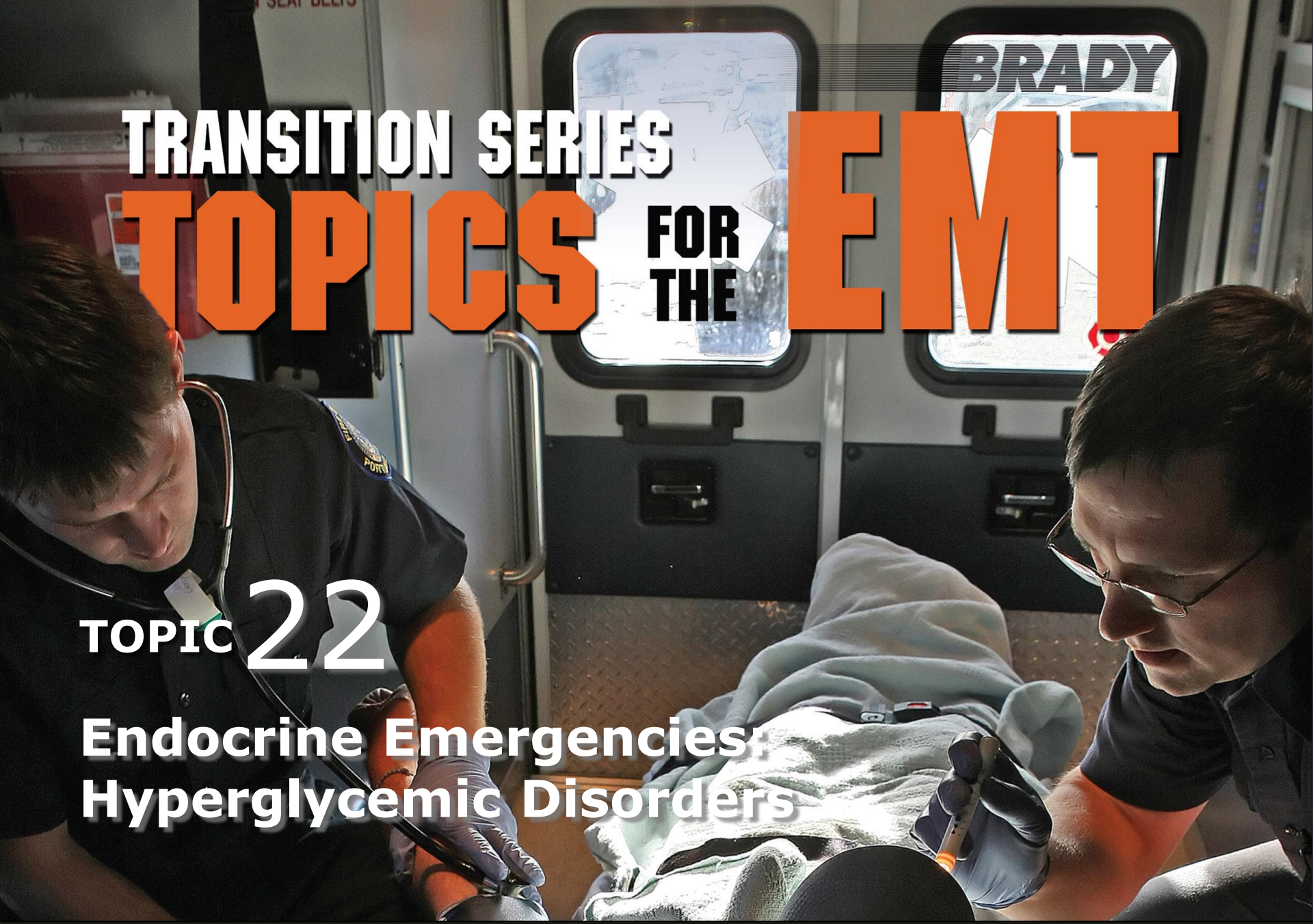

BRADY
TRANSITION SERIES
TOPICS FOR THE EMT
TOPIC 22
Endocrine Emergencies: Hyperglycemic Disorders

Objectives

- Review the frequency with which hyperglycemic emergencies occur.
- Discuss the etiologies of hyperglycemia.
- Discuss physiology and pathophysiology of hyperglycemic episodes
  - DKA and HHNS
- Review appropriate treatment strategies.

Introduction

- Hyperglycemic episodes are at the opposite end of diabetic emergencies.
- DKA or HHNS must be considered in all patients with altered consciousness.
- History of onset and monitored BGL levels are best way to differentiate hyperglycemic episodes from other problems.

Epidemiology

- DKA more common in Type 1 DM.
- HHNS more common in Type 2 DM.
- HHNS occurs with higher frequency than DKA does, and is more prevalent in females.
- Mortality rates can be 10-20% in hyperglycemic emergencies.

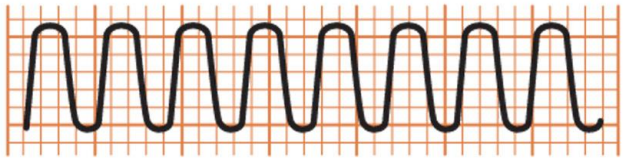
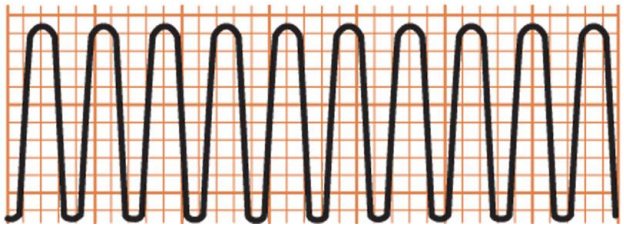
Pathophysiology

- Diabetic ketoacidosis (DKA)
  - Relative of absolute insulin deficiency
  - BGL rises greater than 300 mg/dL
  - Brain has plenty of glucose, but body cannot use it without insulin
  - Progression produces
    - Metabolic acidosis
    - Osmotic diuresis
    - Electrolyte disturbance

Assessment Findings

- Diabetic ketoacidosis
  - Slow change in mental status
  - History and findings consistent with severe dehydration
  - Nausea and vomiting, abdominal pain
  - Fatigue, weakness, lethargy, confusion
  - Kussmaul respirations

Figure 22-1 Kussmaul respirations.

Type of respiration	Diagram	Discussion
Normal		16–20/min; regular in rhythm; ratio of respiratory rate to pulse rate is 1:4
Kussmaul respirations		Increase in both rate and depth associated with diabetic ketoacidosis

Pathophysiology

- Hyperglycemic hyperosmolar nonketotic syndrome (HHNS)
  - Severe elevations in BGL (>600 mg/dL)
  - Some insulin still present
    - Not enough or not effective
  - Changes in physiology
    - Osmotic diuresis
    - Electrolyte disturbance
  - No ketogenesis

Assessment Findings

- HHNS
  - Slow progression of symptoms
  - Dehydration findings
  - Polyuria early, oliguria late
  - Changes in mental status
  - Possible seizure activity
  - Findings of volume depletion

TABLE 22-1 Signs and Symptoms of Diabetic Emergency Conditions

Sign or Symptom	DKA	HHNS	Hypoglycemia
Onset	Slow, over days	Slow, over days	Sudden, over minutes
Heart rate	Tachycardia	Tachycardia	Tachycardia
Blood pressure	Low	Low	Normal
Respirations	Kussmaul	Normal	Normal or shallow
Breath odor	Sweet and fruity	None	None
Mental status	Coma (very late)	Confusion	Bizarre behavior, agitated, aggressive, altered, unresponsive
Oral mucosa	Dry	Dry	Salivation
Thirst	Intense	Intense	Absent
Vomiting	Common	Common	Uncommon
Abdominal pain	Common	Uncommon	Absent
Insulin level	Low	Low	High
Blood glucose level	High	Very high	Very low
Emergency care and patient needs	DKA	HHNS	Hypoglycemia
Basic care	Oxygen	Oxygen	Oxygen, oral glucose
ALS care	Fluids	Fluids	IV glucose
Patient needs	More insulin	More insulin	Glucose

Treatment Considerations

- General considerations
  - Focus of hypoglycemia is the administration of glucose
  - Focus of DKA and HHNS is rehydration of the patient

Emergency Medical Care

- Establish and maintain a patent airway
- Establish and maintain adequate ventilation
- Establish and maintain adequate oxygenation
- Assess blood glucose level
- ALS backup is warranted for fluid resuscitation

Case Study

You are called one afternoon to evaluate an elderly female patient at home. Upon arrival PD is on scene and has forced entry into the home based on the neighbor saying that the elderly occupant has not been seen for days. You find the patient lying on the couch, dried vomit on the face, with loud sonorous respirations.

Case Study

- Scene Size-Up
  - Standard precautions taken
  - Scene is safe, no entry or egress problems
  - One patient, elderly female, looks unresponsive on the couch
  - NOI is unknown mental status change
  - No signs of struggle or trauma

Case Study

- What are some concerns you have based on the scene size-up?
- What are possible conditions you suspect at this time?

Case Study

- Primary Assessment Findings
  - Patient does not respond to painful stimuli
  - Sonorous respirations
  - Breathing is tachypneic with alveolar breath sounds
  - Peripheral perfusion absent, skin dry, carotid pulse present
  - No indication of significant trauma

Case Study

- Is this patient a high or low priority? Why?
- What are the life threats to this patient?
- What emergency care should you provide based on the primary assessment findings?

Case Study

- Medical History
  - Unknown
- Medications
  - Unknown
- Allergies
  - Unknown

Case Study

- Pertinent Secondary Assessment Findings
  - Pupils midsize and midposition
  - Airway now maintained with OPA
  - Breathing still adequate, rate fast
  - Carotid pulse present, peripheral perfusion absent
  - Skin cool and dry, tongue furrowed, membranes pale

Case Study

- Pertinent Secondary Assessment Findings
  - B/P 84/64, heart rate 128, respirations 30/min
  - Finger prick test of BGL reveals 860 mg/dL
  - Pulse oximeter intermittently reading 94%
  - No other findings contributory to presentation
  - Dried urine stains on patient's clothing and couch

Case Study

- With this information, has your field impression changed at all?
- What would be the next steps in management you would provide to the patient?

Case Study

- Care provided:
  - Patient placed in lateral recumbent position
  - High-flow oxygen administered via NRB mask
  - OPA kept in place, airway remained patent
  - ALS is to rendezvous with you en route to the hospital
  - Patient packaged and prepared for transport to hospital

Case Study

- In a patient with this field impression, discuss why the following findings were present:
  - Decrease in mental status
  - Tachycardia
  - Dry skin and furrowed tongue
  - Low blood pressure
  - High glucose level

Summary

- Hyperglycemia can be recognized by its onset and elements of dehydration.
- Although the EMT's treatment of this problem is supportive in nature, quick transport to the hospital or intercept by ALS will allow rehydration to start.