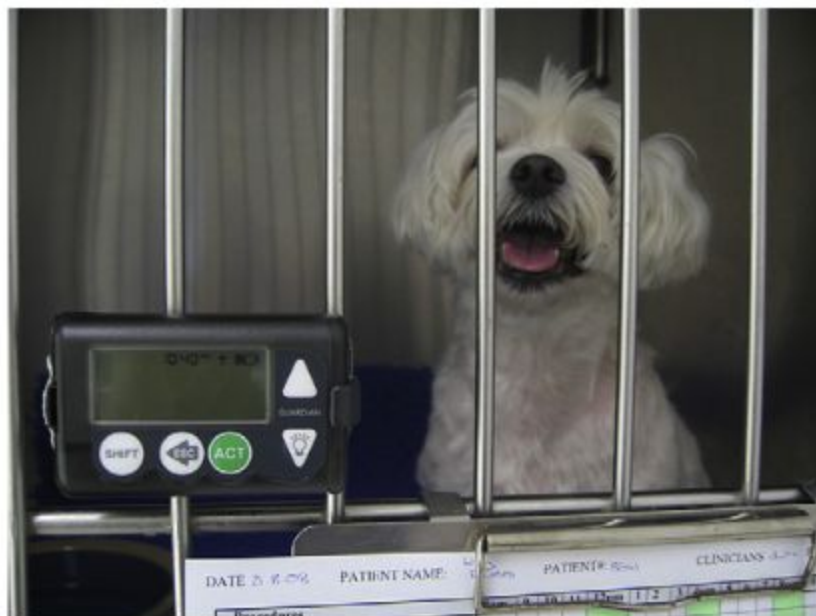


Patient populations that can benefit

- Critical Care:
 - Non-diabetic critical patients
 - Some human literature suggesting that tight glycemic control reduces morbidity and mortality
 - Soms controversy, with tight glycemic control showing increased mortality in other trials
 - Hyperglycemia in non-diabetic sick humans is much higher than in vet med
- Continuous monitoring in felines
 - Devices need to be calibrated 2-3 times per day with blood sticks, so does not entirely eliminate need for blood draws
 - Allows for continuous readings throughout the day
 - MiniMed Gold has been evaluated in sick diabetic veterinary patients
 - Does not have real-time display, only available retrospectively
 - 98% of the paired data points were in either zone A (no effect on the clinical decision made), or zone B (altered clinical decision unlikely to affect outcome)
 - Guardian real-time continuous monitor is real-time
 - Samples interstitial fluid
 - May not be accurate in severely dehydrated patients
 - Stable cats
 - Early control leads to increased rates of remission
 - Tight control leads to increased risk of hypoglycemia



- Dog study of healthy dogs

- Monitors read consistently lower than BGs
- Study of anesthetized dogs showed inaccurately low readings

Other glucose monitoring

Glucose can be measured on either whole blood or on plasma/serum. Whole blood generally gives a lower glucose concentration than plasma/serum as a result of the higher water content of plasma (93% water) compared with erythrocytes (73% water)

Enzymatic measurements - most common in labs and POC analyzers

- POC will also use photometric or electrochemical techniques
 - Glucose is oxidized via oxidoreductases in the presence of coenzymes
 - Generates electrons that are transferred to a mediator molecule
 - Electron is then donated to the electrode (electrochemical) or indicator molecule which forms a color (photometric)
- Cause for discrepancy between human and vet monitors
 - Human monitors assume constant unchanging relationship between plasma and whole blood with RBCs and plasma each containing 50% of glucose
 - Not conserved across species
 - Dogs have 12.5% and 87.5% of glucose in erythrocytes and plasma, respectively, and the disparity is even greater in cats (7% and 93%, respectively).
 - Portable glucose monitors usually measure plasma
 - Canine and feline BG is often **underestimated**
- Interstitial (IG) and plasma glucose (BG) relationship
 - Two theorized models
 - 2 compartment model
 - Capillary wall separating the plasma and interstitial fluid acts as barrier to diffusion
 - Depends on diffusion rate and glucose clearance rate
 - Delay of 5-12 minutes in rapid change of BG and IG
 - Cats lag is around 11 minutes after IV bolus of glucose
- Logistics
 - Each sensor lasts between 48-72 hours
 - Newer technology is increasing this time
 - Calibration required multiple times per day
 - Some monitors only require calibration at beginning and end of sampling period
 - During times without rapid glucose changes
 - Monitors have ranges from:
 - Low 20-40
 - High 400-600



Fig. 6. Adhesive bandage tape used to secure the Guardian Real-Time sensor/transmitting device in a cat that repeatedly attempted to remove it despite standard bandaging.

Insertion video (human):

<https://www.youtube.com/watch?v=yq-Nj9hsrNk>

Questions:

1. True/False: Interstitial glucose monitors can be reliably used immediately upon hospitalization for DKA patients to reduce the requirements for venipuncture for glucose monitoring
2. Using a human portable blood glucose monitor, you obtain a reading of 120 mg/dl on a human, a dog, and a cat. Using your knowledge of POC analyzers, list the species in order of which likely has the lowest TRUE blood glucose, and which has the highest

Answers:

1. True/**False**: Interstitial glucose monitors can be reliably used immediately upon hospitalization for DKA patients to reduce the requirements for venipuncture for glucose monitoring
Dehydration reduces usefulness. Need to wait >6 hours before using in dehydrated patients
2. Using a human portable blood glucose monitor, you obtain a reading of 120 mg/dl on a human, a dog, and a cat. Using your knowledge of POC analyzers, list the species in order of which likely has the lowest TRUE blood glucose, and which has the highest
Cat > Dog > Human
due to the amount of glucose in RBC vs plasma