

## ENDOCRINE EMERGENCIES:

### Back-to-Basics Equals Better Practice-Let the Evidence Drive the Bus

Christopher David Kowal  
BS, MSN-MOL-Ed, RN, CCRN-CMC-CSC  
Research Fellow, Foundation of New York  
State Nurses  
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University of Rochester Medical  
Center



## Disclosures

- Sage Products, Inc., Speaker's Bureau
- NYSNA, Adult Practice Focus Group
- AACN:
  - Nominating Committee, Nominee
  - 2009 Large Grant Recipient

• **Objectives:** After this presentation the participant will be able to:

- 1. Name the 5 more common endocrine emergencies: SIADH, DI, hypoglycemia, DKA, & HHNK.
- 2. Articulate that most patients with these conditions are confined to bedrest within the critical care environment where they pose a greater risk for developing hospital-acquired conditions.
- 3. Specify how the preventative measures of consistent oral care, bathing, and repositioning can reduce the incidence of hospital-acquired conditions in these populations.

- SIADH
- Diabetes Insipidus
- Hypoglycemia
- Diabetic Ketoacidosis

- Hyperglycemic  
Hyperosmolar  
Non-ketotic  
Ketoacidosis
- Thyrototoxicosis
- Myxedema Coma
- Adrenal Crisis

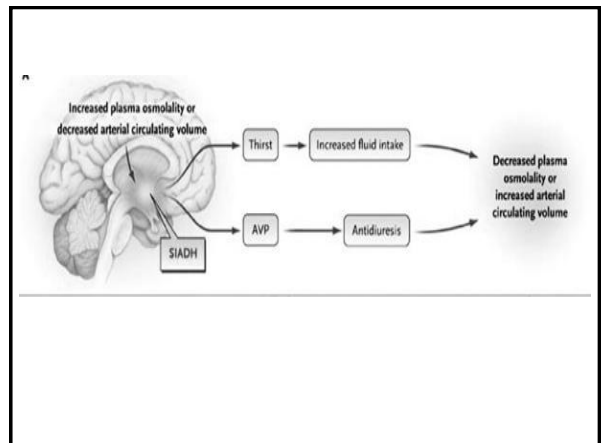
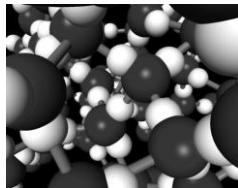
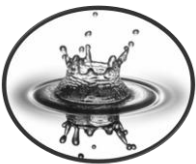
## Back to Basics Approach:

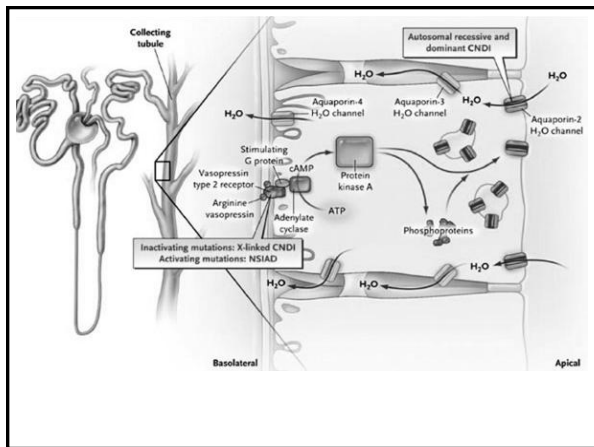
- Hand Hygiene
- Oral Care
- Proper Bathing Technique
- Positioning

## SIADH

(Syndrome of Inappropriate antidiuretic hormone hypersecretion)

# H<sub>2</sub>O





**SIADH**

- Retain H<sub>2</sub>O → Dilutional ↓Na<sup>+</sup> → ↓Osmolarity

**Osmolarity**  
**275 - 295**

↓Osmol < 275

Also... **2 x Na<sup>+</sup>, so... < 135 = SIADH**

- ↓U/O (concentrated)
- Clinical Manifestations:  
H<sub>2</sub>O Intox, Seizures

**SIADH**

- CAUSES: Oat Cell Ca, Viral Pneum, Head Probs
- Treatment: Fluid Restrict  $< 1L/D$   
Hypertonic Saline – 3%NaCl; D<sub>5</sub>NS, D<sub>5</sub>1/2NS  
**NO HYPOTONICS!** (D<sub>5</sub>W, 1/2NS)

Source: Neurology Focus © 2008 American Association of Neurological Surgeons

**Diabetes Insipidus**

- The stomach changes food into glucose.
- Glucose enters the bloodstream.
- The pancreas makes little or no insulin.
- little or no insulin enters the bloodstream.
- Glucose builds up in the bloodstream.

## Diabetes Insipidus

- No ADH!! → ↑Na+ → ↑sOsmolarity → ↑U/O  
uSG: 1.001 – 1.005
- CAUSES: Head Probs, Dilantin
- Comps: SHOCK
- Tx: FLUIDS (NS), ADH (vaso/pitressin) watch heart monitor

## Hypoglycemia

- Affects CVS then CNS
- Adrenaline → Glucose : Glycogen → Glucose
- WATCH: BETAS !!! (block adrenaline)
- NO CVS s/s;  
just CNS

**HYPOLYCEMIA**  
(Low Blood Glucose)

**Causes:** Too little food or skip a meal, too much insulin or diabetes pill's more active than usual.  
**Onset:** Often sudden; may pass out if untreated.

**SYMPTOMS:**

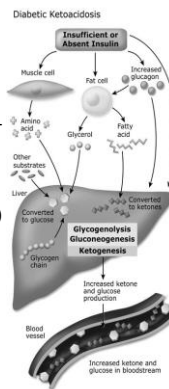
SWEATING	DIZZY	ANXIOUS	HUNGRY
BLURRY VISION	WEAKNESS OR FATIGUE	HEADACHE	IRRITABLE

**WHAT CAN YOU DO?**

LINKA → TREAT → CHECK

## DIABETIC KETOACIDOSIS (DKA)

- Dehydration (4-6L)
- BS 400-900 → Body has NO insulin!  
GET- Acidosis: Diuresis=Acidosis= ↓ PO4-  
K+ goes into blood=influx of H-  
So...INS, FLD, HCO3- drive K+ back into cell  
- Kussmaul's ( ↑↑ RR; depth)
- Tx: INSULIN + FLUIDS  
continuous gtt: 4-8U/H



## HYPERGLYCEMIC HYPEROSMOLAR NON-KETOTIC (Coma)

### HHNK



- Not r/t ADH
- WHO? Old, TPN, Diet-control DM, Pancreatitis, Thiazide use, 'ROID patients.
- Severe dehydration (6-8L)
- BS > 1000 Body HAS insulin!  
GET- NO Acidosis but → LTBB!!
- Tx: FLUIDS then INSULIN  
-NS, 1/2NS, D5 1/2NS

## HHNK

- ACIDOSIS:
  - $K^+$  OUT (of cell) &  $H^+$  IN
  - Cerebral Dehydration ("STROKY")
  - Azotemia

Correction w/  $HCO_3^-$ :  $\downarrow pH\ 0.1 \rightarrow \uparrow K\ by\ 0.6$

## SOMOGYI EFFECT

- Rebound HyGly from release of stress hormones in response to insulin-induced HoGly.

## Thyrotoxicosis

- Recognition and immediate management is important!
- Etiology: Severe infection, DKA, Sx, Trauma, PE
  - Excess Iodine
- S/S: Marked hypermetabolism  $\rightarrow$  MODS
  - Thermoregulation, neurologic, C-V, Resp, GI Distress:
    - "HOT, WET, & CRAZY !!!!!!!!!!!!"

## Treatment of Thyrotoxicosis:

- Minimize the organ failure: Thermo, C-V, Resp supportive measures
- Identify and treat the precipitating event
- Block thyroid hormone release
  - Propylthiouracil (PTU) blocks  $T_4$ - $T_3$ 
    - 600-1000mg load with 1200mg/day

## Myxedema Coma (?)

- Critical (Severe) Hypothyroidism = Fatal (> 60%)
  - 30% mortality still with treatment
- Incidence: Long-standing, hypothyroid patients
  - 4x greater in females (80%)
- S/S similar to HoThyroidism but MORE SEVERE:
  - Think LOW
    - HoTherm, HoTN, Bradyc, Mental Depression (stupor, obtunded, coma)

## So where is the Myxedama?

- Generalized skin and soft tissue swelling, periorbital edema, prosis, macroglossia, & cool, dry skin



Very infrequently identified in patients

- Pre-existing HoThyroidism is almost always found:
  - ↑ TSH & DEC free-T<sub>4</sub> / T<sub>3</sub>
- In Critical HoThyroidism: T<sub>3</sub> / T<sub>4</sub> levels may be non-existent

**BOTTOM LINE:** Do NOT delay treatment awaiting lab results

- Treatment: Replace thyroid hormone, treat precipitating cause, and support.
  - Mortality can still exceed 30% even with prompt diagnosis and intervention
    - Bolus thyroxine 300-500 mcg with 50-100 mcg daily
      - Needs to be adjusted to prevent cardiac s/s
      - May also use triiodothyronine
  - Supportive Care: Ventilatory support, passive external re-warming, & correction of underlying electrolyte abnormalities. Give glucose and steroids.

## Adrenal Crisis

- Significant loss of adrenal gland function.
- Life-threatening emergency.
- Insufficiency can exist in up to 76% ICU patients in septic shock.

## Chronic Adrenal:

- Addison's (Chronic Primary)
  - 80% autoimmune
  - 20% infection / malignant mets
- Chronic Secondary: ↓ ACTH

## Acute Adrenal:

- Adrenal Crisis:
  - Adrenal hemorrhage (sepsis), necrosis, or thrombosis
  - Pituitary dysfunction (postpartum pit necrosis-\*\*\*\*\*), pituitary macroedema, or primary CNS lesions

## S/S & Tx of Adrenal Insufficiency

- Mineralcorticoid deficiency
  - HoTN / Shock
  - Complicated underlying conditions (sepsis, hemorrhage, Sx, trauma)
  - Unexplained HoTN: even when resuscitated or given catecholamines
  - A/N/V, Abd pain, weak, fatigue, lethargy, fever, confusion, coma
  - Suspect acute hemorrhage when: abd/groin pain, peritoneal s/s, vomiting, confusion, HoTN

## Adrenal Insufficiency Ctd:

- Check cortisol levels
- HoNa+ & HyK+ results
- Cortrosyn test
- Treatment: Steroids (Dex) & Hydrocortisone

## Basic Care of the Critical Patient:

### • Common Findings:

- Vented
- Sedated
- Bedrest

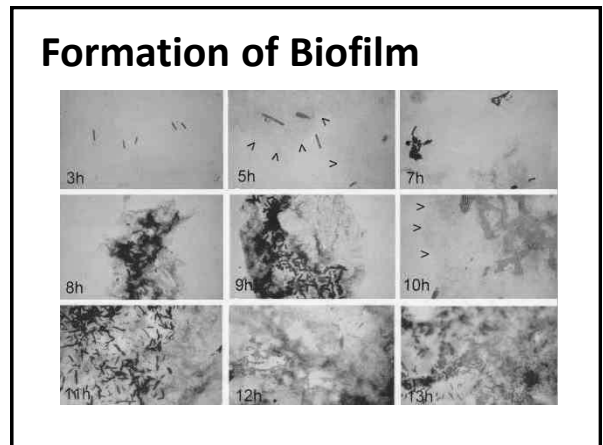
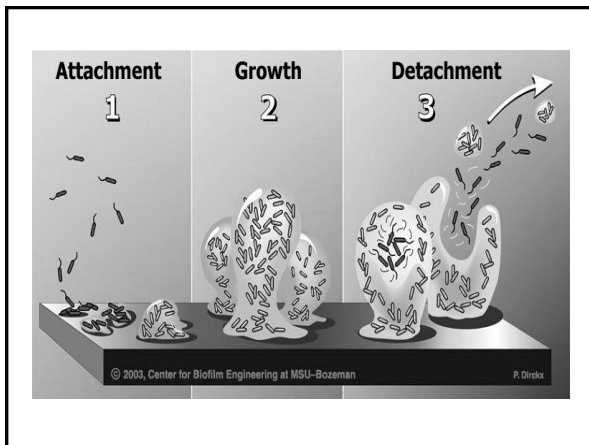
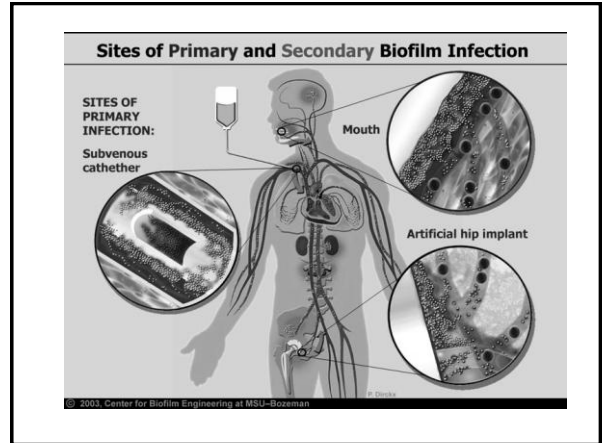


## Risks:

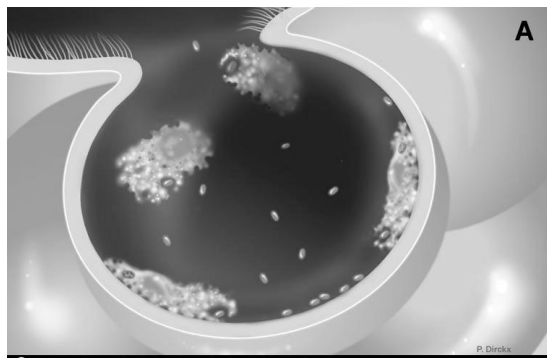
- Aspiration
- Infection
- Immobility/Skin Breakdown



- “Aspiration pneumonia develops after the inhalation of colonized oropharyngeal material. Aspiration of colonized secretions from the oropharynx is the primary mechanism by which bacteria gain entrance to the lungs.”



**Biofilm Entering into Alveoli**

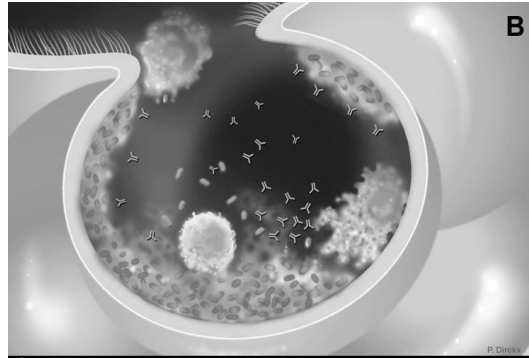


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[http://www.erc.montana.edu/Res-Lib99-SW/Image\\_Library/Medical%20%29Health/default.htm](http://www.erc.montana.edu/Res-Lib99-SW/Image_Library/Medical%20%29Health/default.htm)

**Biofilm Growing and Strengthening**



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**Biofilm Calcifies**



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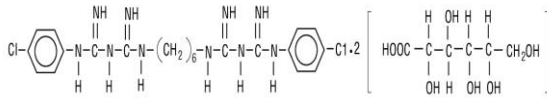
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[http://www.erc.montana.edu/Res-Lib99-SW/Image\\_Library/Medical%20%29Health/default.htm](http://www.erc.montana.edu/Res-Lib99-SW/Image_Library/Medical%20%29Health/default.htm)

**Mechanical  
Cleansing**  
with an oral  
antiseptic helps to  
kill and remove  
biofilms.

**Oral  
Debridement**  
helps lift and  
remove inactive  
biofilms that are  
left behind.





# CHG

ORAL & EPIDERMAL

## Magnitude of Problem

- Approximately 60 million surgical procedures performed per year in the U.S.<sup>1,2</sup>
- 2.6% to 5% of surgical procedures result in surgical site infections (SSIs)<sup>3,4</sup>
- At least 1.5 million SSIs per year in the U.S.<sup>5</sup>
- Account for more than \$25,000 increase per SSI<sup>6</sup>
- Not to mention the incidence and impact of closely related CVAD or CT infections as well.

## Proper Skin Care

- All ICU patients should have a **DAILY** CHG bath
  - Exception, patients with known allergies
- CHG rapidly kills bacteria on the skin
  - Does not kill C-Diff
- CHG will continue to prevent skin colonization by bacteria for hours
- Very low risk of skin irritation

Johnson D. Am J Infect Control. June, 2011; 38(5): E196-E197

## Reducing Surgical Site Infections

### Reducing SSIs

- Bonnie Harris, Prince Williams Hosp, IHI Poster, Dec 2007
  - No standardized pre-op body cleansing protocol
  - 2% CHG Cloths used housewide
  - Patients instructed in pre-op
  - Application, neck down
  - Results:
    - > 60% SSI reduction
    - 10-month ROI > \$348K

Preoperative Skin Preparation Protocol Results in Reduced SSI Rates Henry Rhee, MD, Chair Infection Control Committee and Bonnie Harris, CIC, Infection Control Practitioner, presented at Institute for Healthcare Improvement (IHI), Orlando, FL, December 2007

## Pressure

- The longer a patient stays in bed or immobile, the greater their risk for decreased circulation and tissue hypoxia → Necrosis / Cell Death → Pressure Ulcers

## Pressured by Cost

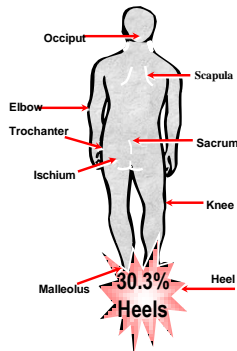


- \$8.5 billion spent each year on pressure ulcers<sup>1</sup>
- Nearly 1/3 of pressure ulcers are heel ulcers<sup>2</sup>
- Up to \$ 2.5 billion spent on heel ulcers annually
- Estimated cost to heel stage 1,2 or 3 is between \$2,000-\$30,000 and \$70,000 for full-thickness wounds<sup>3</sup>

1. Stanton MW, Rutherford MK. Hospital nurse staffing and quality care. Rockville (MD): Agency for Healthcare Research and Quality;2004. Research in Action Issue 14. AHRQ Pub, 04-0029.  
2. Amlung SR, Miller WL, Bosley LM. Adv Skin Wound Care. 2001 Nov/Dec;14(6):297-301  
3. Young ZF, Evans A, Davis J. JONA. 2003 Jul/Aug;33(7/8):380-3.

## Anatomic Locations of Pressure Ulcers

- |                             |              |
|-----------------------------|--------------|
| 1. Sacrum                   | 36.9%        |
| <b>2. Heel</b>              | <b>30.3%</b> |
| 3. Ischium (sit bone)       | 8.0%         |
| 4. Elbow                    | 6.9%         |
| 5. Malleolus (ankle bone)   | 6.1%         |
| 6. Trochanter (hip bone)    | 5.1%         |
| 7. Knee                     | 3.0%         |
| 8. Scapula (shoulder blade) | 2.4%         |
| 9. Occiput (back of head)   | 1.3%         |



Amlung SR, Miller WL, Bosley LM. Adv Skin Wound Care. 2001 Nov/Dec;14(6):297-301.

## Pressure Ulcers in the O.R.

- 40.4 M inpatient; 31.5 M out-patient surgical procedures annually<sup>1</sup>
- 4.4 M surgeries longer than 3 hours<sup>2</sup>
- 1.7 - 4.5 million hospital-acquired pressure ulcers (HAPU) in U.S.<sup>2</sup>
- Surgeries greater than 3 hours account for almost 25% of HAPM.<sup>2</sup>

1. [http://www.cdc.gov/nchs/products/pubs/pubd/series/sr13/140-131/sr13\\_139.htm](http://www.cdc.gov/nchs/products/pubs/pubd/series/sr13/140-131/sr13_139.htm)  
2. Beckrich K, Aronovitch S. Nursing Economics. Sept-Oct 1999 Vol. 17/No. 5: 263-271



# Review ?

## Question Review:

- Vasopressin is ordered for the DI pt to do which?
  - A. Stimulate pancreas to secrete insulin.
  - B. Slow intestinal absorption of glucose.
  - C. Inc H<sub>2</sub>O reabsorption in the tubules.
  - D. Increase BP.

C – Vasopressin increases urine concentration by inc tubular reabsorption of water. It does not increase BP or affect insulin production or intestinal absorption of glucose.

- Patient has BS 1200. Which s/s is found?
  - A. fruity breath odor
  - B. dehydration
  - C. urine positive for ketones
  - D. HTN

B – In HHNK, glycosuria and polyuria occur as result of extreme sGluc , causing severe dehydration. Ketosis & acidosis do NOT occur b/c INSULIN levels are sufficient to prevent excessive lipolysis but not glucose utilization.

- A patient with DM-II was found unresponsive, sitting at his desk at work. An admitting diagnosis of HHNK coma was made in the ER. The nurse anticipates his highest priority needs by preparing:
  - A. large amounts of IV normal saline for infusion
  - B. insulin drip made with glargine insulin for infusion
  - C. oxygen at 40% via mask
  - D. padded side rails and bite block

• For patients with diabetes insipidus, which of the following statements regarding fluid management is accurate?

- A. electrolyte levels must be monitored to determine correct IV fluids to administer
- B. if the DI is nephrogenic, vasopressin will need to be administered
- C. if the DI is neurogenic, only fluids will need replacement
- D. the patient's output must exceed his intake in order to prevent complications

• The nurse performing an admission assessment on a patient diagnosed with diabetes insipidus. Which of the following assessment findings would the nurse expect to see in a patient with this condition?

- A. elevated SBP, tachycardia, decreased UOP
- B. elevated serum potassium, brady, numbness in hands
- C. polyuria, extreme thirst, decreased urinary SG
- D. widened PPs, dilated pupils, decerebrate posturing

- A patient is admitted following involvement in a motor vehicle collision. The patient's UOP had increased from 125ml to 1000ml over the past 2 hours. Which of the following is the most important assessment the nurse should make at this time?
  - A. abdominal girth measurement
  - B. urine specific gravity
  - C. capillary blood glucose level
  - D. potassium level

- A normal releasing stimulus for ADH is:
  - A. decreased aldosterone levels
  - B. decreased serum osmolality
  - C. increased serum osmolality
  - D. increased potassium levels

- Symptoms of SIADH result from:
  - A. elevated potassium levels
  - B. water intoxication
  - C. increased serum osmolality
  - D. precipitating factors of SIADH

- The patient with SIADH would most likely present with which complication?
  - A. tetany
  - B. seizures
  - C. hypotension
  - D. poor skin turgor

- ADH stimulates the kidneys to:
  - A. reabsorb sodium and excrete potassium
  - B. reabsorb water and concentrate urine
  - C. reabsorb water and dilute urine
  - D. reabsorb sodium and retain potassium

- A major complication of diabetes insipidus is:
  - A. hypovolemic shock
  - B. seizures
  - C. congestive heart failure
  - D. cardiac dysrhythmias for hypokalemia

- Which statement about HHNK is false?
  - A. hyperglycemia occurs because of a total insulin deficiency
  - B. cerebral impairment is a major factor
  - C. ketogenesis does not occur
  - D. severe dehydration results from an osmotic diuresis

- Diagnostic data of HHNK would reflect:
  - A. pH of 7.10
  - B. 4+ ketone bodies in the urine
  - C. azotemia
  - D. Hct of 29%

- A patient with HHNK will exhibit which signs and symptoms?
  - A. shallow respirations, hypertension, and flushed skin
  - B. change in LOC, decreased respirations, and hypotension
  - C. diaphoretic skin, decreased skin turgor, and increased heart rate
  - D. weakness, tachypnea, and hypotension

## Summary

- Endocrine Emergencies are relatively uncommon but life-threatening
- Symptom recognition is primary-especially in ICU
- Not delaying treatment because of no underlying, pre-existing history or condition is key
- Aggressive, supportive care, and prompt replacement of steroids and hormones will greatly reduce the morbidity and mortality rates of these potential candidates

Shah, & Lettiere. (2007). Endocrine emergencies. Retrieved from Medscape.org database.

