Enviromental Emergencies : Emergency approach to Drowning and Near drowning

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Outline

- Definitions
- Epidemiology
- Pathophysiology
- Clinical Assessment
- Differential diagnosis
- Management
- prognosis
- Disposition

Environmental Emergencies

Environmental emergencies are sudden disasters or accidents that threatens human life and may damage the environment

Common environmental emergencies in Uganda

- **Bite and stings** (snakes, insects, spiders etc.)
- **Extremes of temperature:** cold and heat related injuries
- **Drowning**
- **Exposures:** fire, chemicals, smoke/gases and poisonous plants
- **Temperature**: Extreme heat, extreme cold
- **Bites and stings** insects, spiders, snakes, and marine life
- **Electrical burns and Lightning strikes**
- **High-altitude sickness**,
- **Diving emergencies**

Definitions

Traditional context: drowning & near drowning

Drowning is the process of experiencing respiratory impairment from submersion/immersion in liquid.

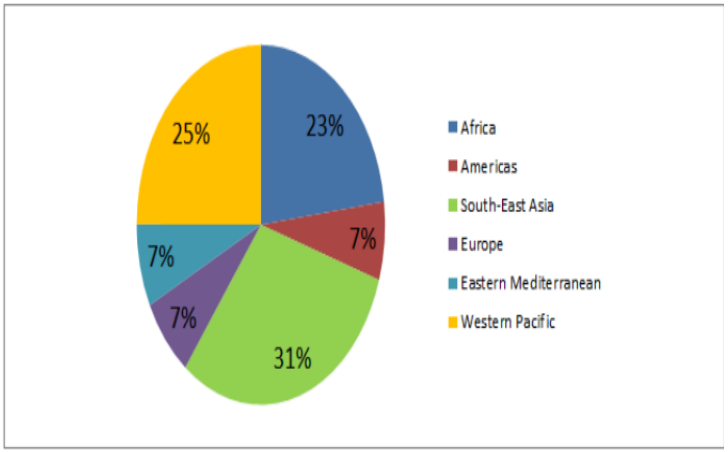
'**Submersion**' refers to the airway going below the level of the surface of the liquid

'Immersion' refers to liquid being splashed across a person's face.

Epidemiology

- Annual 300,000 drowning deaths occur worldwide.
- 90% of drowning death occur in poor countries
- disproportionately impacts children and young people.
- Age group 1-4 yrs, then 5-14 yrs.
- Global trends have decreased since 2000 by 38%

ig. 1: Share of global drowning deaths by WHO regions, 2016



MAKERERE UNIVERSITY

College of Health Sciences
School of Public Health

UNDERSTANDING AND PREVENTING DROWNING IN UGANDA

Final Dissemination Report for Stakeholders

Drowning deaths

85%
1,130 drowning deaths
Drowning death rate: 13.4 per 100,000/year

15%
202 drowning deaths
Drowning death rate: 2.3 per 100,000/year

Drowning survivors

75%
554 drowning survivors
Drowning survivors: 6.6 per 100,000/year

25%
180 drowning survivors
Drowning survivors: 2.0 per 100,000/year

14. APPENDIX A: Number of Drowning Cases Reported in each District by Source

The table below shows the number of drowning cases recorded by source in the district police offices, marine police detachments, fire/rescue brigade detachments, and the largest mortuaries in the 60 phase one study districts. This is not the number of drowning cases that occurred during that time, but the number of drowning cases that were recorded. We learned from this study that many more cases of drowning happen that are never reported to or recorded in administrative sources.

Total number of drowning cases reported in each district by source, Jan 1 2016 – Jun 30 2018, Uganda*

Lakeside Districts

	FATAL DROWNING					NON-FATAL DROWNING				ALL
	Total Fatal Cases	District Police	Marine Police	Fire/ Rescue Brigade	Mortuary	Total Non-fatal	District Police	Marine Police	Fire/ Rescue Brigade	Total Drowning Cases †
Kalangala	165	86	69	0	10	16	1	15	0	181
Kampala	107	2	N/A	22	83	15	0	N/A	15	122
Jinja	110	8	28	30	44	6	0	4	2	116
Namayingo	74	17	57	N/A	0	9	0	9	N/A	83
Mayuge	43	13	30	N/A	0	6	0	6	N/A	49
Kasese	40	9	20	1	10	8	0	6	2	48
Masaka	36	8	N/A	4	24	9	0	N/A	9	47
Hoima	31	2	23	6	0	7	0	1	6	40
Buikwe	34	2	8	0	24	4	0	4	0	38
Serere	31	8	23	N/A	0	5	0	5	N/A	36
Busia	23	0	6	15	2	9	0	0	9	32
Wakiso	27	4	23	0	0	0	0	0	0	27

Epidemiology: risk factors

- Age
- Sex
- Occupational exposure
- Climate-related risks
- Transport on water
- Migration and seeking refuge

TABLE 215-1 Disorders and Injuries Associated With Drowning

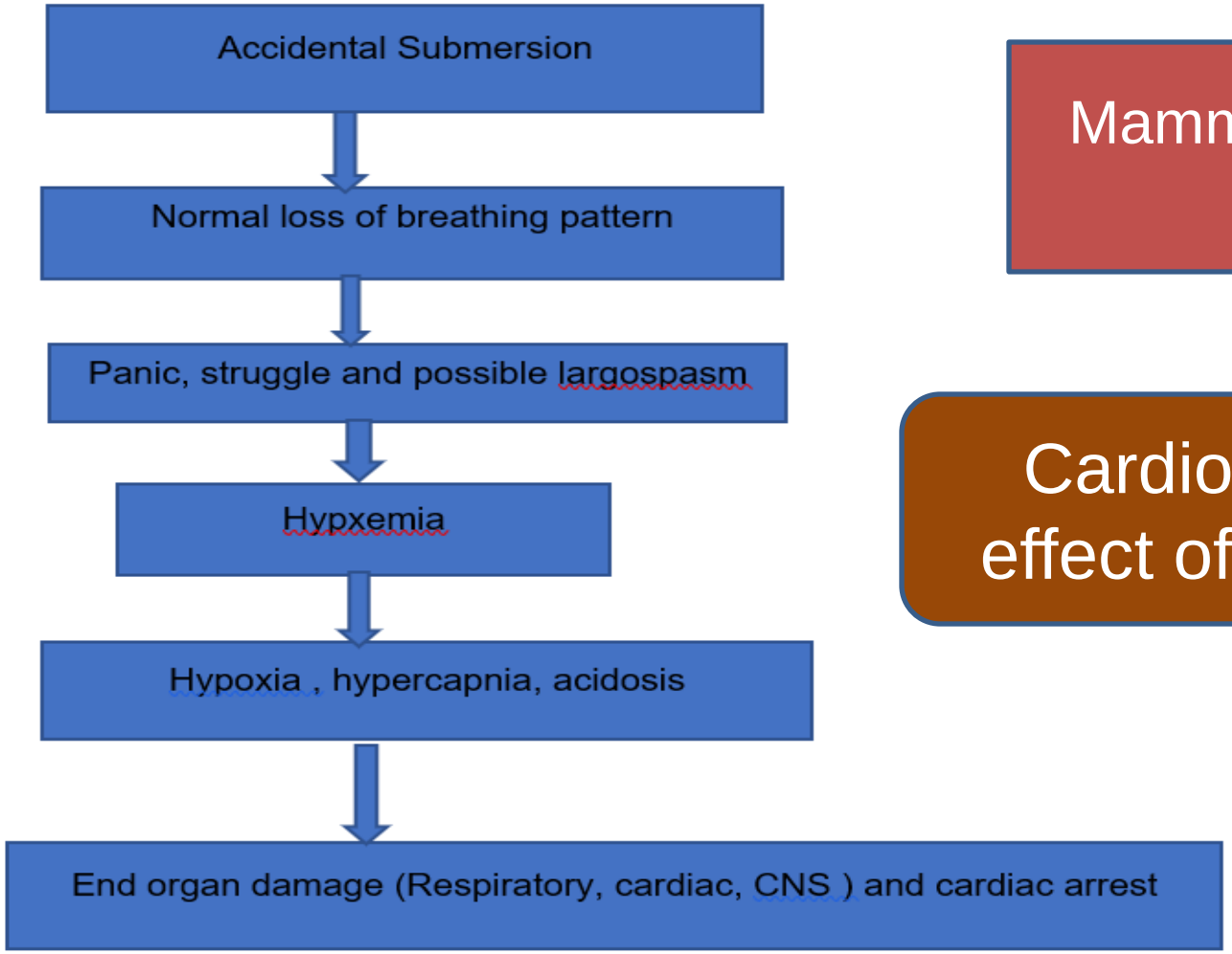
Disorders Associated With Drowning

- Alcohol or other intoxicants
- Syncope (e.g., due to hyperventilation prior to underwater diving)
- Seizures
- Cardiac conditions (e.g., dysrhythmias including prolonged QT syndromes, Brugada's syndrome, ischemic heart disease)
- Dementia
- Intentional (suicide, homicide, child abuse or neglect in young children)

Injuries Associated With Drowning

- Spinal cord injuries due to diving into shallow water, significant falls from heights, or boating/personal watercraft mishaps
- Hypothermia
- Aspiration
- Respiratory failure, insufficiency, or distress

Pathophysiology



Mammalian diving reflex

Cardiovascular effect of drowning

Clinical assessment: History

Timeline

- Immersion time
- Time to and treatment given
- Time to first respiratory effort

Drowning circumstances

- inconsistencies in story (Suicide, homicide)
- story incompatible with developmental age (Child abuse and neglect)
- Liquid characteristic

Precipitating medical causes

- Seizures
- Hypoglycemia
- Arrhythmias and Long QT Syndrome
- Intoxication

Clinical assessment: Exam.

Evidence of respiratory compromise (distress, cyanosis, crackle, wheezing)

Evidence of cardiovascular compromise

Evidence of hypoxic brain injury (Level of consciousness, pupillary size)

Signs of trauma (head and cervical spine trauma) **and hypothermia**

Investigations

Laboratory

- RBS
- Arterial Blood Gases (ABG)
- CBC
- RFTs and Serum Electrolytes
- Coagulation profile
- Blood culture (cases of significant aspiration),
- Toxicology screen
- Creatine kinase (CK)

Radiological

- X-ray (CXR) +- CT scan (Suspicion of Head & spine injury)
- POCUS
- ECG and cardiac monitoring
- EEG

Management of drowning in ED

Goals

-Support Airway, Breathing & circulation

-Stabilizing body temperature (rewarm)

- Prevent secondary brain injury

Initial approach follow ATLS principle

A B C D E approach

Assess, correct & re assess

Airway & C-spine stabilization : (don't attempt to drain water from the lungs)

Breathing:

-Think and Prevent Aspiration; NG tube, Bronchoscopy

- Provide of 100% O2; Continuously monitor SPO2
- Use devices delivering highest level of oxygen
- Consider CPAP and Intubation with mechanical ventilation
- Bronchospasm: nebulized bronchodilators
- Prone position
- Antibiotic
- Surfactant

Assess, correct & re-assess

Circulation (CPR, hypovolemia)

- For cardiac arrest follow ALS guidelines.
- Hypothermia (pulse and securing IV access)
- shock results from hypovolemia
- Hypotension (oxygen, fluids and rewarming)
- Vasopressors only use in refractory case
- Electrolyte disturbances uncommon, corrected

Assess, correct & re-assess

Disability

- Assess GCS/ AVPU
- Check and correct glucose
- Assess pupil
- Look for features of stroke and other neurological deficits

Exposure

- Look for traumatic injuries and signs of intoxication
- Measure core body temperature
- Treat hypothermia (consider available option for warming)
- Remove clothes , cover with blankets, warm IV fluids

Look for and treat associated conditions and complication

Risk stratification

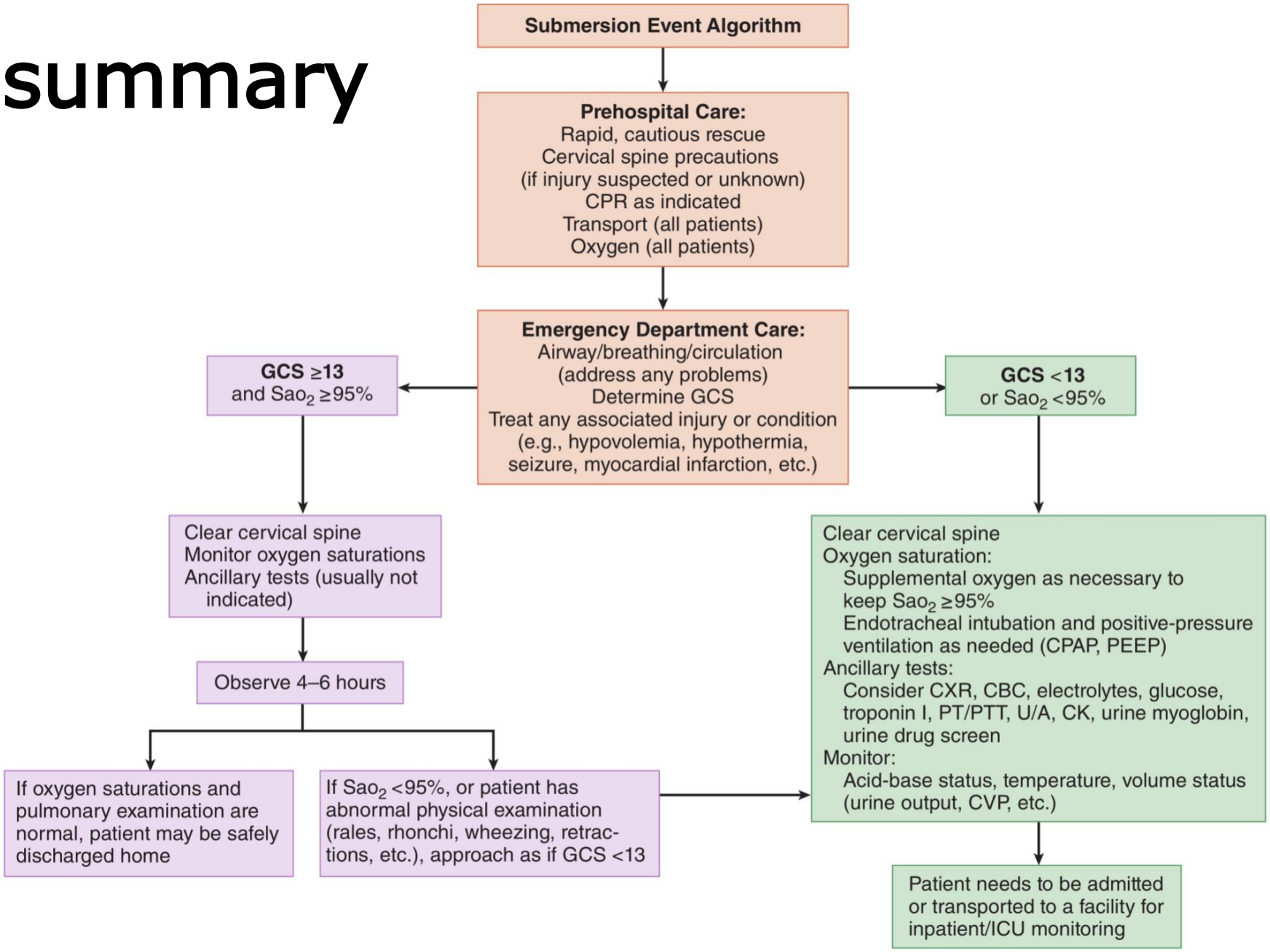
Poor Prognostic Indicators

- Submersion > 5 minutes
- No resuscitation for > 10 minutes
- Fixed and dilated pupils
- GCS < 5 (comatose)
- pH < 7.1

Good Prognostic Indicators

- Age < 14
- CPR in the field
- CPR < 25 min
- Detectable pulse on arrival
- T Core < 35°C (mixed results; some studies support this, some show no effect)

summary



IGURE 215-1. Drowning event algorithm. CBC = complete blood count; CK = creatine kinase; CPAP = continuous positive airway pressure; CVP = central venous pressure; CXR = chest

Complications

- Laryngospasm
- aspiration pneumonitis
- ALI / ARDS
- ischemic cardiomyopathy
- arrhythmias
- hypoxic ischemic encephalopathy
- MODS (Renal failure)
- DIC
- Rhabdomyolysis
- hypothermia
- electrolyte disturbance
- associated trauma e.g. TBI, spinal cord injury

Disposition

- Treat, monitor and observe a patient for 6-8 hours.
- Decision depends on several factors (evaluation & social factor)
- Key Question: asymptomatic or symptomatic
- Admitted symptomatic , discharge asymptomatic
- All intubated patient should admitted at ICU

Prevention of Drowning

- **Education** (learn swimming, CPR, drowning risks &teach children)
- **Supervision** (Children, transport vessel, pools)
- **Safety Equipment** (life Jackets, cover well, fencing)

Key take home points

- Mgt of hypoxemia and CVS failure is key
- Look for evidence of precipitating factors and associated injuries
- Volume of H20 aspirated is <4ml avoid trying to drain water/ Heimlich maneuver
- There is no treatment difference for fresh water vs salt water victims
- Steroid play no role