VITICUSGROUP™
WVC ANNUAL CONFERENCE
MARCH 2 - 5, 2025 | LAS VEGAS, NV

The collapsed DKA, cushingoid patient: and other confusing endocrine comorbidities.

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IDEXX

Financial Disclosure

Patty Lathan

I have financial interest, arrangement or affiliation with:

Idexx, Boehringer Ingelheim, Scout Bio:	**Consultant, honoraria**
Merck Animal Health, Dechra Pharmaceuticals:	**Honoraria**

Bill Saxon

Full-time IDEXX Employee

You’re on clinics and in walks…

Picture the most flat-out dog you’ve seen recently…

Everyone's favorite combo:

- Acute (or acute on chronic) pancreatitis
- Diabetic ketoacidosis
- Potbellied Dachshund… Cushing's syndrome, too?

Where would *you* start?

The plan:

- Forget about Cushing's syndrome for now (unless on tx)
- Basic principles of emergency stabilization
  - LRS good initial fluid choice (has buffer and calcium)
  - QUATs: PCV/TS, BG, electrolytes, lactate, venous blood gases
  - CBC, biochemistries, UA (save samples of additional testing)
  - Resting cortisol if on trilostane
- Confirm pancreatitis within minutes
- Brace yourself/staff for DKA treatment

In clinic diagnosis of pancreatitis

- **SNAP cPL**
  - ***Screening*** **test: negative result rules OUT pancreatitis**
  - **Positive result *could* be pancreatitis – must confirm.**

- **Catalyst® pancreatic lipase**
  - **Excellent correlation with Spec cPL and cPLI (and Spec fPL, fPLI)**
  - **Undetectable in dogs with EPI (i.e., specific for *pancreatic* lipase)**

Simultaneous treatment for pancreatitis and DKA

- LRS: restore volume, hydration, keep up with ongoing losses, provide maintenance (avoid volume overload)
- Analgesia in *all*: buprenorphine, methadone, fentanyl…
- Maropitant 1 mg/kg SC q24h
- Regular insulin
- Other insulins, e.g., Lispro

Do I have to use regular insulin CRI for DKA?

Not necessarily…

Insulin protocols for DKA in dogs

- Regular insulin CRI
  - Add 1-2 U/kg to 240 ml saline
  - BG >400 = 20 ml/h, 0% dextrose
  - BG 250-400 = 10 ml/h, 0% dextrose
  - BG 150-250 = 5 ml/h, 2.5% dextrose
  - BG 80-150 = 0 ml/h, 5.0% dextrose
  - BG <80 = 0 ml/h, 5.0% dextrose, bolus 1 mg/kg 50% dextrose
- Regular insulin intermittent IM injection
  - 0.25 U/kg q 1-2 h
- Lispro insulin? Longer acting insulins (e.g., glargine)?

Additional treatment:

- **Enteral nutrition within 48 h *of onset of signs* of pancreatitis**
  - **Royal Canin GI Low Fat liquid diet**
- **Panoquel® 0.4 mg/kg IV SID x 3 d, over 15-60 sec**
- **Monitor potassium and phosphorus, add to fluids prn**
  - **Monitor PCV/TS**
- **Bicarb rarely necessary**

Crisis over. I still think this dog has Cushing's syndrome. How can I prove it?

This is tricky but we have some tips…

(but first tip is…ABSOLUTELY NOT NOW!!!)

Suspect HAC in a Diabetic

Tip #1:
No need to rush.
Cushing's testing can and should wait.

Diagnosing Cushing's in known diabetic

- Cushing's most common cause of insulin resistance in dogs
- Suspect when
  - Lack of response to or short or variable duration of insulin
  - PU/PD (USG <1.020) despite decent glucose regulation
  - Hypertriglyceridemia
  - Panting, derm changes, pot belly, hepatomegaly…

Testing for Cushing's in known diabetic

- Wait ≈2-4 wk after start of DM treatment
  - False positives if screen for Cushing's at time of DM dx (stress)
- When weight loss stops (i.e., DM control adequate'ish)
- LDDST if dog stable
- ACTH stim more specific – fewer false positives
  - Consider positive with post-ACTH cortisol >?

How much do I lower insulin dose when I start trilostane?

You don’t.

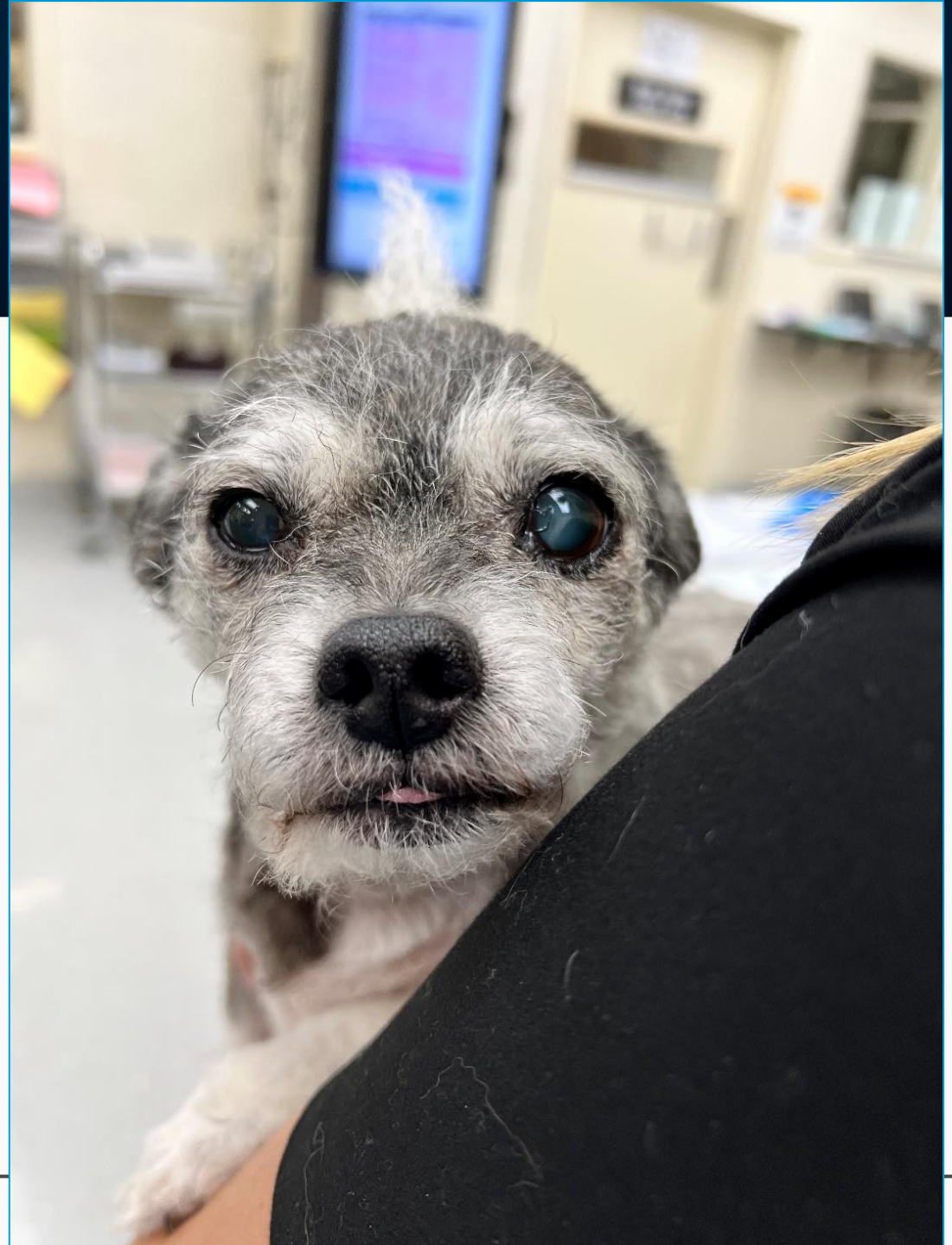
Treating newly-diagnosed HAC in a diabetic

- Trilostane, 1-1.5 mg/kg PO BID WITH FOOD
  - No insulin dose decrease needed, usually
- Monitor with ACTH stimulation testing or pre-pill cortisol (if you have experience here)
  - 2 weeks after starting trilostane
  - 1 month later
  - 3 months later
- Focus on control of HAC before fine-tuning insulin
  - CLINICAL SIGNS/CLINICAL CONTROL
  - FreeStyle Libre may allow more rapid insulin dose adjustments

Flipping the script.

You’re treating a dog for Cushing’s syndrome. Something’s not right.

Could it also be a diabetic?



Suspect DM in a known cushingoid when:

- PU/PD persists despite cortisol suggesting HAC controlled
- **Weight loss**
- **Blood glucose trending up or mildly increased**
- **Fructosamine increased**
- **Check UA in dogs with HAC when signs don’t fit**

NEXT UP…SUNNY (via email…)

I was hoping you possibly had time to discuss a case. Sunny [redacted] is a 13 yr old neutered dachshund referred to LSU IM for elevated liver enzymes. After his visit with LSU, we performed LDDST and confirmed Cushings. Initially started Vetoryl at 1 mg/kg BID. Resting cortisol (pre-trilostane) 2 weeks later was 2.7. Clinical signs are not controlled (PU/PD, lethargic at home). I then increased Vetoryl to 2 mg/kg in the morning and 1 mg/kg in the evening. Clinical signs not improving and now owner is reporting urinary incontinence. Resting Cortisol yesterday is 5.0. Other considerations, he has a 4 lb weight loss over the last couple months, currently on Vetmedin and overall just looks terrible.

Am I ok to increase to 2mg/kg BID. Should I increase it? Should I culture the urine?

My response…

I suspect that you have room to increase with the resting cortisol of 5. But geez, that weight loss is definitely not typical of Cushing's.

Urine culture is reasonable, although checking a chem may be helpful. It's possible he decided to develop DM, as well (would pick that up on UA). Another thought is making sure he doesn't have a macroadenoma causing decreased appetite and lethargy. I assume his appetite hasn't picked up recently? Has it gotten worse?

Update on Sunny…

Good morning. Wanted to let you know Sunny's blood glucose was 612 yesterday with 1+ glucosuria, 1+ ketonuria. No evidence of UTI. ALP has decreased from 9000 to 2600. Also the PrecisionPSL is elevated at 205 (normal is 24-140).

Sent: Friday, January 24, 2025 5:00:01 PM

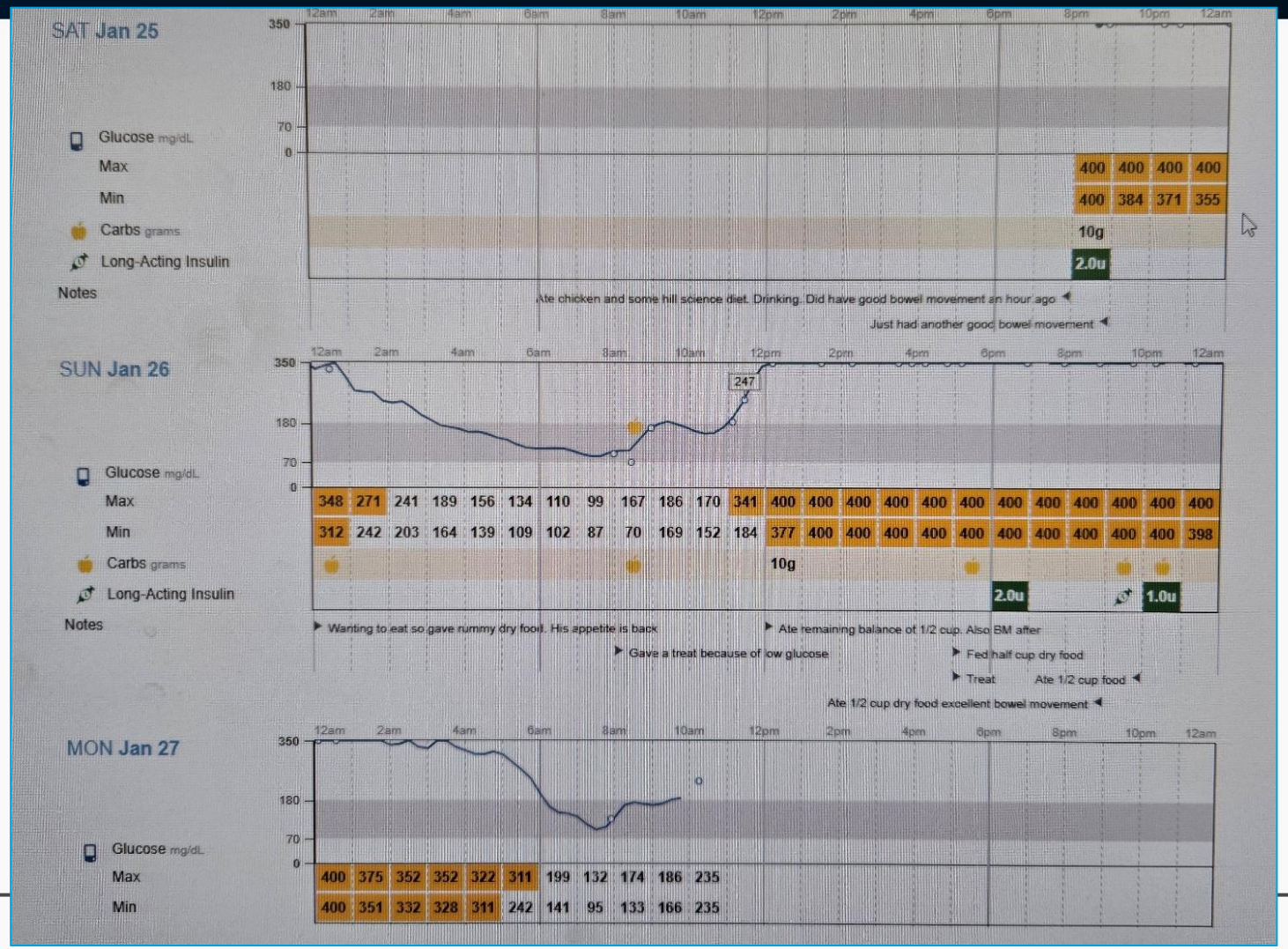
To: Patty Lathan <plathan@lsu.edu>; Robyn N Jolly <rjolly@lsu.edu>

Subject: Re: Sunny Welborn

Happy Friday! Hope y'all enjoyed the snow! Wanted to give you an update on Sunny Welborn. I started him on Degludec 0.6u/kg SID (current weight is 11 lbs, so 3 units SID). A few days later when he came in for his Freestyle Libre application, the owner stated that he seems better at home having more energy and eating his full meal. Libre reading was at or above 500 approximately 10 days after starting insulin therefore I increased to 4 units SID. There were a couple readings in the 470 -490 range but the vast majority was 500. It's been 4 days at 4 units SID and readings are still high (majority over 500 but a few readings at 392, 438, 449...).

Should I increase again next week to 5 units SID? What's the max dose of Degludec? Not much info on VIN or Plumbs for me to reference. At what point do you suspect insulin resistance? Do you ever use this BID?

Another dog that was started on degludec over the weekend…



Diabetes mellitus causes weight loss.

Cushing's syndrome does not.

Treatment: DM in Known cushingoid

- Vetsulin®, NPH BID
  - Err towards high end of starting range
  - Basal insulin may help decrease glycemic variability
    - Degludec (0.5 U/kg SID to start) or glargine U-300
- Split trilostane to BID dosing if currently SID
  - Same DAILY dose
  - Example: 60 mg SID = 30 mg BID
- Monitor as usual
  - CLINICAL SIGNS, weight, glucose monitoring
  - Cortisol/stims for HAC
- Try not to micromanage DM—focus on clinical signs!

DKA in Known cushingoid

- Acute anorexia, vomiting, dehydration, collapse…
- Check cortisol (+ chem, ideally) first to rule out adrenal crisis
- UA, chem, CBC, pancreatic-specific lipase
- Check for ketones
  - Urine ASAP – even few drops for dipstick
  - If no urine use serum from HCT tube on ketone pad of urine dipstick
  - Or check BHB with a ketone meter (Precision Xtra)

Test interpretation practice!

Is an insulinoma causing the hypoglycemia?

- Ruled out other causes?
- Blood glucose <60 mg/dL?
- Submit insulin glucose panel (ratio not helpful)
- If BG on panel >60 mg/dL cannot interpret
- If BG <60 mg/dL…

Ask ‘what should insulin be when glucose is low?’

LOW.

Therefore, if glucose is within reference range or high = insulinoma.

LILY [redacted] 5788 Patient management >

Canine | West Highland Terrier | Female Spayed | 8 y

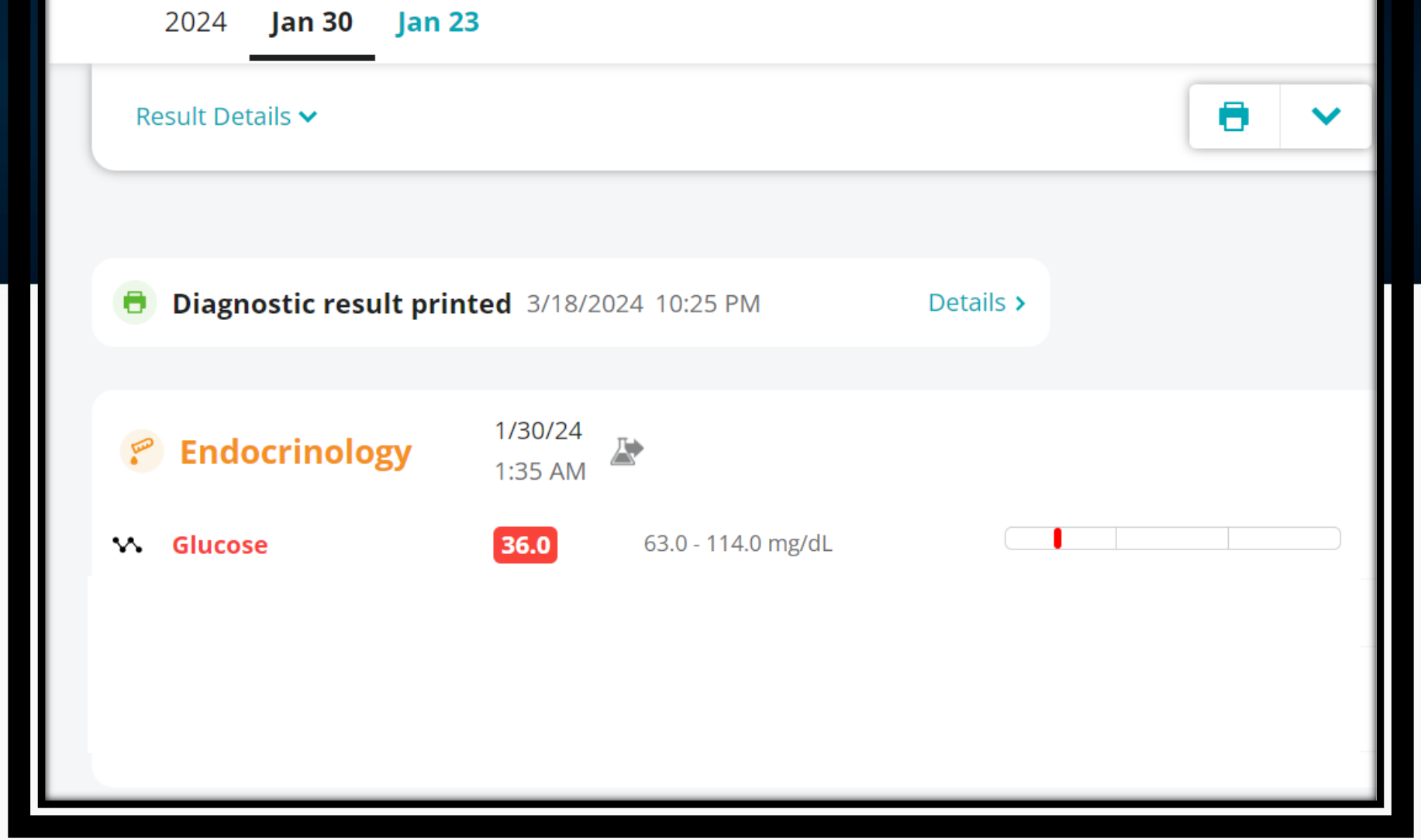
2024 **Jan 30** **Jan 23**

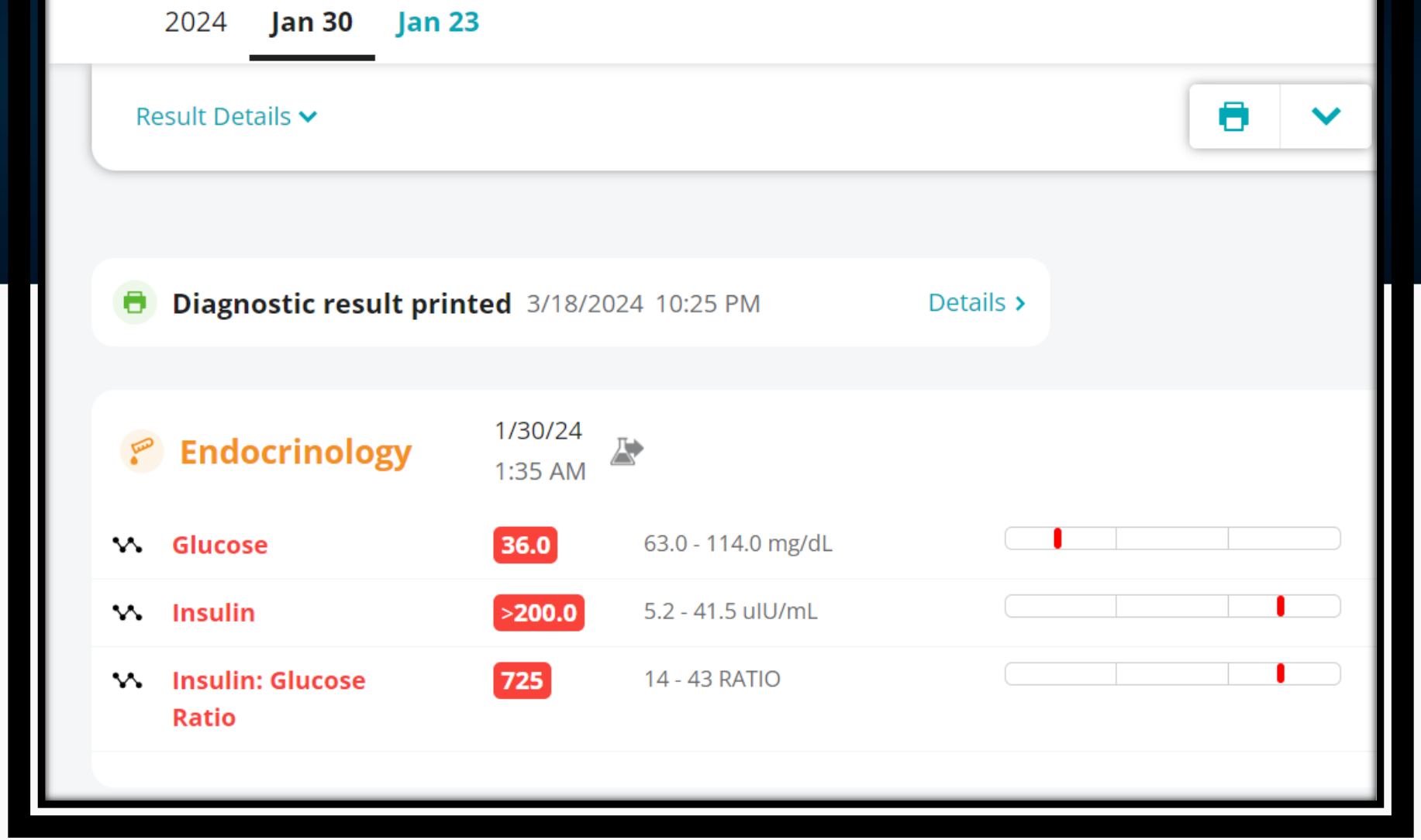
Result Details

Chemistry

1/23/24
6:00 AM

Glucose	a	37	63 - 114 mg/dL	
IDEXX SDMA	b	10	0 - 14 µg/dL	
Creatinine		0.7	0.5 - 1.5 mg/dL	
BUN		12	9 - 31 mg/dL	
BUN: Creatinine Ratio		17.1		
Total Protein		6.7	5.5 - 7.5 g/dL	
Albumin		3.5	2.7 - 3.9 g/dL	
Globulin		3.2	2.4 - 4.0 g/dL	
Albumin: Globulin Ratio		1.1	0.7 - 1.5	
ALT		59	18 - 121 U/L	
ALP		125	5 - 160 U/L	


2024
Jan 30
Jan 23
Result Details
Diagnostic result printed 3/18/2024 10:25 PM
Details
Endocrinology
1/30/24
1:35 AM
Glucose
36.0
63.0 - 114.0 mg/dL


2024
Jan 30
Jan 23
Result Details
Diagnostic result printed 3/18/2024 10:25 PM
Details
Endocrinology
1/30/24
1:35 AM
Glucose
36.0
63.0 - 114.0 mg/dL
Insulin
>200.0
5.2 - 41.5 uIU/mL
Insulin: Glucose Ratio
725
14 - 43 RATIO

Is primary hyperparathyroidism causing the hypercalcemia?

- Ruled out other causes?
- IONIZED calcium increased?
- Submit iCa PTH panel (+/- PTHrp)
  - DIFFERENT TUBES!!!! CALL LAB!!!
- If iCa normal cannot interpret
- If iCa increased…

Ask ‘what should PTH be when iCa increased?

LOW.

Therefore, if PTH is normal or high = primary hyperPTH.

TEST		RESULT	REFERENCE VALUE	
Ionized Calcium	a	**1.55**	**1.25 - 1.45 mmol/L**	H

a Referral test performed at Michigan State University.

Endocrinology

TEST		RESULT	REFERENCE VALUE	
Parathyroid Hormone	a	**12.20**	**1.10 - 10.60 pmol/L**	H
Parathyroid Related Protein	b	0.0	0.0 - 1.0 pmol/L	

TEST		RESULT	REFERENCE VALUE		
Ionized Calcium	a	1.52	1.25 - 1.45 mmol/L	H	1.55

a Referral test performed at Michigan State University.

Endocrinology

TEST		RESULT	REFERENCE VALUE	
Parathyroid Hormone	a	5.70	1.10 - 10.60 pmol/L	3.00
Parathyroid Related Protein	b	0.0	0.0 - 1.0 pmol/L	

Thank you!

Thank you!

Thank you!