MODERATE SEDATION & HYPOGLYCEMia:

A critical case study

Modérée Hypoglycémie: une étude de cas critique

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OBJECTIVES

- Through a case study presentation

The participant should be able to:

Define hypoglycemia - définir l'hypoglycémie

Differentiate between moderate & severe hypoglycemia- différencier modéré à sévère

3. Recognize the risks of moderate sedation & hypoglycemia- reconnaître le risque

4. Acknowledge importance of pre-op education-

Case study

- 59 female: EGD/COLONOSCOPY
- Pre-op dx: Anemia (H & H 6.4/21) GI Bleed, Weight loss & Dysphagia
- Past Medical HX: HTN, DM type 2, Asthma
- Family dropped off patient at same day surgery registration area.

- Pt: Confused, pale & diaphoretic, shaky

- To holding area

- Vitals

104/59, ST 128, RR 14, O2 Sat 93%

- Pt: “Took all meds last night, nothing to eat yesterday except liquids & colon preparation. Nothing this am.”

- CBG(capillary blood glucose)
- **US 11mg/dl /Canadian (0.61 mmol/L)**

- To convert from mg/dl to mmol/L divide by 18. To convert mmol/L to mg/dl, multiply by 18.

- While calling for help, IV placed w/stat labs drawn. Repeat CBG while lab running:
- **13mg/dl (0.72mmol/L)**

Nurse amazed that CBG machine gave a value.

Meter standards requires that 95% of results be within +/- 20% of the true value.

Stat lab glucose returns:
16mg/dl(0.88mmol/L)

- GI doctor orders ICU bed
  - No beds available
  - Nurse recommends: send pt.to ER
- GI doc talks to ER doc:

Decision made to treat in endoscopy until bed available….

Initial treatment

- D50 1amp IVP (0.5gram/50cc)
- D10 @ 250cc/HR.

defining hypoglycemia

- Glucose < 70 mg/dl (<4mmol/L)
- Why <70mg/dl (<4mmol/L)
  - Recommended by Diabetes Canada 2018
  - American Diabetes Association (ADA) & American Assoc. of Clinical Endocrinologists (AACE)

- Approximately is lower limit of normal post-absorptive plasma glucose but greater than glycemic threshold for activation of glucose counter-regulatory

- Glucose of 70 /4 allows time to respond & prevent severe clinical events
- Threshold for symptoms can vary

- Provides margin for limited accuracy of CBG devices

1 Recognize Symptoms Early

No matter how carefully you manage diabetes with insulin, hypoglycemia (low blood sugar) may still develop very quickly. Symptoms include:

SWEATING

BLURRY VISION

DIZZINESS

ANXIETY

HUNGER

IRRITABILITY

SHAKINESS

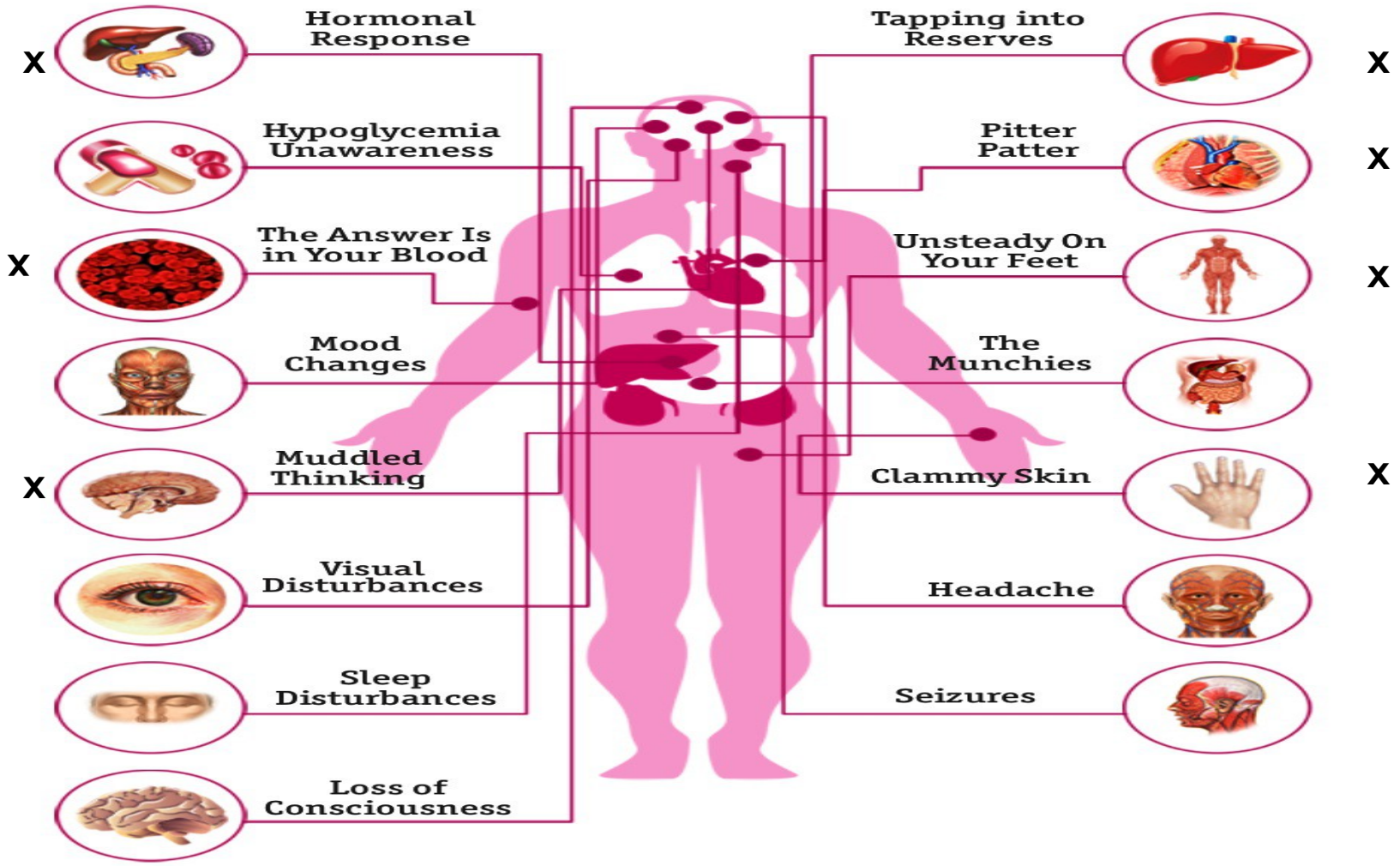
FAST HEARTBEAT

HEADACHE

WEAKNESS, FATIGUE

THE EFFECTS OF LOW BLOOD SUGAR ON THE BODY

Every cell in your body needs sugar (glucose) to function. When your blood sugar levels drop too low, your cells become starved for energy. Initially, that can cause minor symptoms, but if you don't get your blood sugar levels up soon, you're at risk of serious complications.



3 severities (diabetes Canada 2018)

aSYMPTOMATIC/mild: Autonomic symptoms are present. The individual is able to self-treat.

MODERATE: Autonomic and neuro-glycopenic symptoms are present. The individual is able to usually self-treat.

SEVERE: Individual requires assistance of another person. Unconsciousness may occur. Plasma Glucose is typically <2.8□mmol/L.

SEVERE SYMPTOMATIC

- Severe = <40mg/dl (< 2.22mmol/L)
  - **CRITICAL**
- Higher mortality
- Cardiac arrhythmias
- Can aggravate myocardial ischemia

CEREBRAL VASODILATION

- Your brain uses 20% of glucose
  - **The main consumer of glucose**
    - Explains change in LOC
- Possible irreversible brain damage, seizures
- Potential of DEATH

PREVALENCE

- Hypoglycemia is 2-3x more prevalent in type 1 diabetics…….
  - However given the overwhelming prevalence of type 2 most hypoglycemic episodes in outpatient procedures are in type 2 diabetics
- Nocturnal hypoglycemia is almost 2x as common as day time……
  - When do we do our preps and NPO status???

RISK FACTORS

- NPO since MN
- Endo: doing preps w/o carbs
- No solid food/protein
- Hypoglycemia can be common in pts taking glycemic agents especially if more than one

Hypoglycemia unawareness

- Long term diabetics
  - The level of glucose required to stimulate a response may be >glucose level associated with neuro-glycopenia.
- Patients may experience confusion as the first symptom of hypoglycemia.
- Hypoglycemia unawareness itself is associated w/ a 6x increased risk of future severe hypoglycemia.
  - Ask your patient if they can sense a drop in their glucose?

RISK FACTORS

- Patients w/recent hypoglycemic episodes may have lower threshold for symptoms in response to low glucose
  - May not “sense it”
  - Frequent hypoglycemia can decrease normal responses to hypoglycemia and lead to defective glucose counter-regulation and hypoglycemia unawareness(Diabetes Canada 2018).
- Hospitalized patients & poorly controlled diabetics commonly have hypoglycemia

HYPOGLYCEMIA CAN BE COMMON IN PT'S TAKING GLYCEMIC AGENTS

- Insulin
  - Long acting 24-30 hours
    - Lantus (glargine u200,u300)
    - Levemir(determir)
  - Intermediate
    - NPH

Recommendations:

Discussion with primary care

- 20 % - 50 % reduction of evening dose

symptoms

3 Categories

- Autonomic Sympathetic
  - Acetylcholine / Epinephrine release
  - Sweating, Hunger
  - Palpitations,Tachycardia
  - Shaking ,Tremors

- General
  - Malaise, Weakness

POTENTIALLY MOST SERIOUS ONE

- Neuroglycopenic (cerebral glucose deprivation)
  - Confusion, Drowsiness
  - Speech difficulty
  - In-coordination, Dizziness
  - Seizures, Coma

Common endo MODERATE SEDATION symptoms

SWEATING, Vagal responses

Drowsiness, Deep sedation

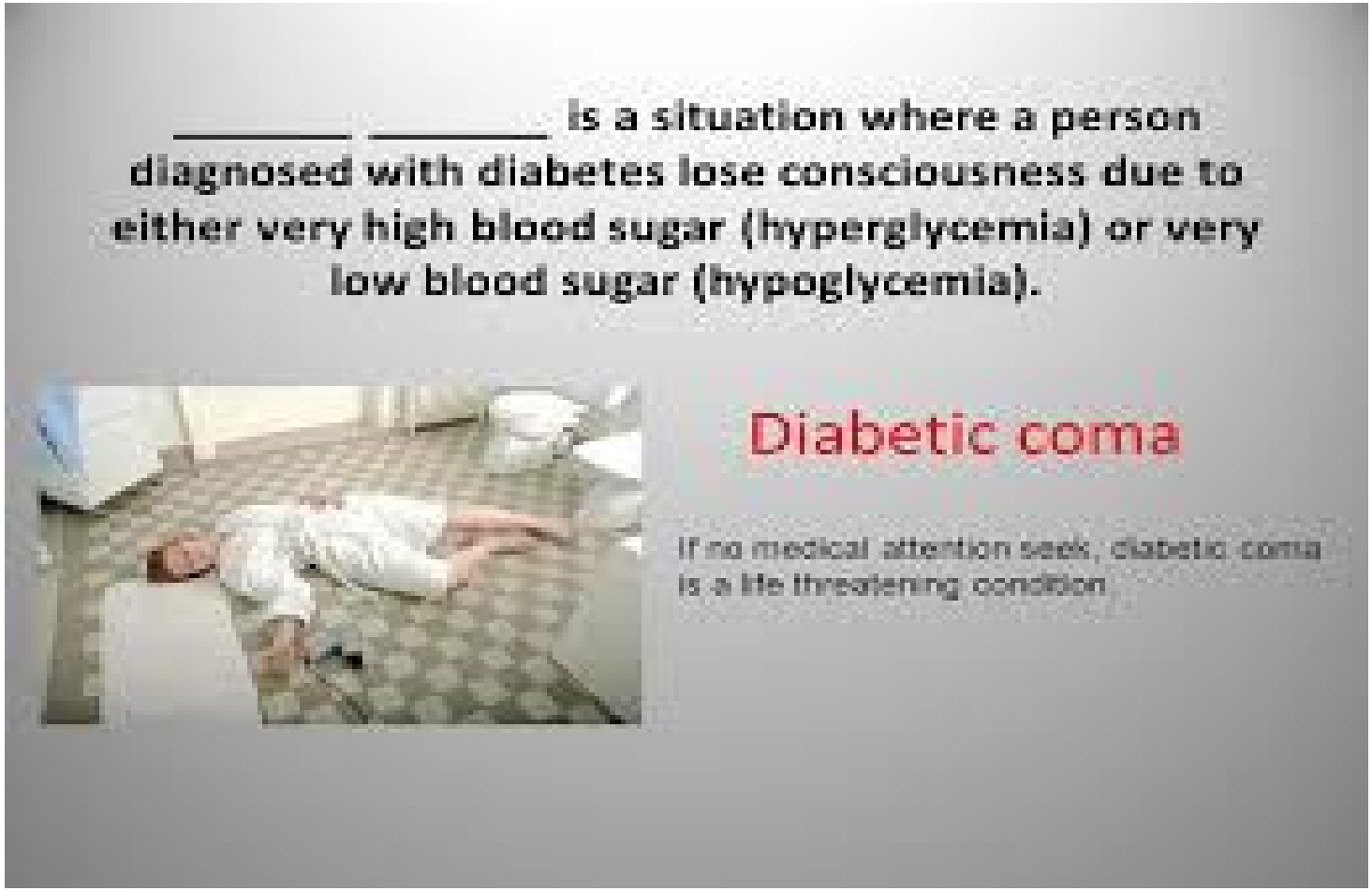
Speech difficulty

Dizziness, Lightheadness

Weakness

Moderate sedation risks

- **Preop**
  - Reduced caloric intake



She is not recovering from moderate sedation.

Sedation can mask hypoglycemia.

Err on the side of higher glucose pre-procedure than low.

Case study Pre-op factors

- Patient did not bring her current med list to preop appointment.
  - Staff never recalled or followed up.
  - Pre-op nurse was not regular staff
- GI doc had incomplete list on H&P
- Until GI doc called that morning primary unaware of when colonoscopy/EGD was scheduled.
  - Doc “she just started Lantus”(in

CASE STUDY CONTINUED

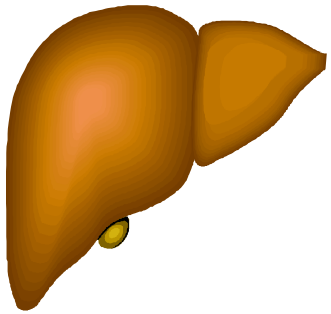
- Next 6 glucoses at 90 minutes after arrival. 12 hours after her full dose of 80 units Lantus.
- D50 (50ml) x 2 ,D10 (500ml infused)
- Glucagon 1mg IV
  - 45(2.5),132(7.4), 51(2.8),156(8.5), 39(2.3) & 82(4.6)
  - Stat labs & CBG's were congruent & unremarkable fortunately.

drugs most commonly perscribed according to Diabetes Canada

- A1C 1.5% above target. Start metformin
- Clinical CVD? Add a CV benefit antihyperglycemic agent: Empagliflozin, Liraglutide,Canagliflozin.
- If not at glycemic target, avoidance of hypoglycemia, weight gain add a DPP-4 inhibitor, GLP-1 receptor agonist or SGLT2 inhibitor.
- Rare chance of increasing risk of hypoglycemia
- Insulin secretatogue:Meglitinide &
- Sulfonylurea, Glyburide, Gliclazide,

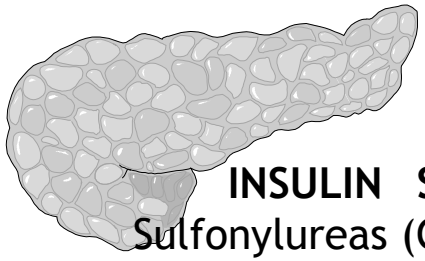
Sites of Action of glucose control meds

LIVER



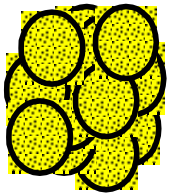
GLUCOSE PRODUCTION
Metformin
Thiazolidinediones

PANCREAS



INSULIN SECRETION
Sulfonylureas (Glyburide, Glimepiride, Gliclazide)
Non-SU Secretagogues: Repaglinide, Nateglinide

ADIPOSE TISSUE



MUSCLE

PERIPHERAL GLUCOSE UPTAKE

Thiazolidinediones (Actos, Avandia)
Metformin
Insulin

INTESTINE

GLUCOSE ABSORPTION

Alpha-glucosidase inhibitors (percose,acarbose,glyset,miglitol)
GLP-1 Glucose like peptide -1 agonists (exenatide(Byetta/Bydureon),liraglutide Victoza),Saxenda, lixisenatide, Lyxumia,
DPP4 Inhibitors(Januvia, janumet, sitagliptin, linagliptin, saxagliptin)(

ANTIDIABETIC DRUGS

- **Sulfonylureas:** Stimulate the pancreas to produce more insulin. *Gliclazide*(Diamicron), *Glyburide*(DiaBeta), *Gl*

Known that a molecule called DPP4 removes GLP-1 from the body quite quickly. A canadian doctor realized, during the course of his Diabetes Canada-funded research, that finding ways to mimic what GLP-1 does or to block what DPP4 does would both have the end result of lowering blood glucose levels. Dr. Drucker followed this line of reasoning, and through his research developed two new treatments for type 2 diabetes. The first type of treatments are called GLP-1 analogues (means that they mimic the action of GLP-1), include drugs liraglutide (Victoza) and exenatide (Byetta). The second type of treatments are called DPP4 inhibitors (they block DPP4 from removing GLP-1 from the body), and include drugs sitagliptin (Januvia), vildagliptin, and saxagliptin.

Diabetes Canada is proud to have funded the research that led to Dr. Drucker's important discovery and to the development of two widely-used types of type 2 diabetes drugs

hypoglycemia risk

- Metformin :Glucophage
  - Rare lactic acidosis. Avoid in severe renal & CHF.
- Sulphonylureas:Glipizide
  - Highest risk hypoglycemia
- Glinides (Prandin, Starlix)
- Thiazolidinediones
- Alpha-glucosidase inhibitors (Victoza, Bydureon)
- Dipeptidyl peptidase-4 inhibitors (Januvia)
- Sodiumeglucose

- Neutral risk
- Yes hypoglycemia risk
- Yes hypoglycemia risk
- Neutral risk
- Neutral/Low risk; Only works on high glucoses.
- Neutral/Low risk; Works when glucose is high, and less when low, works by enhancing intrinsic ability to lower blood sugar

- METFORMIN
  - Low risk of hypoglycemia
  - hold am dose

Make sure renal function and hydration is adequate. More issues with renal/lactic acidosis. Current guidelines American College of Radiology does not recommend holding dose in relation to IV contrast studies if the patient does not have acute kidney injury & has an GFR 30 ml/min

- Much more important for DI, CATH LAB, than ENDO.

Higher risk of hypoglycemia: hold evening before & AM day of

- Sulfonylureas
  (glipizide,glyburide,diabeta,micronase,orinase,diabenase, gliclazide)
  - Action is by increasing second phase insulin secretion. The action It may be longer than their half-life given the biologic activity of their metabolites

- Thiazolidinediones: ACTOS, AVANDIA
  Health warning, lawsuits

PREOP TEACHING

Education /Communication

- What meds & what time do you take them?
- When did the primary tell them to or if to stop insulins or oral agents?
  - **primary care/endocrinologist**
    - **Usually stop sulfonureas (glipizide) day before.**
    - **Metformin & other oral meds held morning of.**
    - **Usually take 20%-50% usual insulin dose**

recommendations

- Follow ASA guidelines:

  2 hour clear liquid

  - Educate docs about ASA guidelines
- Endo pts split dose preps
  - Night before & am day of
- Clear liquids w/ glucose fluid

- **Educate:** Patient to test

How to differentiate?

- ????
- When in doubt treat as hypoglycemic, until blood sugar >70-80 (3.88 – 4.44)
- Most common risk factor for hypoglycemia is an

INTERVENTIONS

- If not NPO:
  - 3-4 glucose tablets (15-20 grams)
  - Gel serving (15 grams)
  - 4oz juice (15 grams)

15-20□g oral glucose dose will produce a BG increase of approximately 38-64(2.1-3.6□ mmol/L) at 45 minutes.

INTRAVENOUS

- Glucagon =1mg IV
  - Increases glucose in 8-18 minutes by converting stored glycogen to glucose in the liver.
  - Glucagon 1▫mg given SQ or IM produces a significant increase in BG(3 to 12.mmol/L) within 60 minutes.
  - The effectiveness of glucagon is reduced in patients who have consumed > 2 alcoholic drinks in the

- D50= 50ml 50%Dextrose/25 grams=100 calories
  - Raises glucose by average of 100 (5.55) within 5-20 minutes; metabolized within 30 minutes
  - Run IV fluids wide open since high osmolality

- D10 IV fluid absorbed better than D50
- 250cc D10 = 25 grams
- IV can be bolused almost as fast as an amp of D50

D5 is 5 grams per 100cc

D10 is 10 grams per 100cc

- Long acting insulin:
- Lantus, Levemir (Detemir)
- Degludec U-100,Degludec U-200,
- Glargine U-100,Glargine U-200,Glargine U-300
- **May cause a recurrent hypoglycemia.**

  After initial glucose is metabolized recheck CBG often since insulin is still on board.

  - Keep treating until glucose >70 (3.88) – 80 (4.44)
  - According to Diabetes Canada after

STILL IN ENDO:

- Treatment up to this point:
  - 1mg Glucagon x 2 doses
  - 4 amps D50
  - 750cc D10
  - 125mg Solumedrol (HX asthma)
    - GI DOC thought “couldn’t hurt”

Initial H&H 6.7 & 22.1.

- T&C for 2units PRBCs

- Pt more alert & oriented
- VSS:

SR, skin W & D but pale (Anemic)

- Nurse wants to feed patient & send to ICU, which has bed available now
- D10 infusion @250 cc/HR continues
- GI doc & primary discussing what they

2-2.5 HOURS LATER

Daughter arrives:Wants to know why procedure not done yet?

- Pt stable, alert & oriented
- Last three glucoses:
  - Last hour >120(4.28).

CASE STUDY HOUR 3

- **Primary care & GI doc decide to:**
  - Transfuse PRBC's
- Scope patient
  - Reconsented from patient & daughter.
- Moderate sedation
  - 3mg versed & 50 mcg fentanyl
  - Total EGD time 7 minutes including sedation

results

- Large deep duodenal bulb ulcer & pyloric channel ulcer
- CBG 66(3.66) done between EGD/colon:
  - D10 still infusing at 100ml/HR w/ blood also infusing in 2nd IV site.
  - Treated w/ D50 1 amp & 1mg glucagon IV
  - Doc decide to continue since same treatment intra endo as if in ER/ICU w/ same monitoring w/ CBG's & treatments

SHOULD WE HAVE DONE EGD?

Should we proceed w/ colon?

- 26 minutes later (CBG,treatment & scope time)
- Results: diverticulosis,4 polyps
- CBG repeated 99(5.5)
  - Another bag of D10 started
  - Ist Unit RBC finishing.
  - Pt to recovery

POST MODERATE SEDATION

- Pt allowed to eat, drink
- 2nd Unit RBC starting
- CBG's next 2 hours
- 123(6.83),69(3.83),177(9.83) 80(4.44),132(7.33)
- Blood done , CBG 155(8.61)

SHOULD WE SEND HER HOME?
Devrions-nous la renvoyer chez elle?

Alert, oriented, passing flatus, VSS, skin W&D, lungs clear, patient voiding.

Family at bedside: States they will monitor her blood sugar frequently and be on look out for S&S

Primary care says send her home & have her follow up in office the following day.

merci

RESOURCES

American Diabetes Association (ADA)

www.diabetes.org

American Association of Diabetes Educators

www.diabeteseducator.org

American Association of Clinical Endocrinologists

www.aace.com

Diabetes Canada

www.diabetescanada.org

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