Chapter 25
Submersion Incidents: Drowning and Diving Emergencies

Objectives

1. Define key terms introduced in this chapter (slides 14-16).
2. Discuss ways to reduce the risk of submersion incidents (slides 12-13).
3. Describe factors that can lead to submersion incidents in infants, children, adolescents, and adults (slides 17-19).
4. Explain factors that affect the likelihood of survival from submersion incidents (slides 20-21).
5. Describe the pathophysiology of drowning (slides 22-23).
6. Discuss the association between shallow water diving and spinal injuries (slides 24-25).

Objectives

7. Explain actions you should take to protect your own safety when responding to a water emergency (slides 26-27).
8. Explain the necessity of taking spinal precautions to any swimmer or diver who may have suffered trauma (slides 28-29).
9. Given a scenario in which a patient has suffered a submersion incident, explain how to provide resuscitative care (slides 30-31).
10. Explain the assessment-based approach to drowning and other water-related injuries, including emergency medical care for the drowning victim (slides 32-41).
Objectives


12. Describe laws of physics as they relate to scuba or deepwater diving, including (slides 44-45):
   a. Boyle law
   b. Dalton law
   c. Henry law
   d. Charles law

13. Explain the pathophysiology of decompression sickness (slides 46-47).

Objectives

14. Recognize the signs, symptoms, and patient history associated with (slides 48-49):
   a. Type I decompression sickness
   b. Type II decompression sickness
   c. Arterial gas embolism

15. Explain the pathophysiology of barotrauma injuries (slides 50-51).

16. Describe the emergency medical care of patients suffering from air embolism, decompression sickness, and barotrauma (slides 52-53).

Multimedia Directory

Slide 16   Submersions and Drowning Animation
Slide 19   Drowning Video
CASE STUDY

Dispatch

EMS Unit 631

Respond to 99 Wolf Road in the Delmar Hotel for a 25-year-old male in trouble in the pool. Police are en route.

Time out 2132
Upon Arrival

- Manager states an intoxicated male did a jack-knife in the shallow end of the pool
- Find male floating supine in the pool with support of a hotel employee
- Patient states he cannot feel his arms or legs

How would you proceed to assess and care for this patient?

Water-Related Emergencies
Water Related Emergencies

- Some drownings related to swimming
- Many caused by diving, deep-water exploration, boating and water skiing
- Precautions for water safety
  - Fence pools
  - Supervise children
  - Do not mix alcohol and water activities
  - Use personal flotation devices and life preservers

Definitions

- Two common terms used in the past: drowning and near-drowning
- It is now recommended that all submersion incidents be referred to as a drowning: a submersion incident resulting in a primary respiratory impairment; the person may live or die
Submersions and Drowning

Click here to view an animation about submersions and drowning.

Return to Directory

Incidence of Drowning

Back to Objectives

• Third leading cause of accidental death
• Causes in age groups
• Conditions leading to submersion
Drowning

Click here to view a video on the topic of drowning.

Return to Directory

Prognostic Predictors

Orlowski score: the more predictors present, the less likely a patient will survive
Pathophysiology of Drowning

- Primary injury
- Second injury
- Surfactant
- Emergency medical care

Diving Emergencies
You should always assume that a diver has sustained neck and spine injuries.

Safety Measures in Water-Related Emergencies

- Safety around water
- Criteria to enter
- Reach, throw, row, go
Possible Spine Injury

• When to suspect spine injuries
  • Emergency care

Resuscitation
Assessment-Based Approach: Drowning and Water-Related Emergencies

Scene Size-Up

- Mammalian diving reflex
- Cold-water versus warm-water drowning

Scene Size-Up

- Safety
- Critical in water-related emergencies
- Assistance from other departments
Assessment-Based Approach: Drowning and Water-Related Emergencies

Primary Assessment

• General impression
• Level of responsiveness
• ABCs
• CPR if necessary
• Transport priority

Secondary Assessment
Secondary Assessment

• Signs and symptoms
• Asymptomatic
• Symptomatic
• Cardiac arrest
• Obviously dead

Assessment-Based Approach: Drowning and Water-Related Emergencies

Emergency Medical Care

Back to Objectives

Emergency Medical Care

• Remove patient from water
  – Backboard in water if necessary
• Place patient on left side if no spine injury suspected
• Prepare to suction
• Ventilate if necessary
• Begin CPR, if needed
• Provide gastric distention relief
• Manage other conditions
• Transport quickly
Assessment-Based Approach: Drowning and Water-Related Emergencies

Reassessment

- Monitor for changes
- Every five minutes for unstable patient
- Every 15 minutes for stable patient

Scuba- or Deep-Water Diving Emergencies
• Availability of scuba or deep-water diving sites
• Complications

Basic Laws of Physics Related to Scuba- or Deep-Water Diving Emergencies

• Dysbarism
• Boyle’s Law
• Dalton’s Law
• Henry’s Law
• Charles’s Law
Decompression Sickness

Pathophysiology

- Effects on body
- Predisposing factors
- Predisposing physical characteristics
- Environmental factors

Decompression Sickness

Categories of Decompression Sickness
Categories of Decompression Sickness

- Type I decompression sickness
- Type II decompression sickness
- Arterial gas embolism

Decompression Sickness

Barotrauma

Barotrauma

- Cause
- Signs and symptoms
- Complications
Decompression Sickness

Emergency Medical Care

- Establish in-line spine stabilization
- Open airway
- Initiate CPR and apply AED
- Transport

CASE STUDY

Follow-Up
CASE STUDY

Primary Assessment
• Enter into pool; partner takes manual in-line stabilization
• Patient's speech is disconnected and slurred
• No signs of shock or major bleeding

CASE STUDY

Primary Assessment
• Board patient in water
• Remove patient from water
• Administer O₂ at 15 lpm via a nonrebreather mask when out of water

CASE STUDY

Secondary Assessment
• Contusion on top of head; point tenderness on neck; no other trauma
• Patient cannot move either set of limbs; sensation absent; pulses present
CASE STUDY
Secondary Assessment
• BP: 112/72; HR: 78; RR: 15; SpO₂: 99 percent
• Pupils equal and reactive to light

CASE STUDY
Treatment and Reassessment
• ABCs
• Keep patient warm
• BP: 112/72; HR: 76; RR: 15; SpO₂: 99 percent
• Patient vomits; suctioned and turned on board to left

CASE STUDY
Treatment and Reassessment
• Upon arrival, give report
• Take ambulance out of service to change uniforms
Four-year-old male reported victim of a near drowning incident

It's February, and the outside temperature is 34 degrees Fahrenheit

Upon arrival, you're directed to the back of the house where the patient is on the sidewalk next to a swimming pool

Critical Thinking Scenario

Family states he was outside playing in the snow and suddenly disappeared

After 15 minutes of searching, they found the pool cover displaced and the patient at the bottom of the shallow end of the pool

The patient is extremely pale, cyanotic, and not moving

He is pulseless and apneic

Critical Thinking Questions

1. How would you proceed with the emergency care of the patient?
2. Would you apply the AED and proceed with defibrillation?
3. What are some other special considerations when managing this patient?
Reinforce and Review

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