Carbon monoxide poisoning, side effects- Anaphylaxis, hypertension, reddish skin and mucosa)
Do not use the same line for Sodium Thiosulfate, Dobutamine or Diazepam
- Treat hypotension with Crystalloids and Vasopressors, Profound Acidaemia with IV. Sodium Bicarbonate

NERVE AGENTS

Mode of action:

Nerve agents are synthesized by organophosphate chemicals and have high CNS penetration

Signs & Symptoms:

These agents give rise to classical “DUMBELS” syndrome by activation of Muscarinic receptors causing defecation, urination, meiosis, bradycardia, bronchospasm/ bronchorrhea, emesis, lacrimation, and salivation. Central nervous system syndrome is characterized by restlessness confusion agitation, disorientation visual hallucinations (Liliputian syndrome-seeing small people). Nicotinic receptor activation causes muscle fasciculations, weakness and paralysis. Beware that there can be paradoxical hypertension and tachycardia in the early phase

Causative agents:

Nerve gases (Sarin (GB)-commonest agent, Soman (GD), Tabun (GA), NERVE AGENT VX AND GF)

Management:

- Evacuate from the site
- Perform triage and decide who needs the antidote (When resources are sparse, do the greatest good for the masses.
- Decontaminate by flushing the eyes immediately with water for about 5 to 10 minutes
- If exposure to liquid agent is suspected, cut and remove all clothing and wash skin immediately with soap and water for 5 minutes. Place contaminated clothes and personal belongings in a sealed double bag
- Administration of antidote (Atropine) and enzyme re-activators (PAM) administration.
 - IV. Atropine 2 mg to as high as 20 mg until the patient is cleared bronchorrhea, bradycardia, salivation and sweaty axillae. (Pupils and heart rate are not sensitive indicators of Atropinization, consider repeat doses and infusions for partial/non-responders)

- IV. Pralidoxime (PAM) 1-2 g slow infusion over 20-30 minutes to prevent the irreversible ageing of the Enzyme /counteract Nicotinic effects.
- IV Benzodiazepines to control seizures or extreme agitation. (DO NOT USE PHENYTOIN)
- DO NOT USE SUXAMETHONIUM FOR INTUBATION.

VESICANTS

Mode of action:

Vesicants act by blistering and damaging of the eyes, skin, mucous membranes, and potentially the lungs if exposed to very high concentrations.

Symptoms:

Red eyes, skin irritation, burning of skin, blisters, upper respiratory symptoms, cough and hoarseness.

Causative Agents:

Sulphur, mustard. Vesicants cause damage to eyes, skin, mucous membranes and lungs

Management:

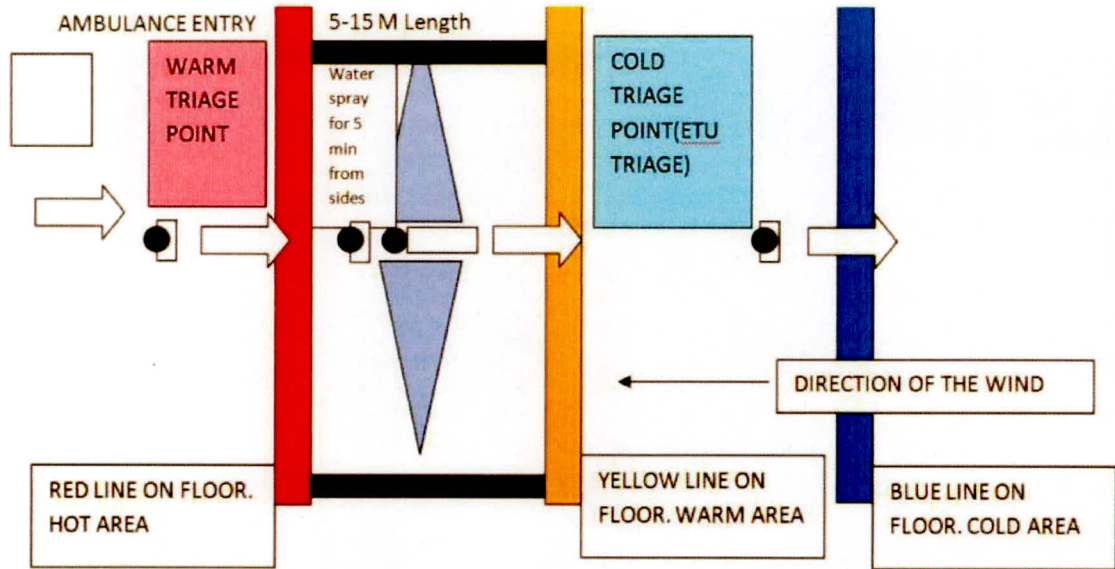
- Remove the patient from the source.
- Decontaminate the patients with water.
- Do extensive irrigation (eye, skin).
- Late complications: Observe for blistering similar to second-degree burns, corneal ulcers and leukpeania in mustard agents

6. Decontamination in the Hospital

Even if the decontamination has been done in the field, decontamination has to be done again at the hospital. In addition, if patients are brought in without decontamination, they too must undergo decontamination at the hospitals. Make sure that there are at least a few showers in the hospital, close to the emergency treatment unit, but before taking the patient in.

Arrange some screens to ensure the privacy of the patient since the clothes have to be removed. Please have some clothes to be given to the decontaminated patient.

Water is considered to be the universal decontamination agent, preferably warm water to prevent shivering. Spraying of warm water on the unclothed patient, for a minimum of five minutes, is the standard decontamination for any chemical agent.



7. Emergency Department Triage

The Emergency Department Triage of patients needs to be arranged. If the field triage has already being done, it needs to be reviewed.

8. Emergency Department Management

Emergency Department Management should be done as per the above guidelines


9. Definitive Management

Definitive management of the patients needs to be done using a usual team approach adopted in the hospital.

10. Personal Protective Equipment for Healthcare Staff

This interim guideline is issued to manage a chemical incident with the resources currently available in the hospitals of Sri Lanka. Available personal protective equipment such as a work uniform, apron, gloves, masks, boots, safety glasses and a face shield appropriately used should ensure the safety of health staff in managing patients following a chemical incident who have been sufficiently decontaminated.

Your urgent attention to ensure the preparedness of the hospitals to respond to a chemical incident is highly valued.


Dr. Anil Jasinghe
Director General of Health Services

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The technical assistance provided by the Sri Lanka College of Emergency Physicians in preparation of this circular is acknowledged.

Annexure 1

Emergency Contact Numbers

No.	Institution	Phone Number
1.	Fire Service Department Colombo	110 0112422222
2.	Disaster Management Center Hotline	117
3.	Police Emergency Hotline	119
4.	1990 Suwaseriya	1990
5.	National Hospital Colombo	0112691111
6.	National Poison Information Center	0112691111 Ext: 2430 0112686143
7.	Disaster Preparedness and Response Division Ministry of Health	0117446508 0777846226 0773877696 0718951089
8.	Epidemiological Unit	0112695112
9.	Quarantine Unit	0112112705 0714199953
10.	Medical Research Institute	011 2 693532 011 2 693533 011 2 693534
11.	CBRN Squadron - Army	0112172692
12.	CBRN Squadron - Airforce	0772229329
13.	Army – Medical Services	0710818548
14.	Hazardous and Chemical Management Unit Central Environmental Authority Ask for Mr. Ajith Weerasundara	0117877277 0112872278 Ext:259 0718175005
15.	Chemical Weapons Convention	0112327807
16.	Sri Lanka Atomic Energy Regulatory Council	0718330846 0112987860
17.	Government Analyst Department	0112176800 0112786395
18.	Bomb Disposal Squad (Sri Lanka Army)	0112434251