Medical Decision Making

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Bias and Error

- Diagnostic error - diagnosis is missed, delayed, wrong
- Diagnosis is the most difficult thing humans do
- We face dynamic situations and evolving information

Medical Errors

- Highest in human primary care, emergency medicine
  - And we have less diagnostic access

- We are pediatrics
  - Animals have signs (objective)
  - Humans have symptoms (subjective)
  - Our clients interpret signs based on their own biases and deliver that to us

Decision Errors

- Choose wrong differential or treatment

- 50-96% of medical mistakes are due to decision errors

Differential Formulation

- History and physical exam
  - 70% of cases may be correctly diagnosed on history alone
  - 50% of remaining cases diagnosed on physical exam

Dr. Lisa Sanders, *Every Patient Tells a Story*

- Differential list
  - Generated in a mean of 28 seconds, with final diagnosis between 1-7 minutes [Kuhn 2002}
  - Initial list is limited by memory and contains 2-6 choices
    - If the answer is not on that list, we likely won't get it
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Bayes' Theorem of Clinical Diagnoses

- We use pieces of information based on the prevalence of various features in different entities to calculate the probability that the disease is present

- This is why:
  - Cattle get treated for footrot for 6 weeks
  - There are rabies surprises

- 5 month old Angora wether
- T 104.6^{o}F
- HR 136 bpm
- RR 76 bpm
- Rumen 0/2 minutes

- 6 month old Boer wether
- T 105^{o}F
- HR 152 bpm
- RR 100 bpm
- Rumen 1/2 minutes

- Tan/brown membranes
- Red urine

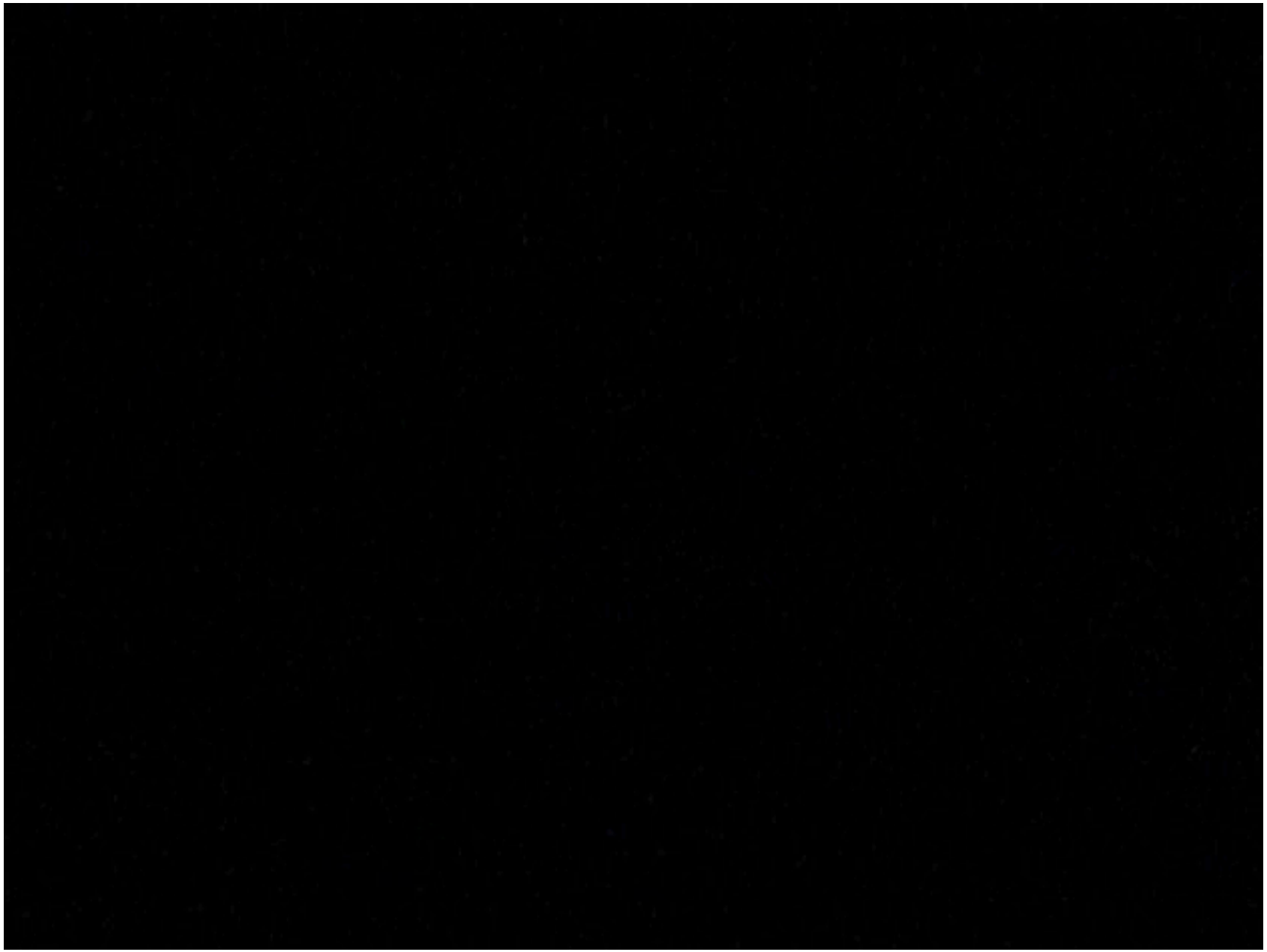
- Rumen pH 6
- Reduced protozoa

Decision Fatigue

- Extraneous factors in judicial decisions [Danzinger, 2011}
  - 2 daily food breaks “decision sessions”
  - Judges made more unfavorable decisions later in inter-meal times 65% to 0%
- Doctors antimicrobial Rx
  - Increases later in the day for acute respiratory infections
  - OR for Rx were 1.01, 1.14, 1.26 relative to first hour for 2-4 hours, $P<0.001$ [Linder et al 2014]

Decision Fatigue

- Fatigue
  - Least risk decision or no decision
  - Clients, staff, vendors, family, friends, community
- Ego depletion
  - Less willpower
  - Every decision costs you something
    - Sell you the cheap extras on the car, then the big engine
    - Poverty creates lots of decisions that are mentally taxing
    - Steve Jobs and President Obama wore the same clothes every day



Decision Fatigue

- “The best decision makers are the ones who know when to not trust themselves.”

[Baumeister 2011]

- Mindfulness, meditation
  - Extends decision-making capacity
- How do you get energy back?
  - Blood glucose
- Plan your decision making out

Cognitive Errors

- Associated with higher morbidity than other medical errors

- Biases
- Failed heuristics
  - Problem solving approaches that are practical, but not guaranteed to be optimal, but reach a short goal
  - Think emergency medicine

Cognitive Errors

- Front line decision making
  - Short on resources
  - Time constraints
    - Financial in veterinary medicine
  - Shortcuts sought

  - Checklists, systematic exams, diagnostic algorithms

Food Animal Physical Examination Form

DATE_____

DR. _____ CASE STICKER

STUDENT_____

OBJECTIVE DATA & GENERAL APPEARANCE

Body weight _____ lb / kg — Body condition _____

Temperature _____ deg F — Mental status _____

Heart rate/pulse _____ / min — Posture _____

Resp rate _____ / min — Gait/strength _____

Ruminations _____ / 2 min — Conformation _____

HEAD/NECK

	N	Abn	Description		N	Abn	Description
Sclera				Oral MM			
Vision				Tongue			
Hydration				Mandible			
Nares				Mandibular LN			
Dentition			(Age)	Prescapular LN			
Capillary refill				Jugular veins			
Facial Symmetry				Bridal			

THORAX

	N	Abn	Description		N	Abn	Description
Heart rhythm				Trachea			
Intensity				Lungs - R			
Murmurs				Lungs - L			
Pulse/ character				Resp pattern			

UMBS LEFT RIGHT

	N	Abn	Description		N	Abn	Description
Musculature				Musculature			
Joints				Joints			
Hooves				Hooves			

ABDOMEN

	N	Abn	Description		N	Abn	Description
Contour				Succussion L			
Rumen fill				Succussion R			
Percussion L				Ballottement			
Percussion R				Withers pinch			
Umbilicus				Prefemoral LN			

PERINEUM

	N	Abn	Description		N	Abn	Description
Vulvar MM				Scrotum			
Discharge				Sheath			
Feces				Urine			

INTEGUMENT

	N	Abn	Description
Hair/fiber			
Skin			

UDDER

	LF	RF	LH	RH
Palpation				
Teats				
Strip Cup				
CMT				

RECTAL EXAMINATION

	N	Abn	Description
Rumen			
LN			
Pregnancy			
Left kidney			
Other			

OTHER FINDINGS

_____

_____

_____

PROBLEM LIST

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

DIAGNOSTIC PLAN

_____

_____

_____

_____

_____

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_____

_____

DIFFERENTIAL DIAGNOSIS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

TREATMENT PLAN

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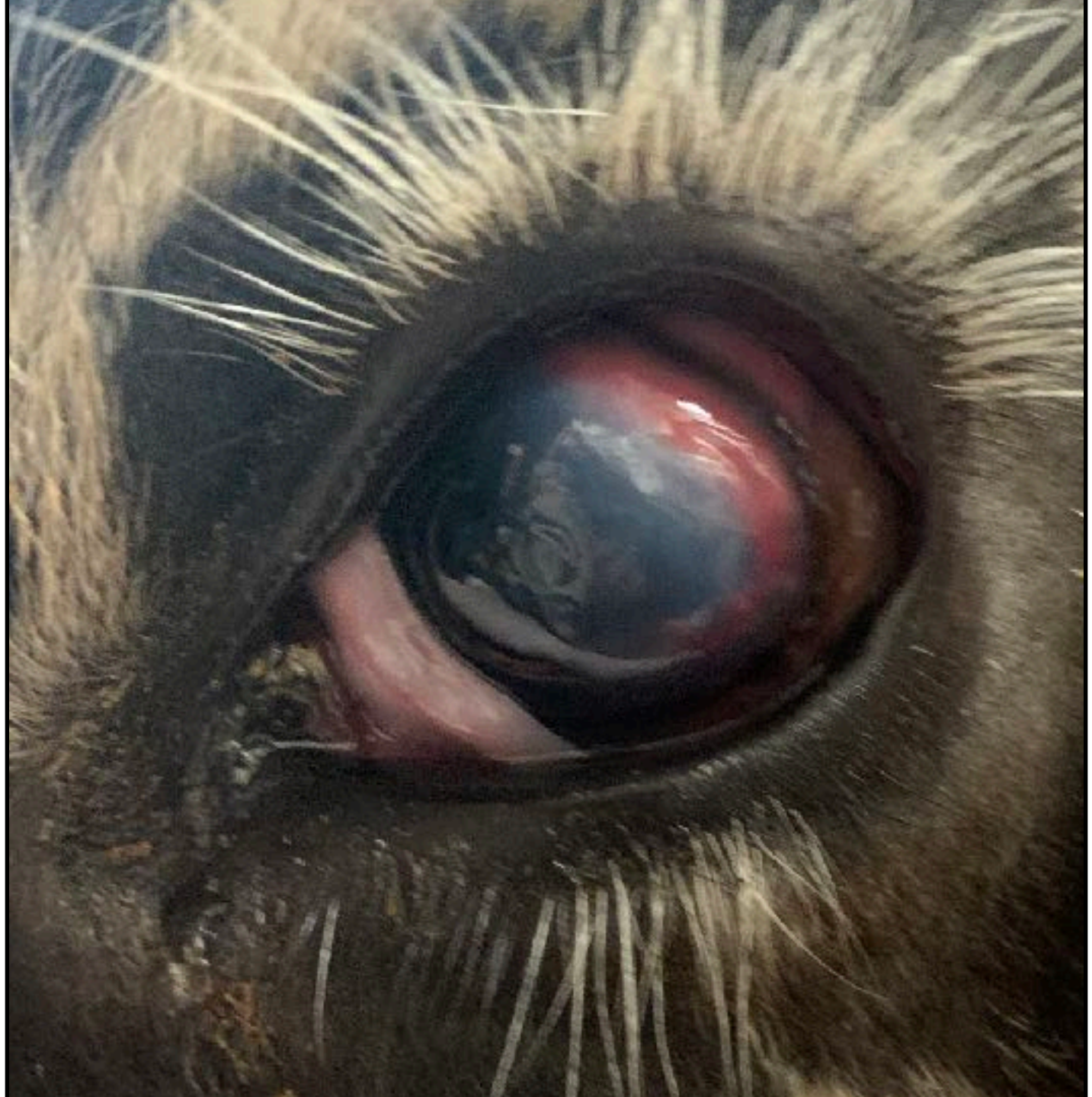

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Animal Weight		Lidocaine toxic dose [10mg/kg] (mLs)	Lidocaine LS epidural [1mL/ 10-20kgs] (mLs)	Ceftiofur CFA (Swine Excede) [1mL/44lbs IM] (mLs)	Flunixin meglumine [1.1mg/kg IM] (mLs)	xylazine [1 mg/kg IM] (mLs)	anol [0.1 mg/kg IM	lam [0.2mg/kg IM	[5mg/kg I	meloxicam [0.4mg/ kg PO q24h] (tablets/ dose)	morphine [0.1mg/kg IM] (**mgs**)
Lbs	kgs										
100	45	22.7	5.0	2.3	1.0	0.5	0.5	1.8	2.3	1.0	4.5
125	57	28.4	6.0	2.8	1.3	0.6	0.6	2.3	2.8	1.5	5.7
150	68	34.1	7.0	3.4	1.5	0.7	0.7	2.7	3.4	2.0	6.8
175	80	39.8	8.0	4.0	1.8	0.8	0.8	3.2	4.0	2.0	8.0
200	91	45.5	9.0	4.5	2.0	0.9	0.9	3.6	4.5	2.5	9.1
225	102	51.1	10.0	5.1	2.2	1.0	1.0	4.1	5.1	2.5	10.2
250	114	56.8	10.0	5.7	2.5	1.1	1.1	4.5	5.7	3.0	11.4
275	125	62.5	11.0	6.3	2.8	1.3	1.3	5.0	6.3	3.5	12.5
300	136	68.2	12.0	6.8	3.0	1.4	1.4	5.5	6.8	3.5	13.6
325	148	73.9	12.0	7.4	3.3	1.5	1.5	5.9	7.4	4.0	14.8
350	159	79.5	13.0	8.0	3.5	1.6	1.6	6.4	8.0	4.0	15.9
375	170	85.2	13.0	8.5	3.7	1.7	1.7	6.8	8.5	4.5	17.0
400	182	90.9	14.0	9.1	4.0	1.8	1.8	7.3	9.1	5.0	18.2
425	193	96.6	14.0	9.7	4.3	1.9	1.9	7.7	9.7	5.0	19.3
450	205	102.3	15.0	10.2	4.5	2.0	2.0	8.2	10.2	5.5	20.5
475	216	108.0	16.0	10.8	4.8	2.2	2.2	8.6	10.8	5.5	21.6
500	227	113.6	16.0	11.4	5.0	2.3	2.3	9.1	11.4	6.0	22.7
525	239	119.3	17.0	11.9	5.3	2.4	2.4	9.5	11.9	6.5	23.9
550	250	125.0	17.0	12.5	5.5	2.5	2.5	10.0	12.5	6.5	25.0
575	261	130.7	18.0	13.1	5.7	2.6	2.6	10.5	13.1	7.0	26.1
600	273	136.4	18.0	13.6	6.0	2.7	2.7	10.9	13.6	7.5	27.3
625	284	142.0	19.0	14.2	6.3	2.8	2.8	11.4	14.2	7.5	28.4
650	295	147.7	19.0	14.8	6.5	3.0	3.0	11.8	14.8	8.0	29.5
675	307	153.4	20.0	15.3	6.8	3.1	3.1	12.3	15.3	8.0	30.7
700	318	159.1	20.0	15.9	7.0	3.2	3.2	12.7	15.9	8.5	31.8

Cognitive Dispositions to Respond

- In what ways are we programmed to respond?
- Anchoring bias - grab on signs too early
- Confirmation bias - looking for confirming evidence only
- Outcome bias - *leaning towards positive outcomes*
- Overconfidence bias - acting on incomplete information
- Premature closure - making dx before verification
    - Search satisfying - call the search off too early, miss comorbidities

- I believe in veterinary medicine, there is an outcome bias away from positive outcomes and providing a doomsday diagnosis without full investigation. Fatigue and other factors likely play a role in this. I think that this is distinct from the scenario where we say, “The outcome is likely to be poor without great expenditure or compromising the welfare of the animal, so we should cease diagnosis/ treatment.”

- “I don’t know what was wrong with her, I’m a cow doctor so I sent her to slaughter.”

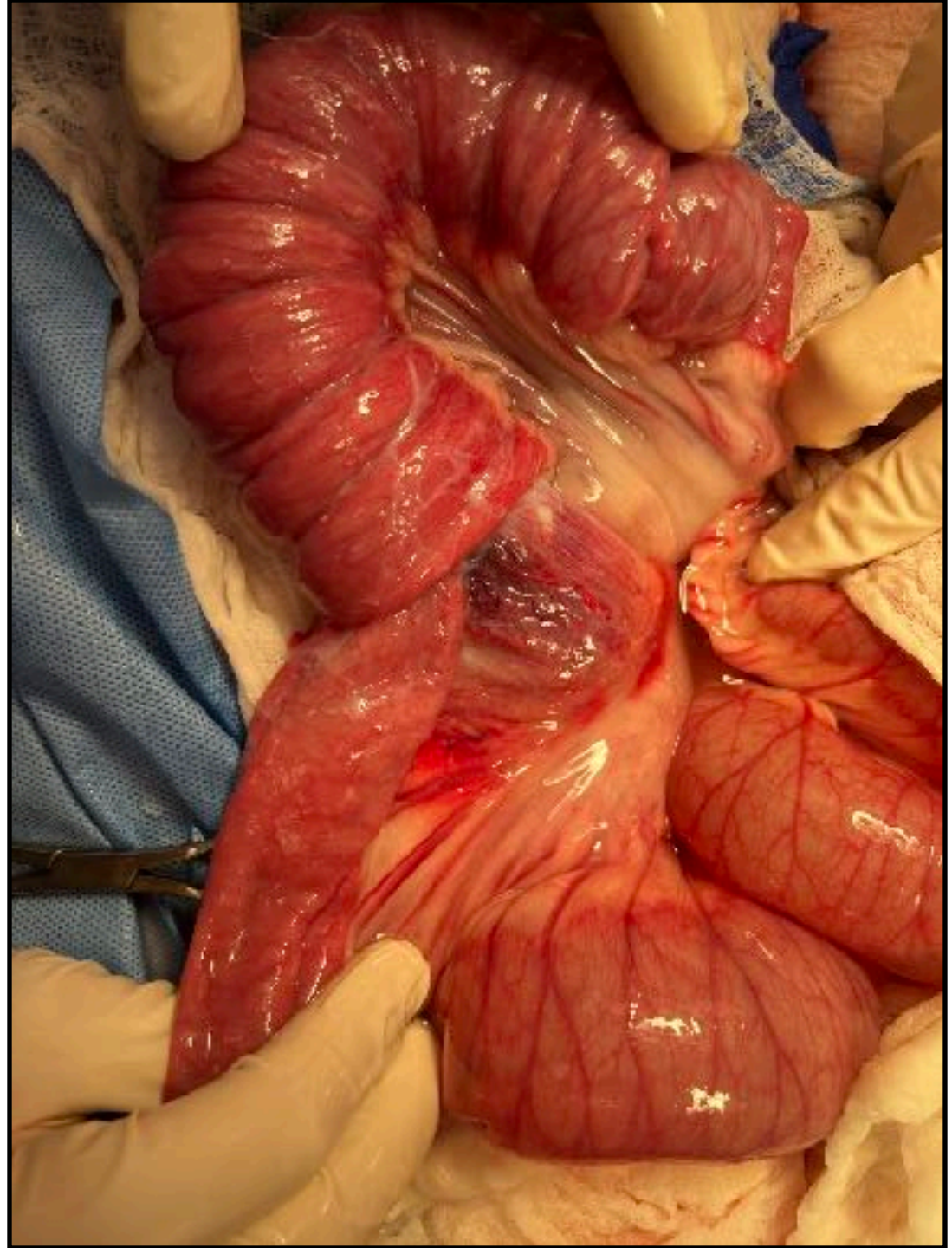
Affect influences

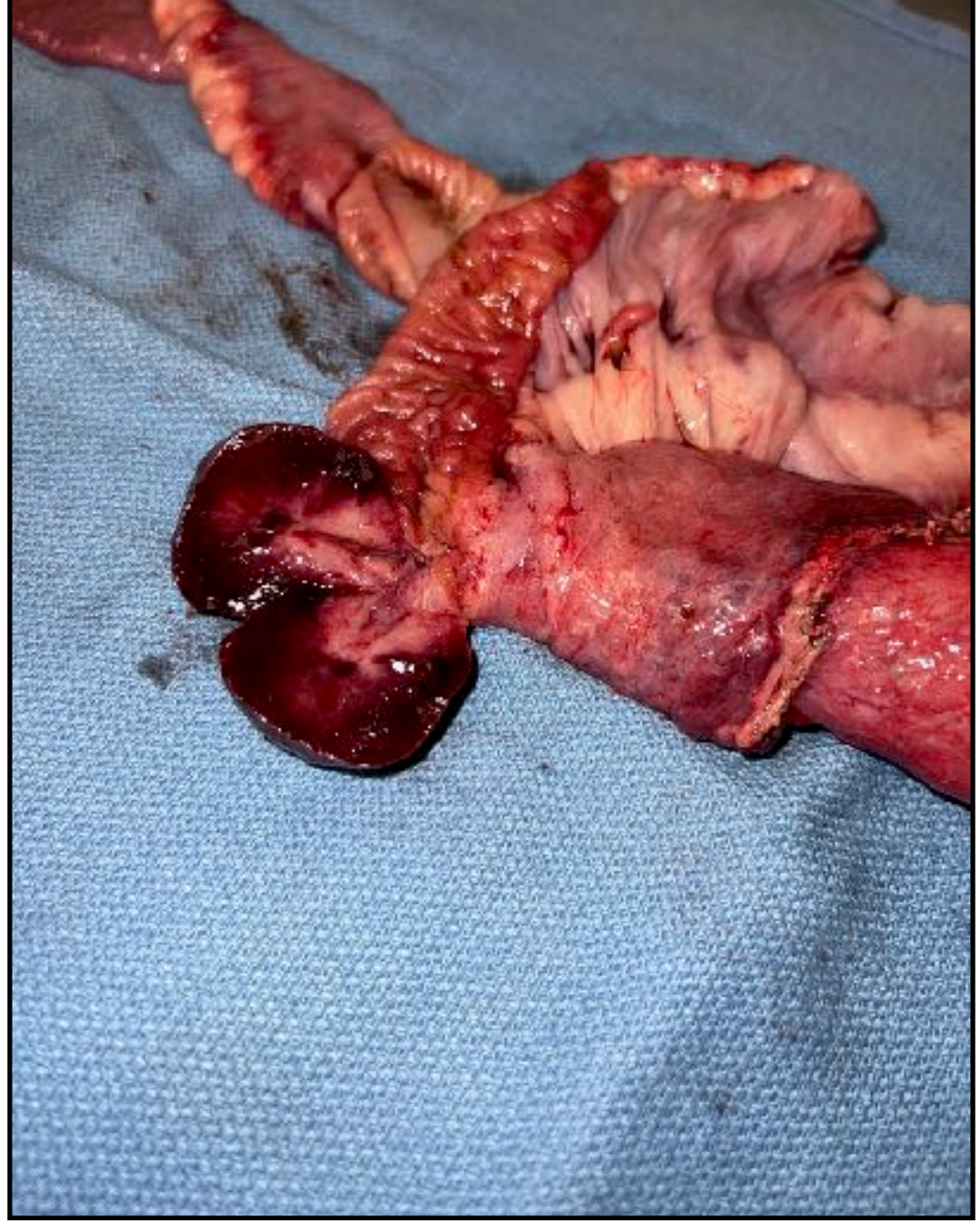
- When a patient makes a physician uncomfortable
- When a client makes us uncomfortable
- Annoying clients really do affect our ability to make good decisions
    - The Miracle of COVID

Distraction

- Task switching
  - Lose 40% productivity
  - It takes 23 minutes and 15 seconds for your brain to get completely back on task if you are involuntarily interrupted at work

[Mark et al https://www.ics.uci.edu?-gmark/chi08-mark.pdf]





How do we start to overcome?

- Become aware of our own thinking processes (metacognition)
- Come to understand the full impact of diagnostic errors
- Ground ourselves in the literature and evidence
- Be unwilling to accept that they are inevitable
- Remove the stigma
    - Usually within practice
    - Overcome the bias against overcoming bias

Tips

- Sleep
- Eat
- Remove client
- Manage stress
- Mood checks
- Empower lay staff to discuss cases openly
- Practice empathy
- Systematic PE and checklists
- Go to farm
- Client expectations
- Step back from DDx list
- Don’t let clients steer
- Colleague
- Necropsy, follow up

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