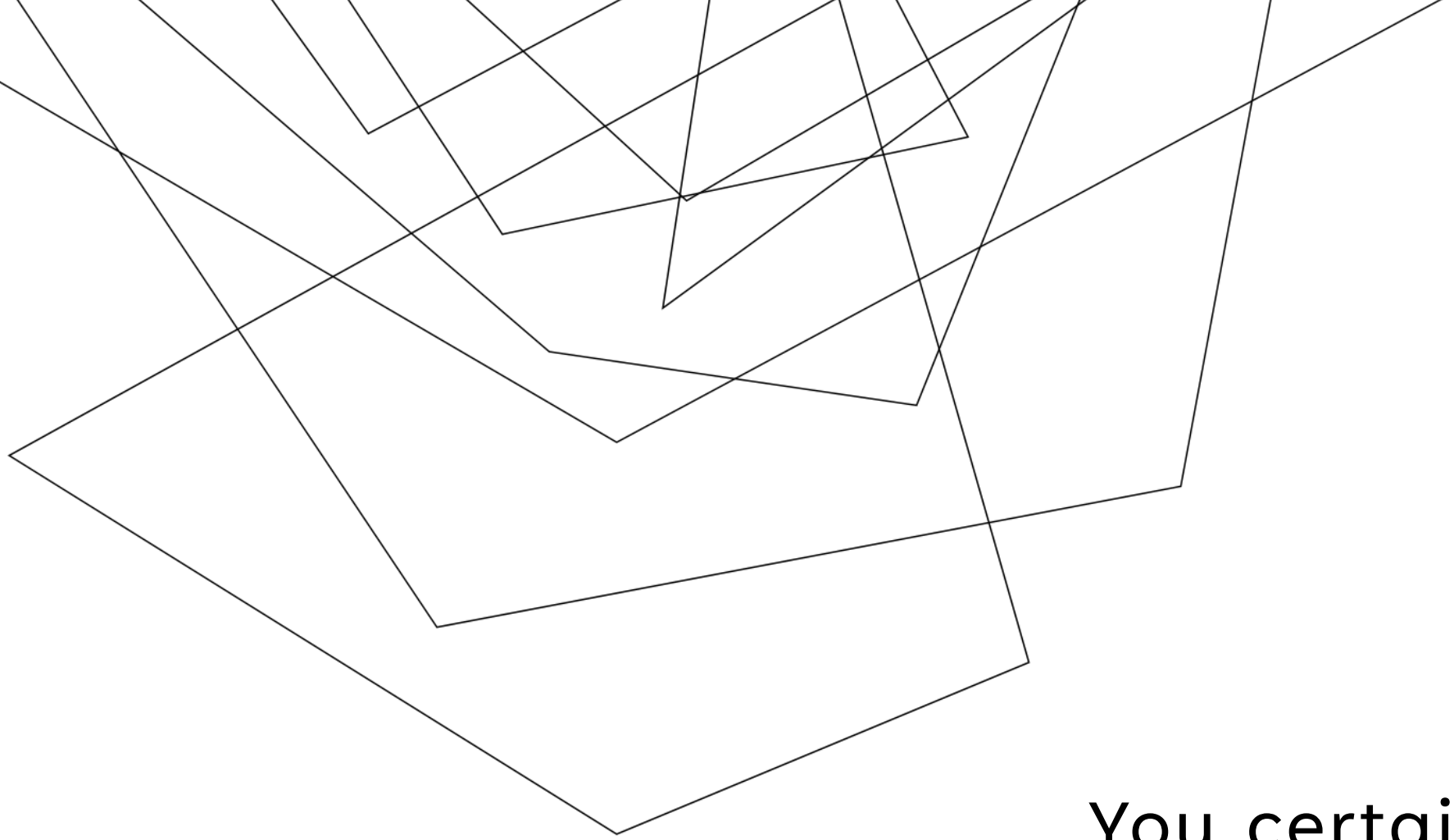


You certainly have SOMETHING

Diagnosing the critically ill

Brandon Oto, PA-C, FCCM

Medical ICU, Bridgeport Hospital

Yale New Haven Health

MANY ICU PATIENTS ARE UNDIAGNOSED

“acute hypoxemic respiratory failure”

“sepsis”

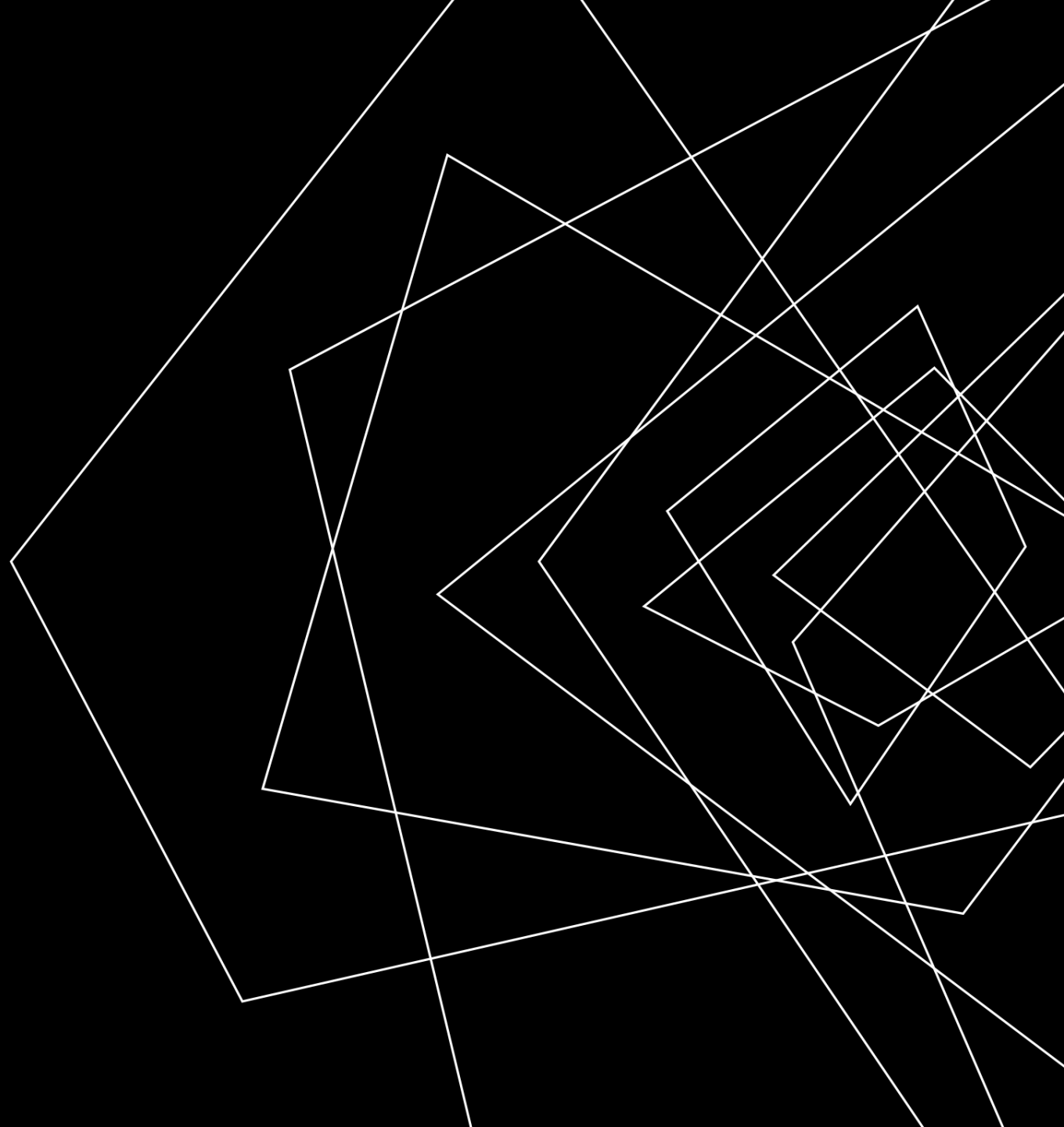
“encephalopathy”

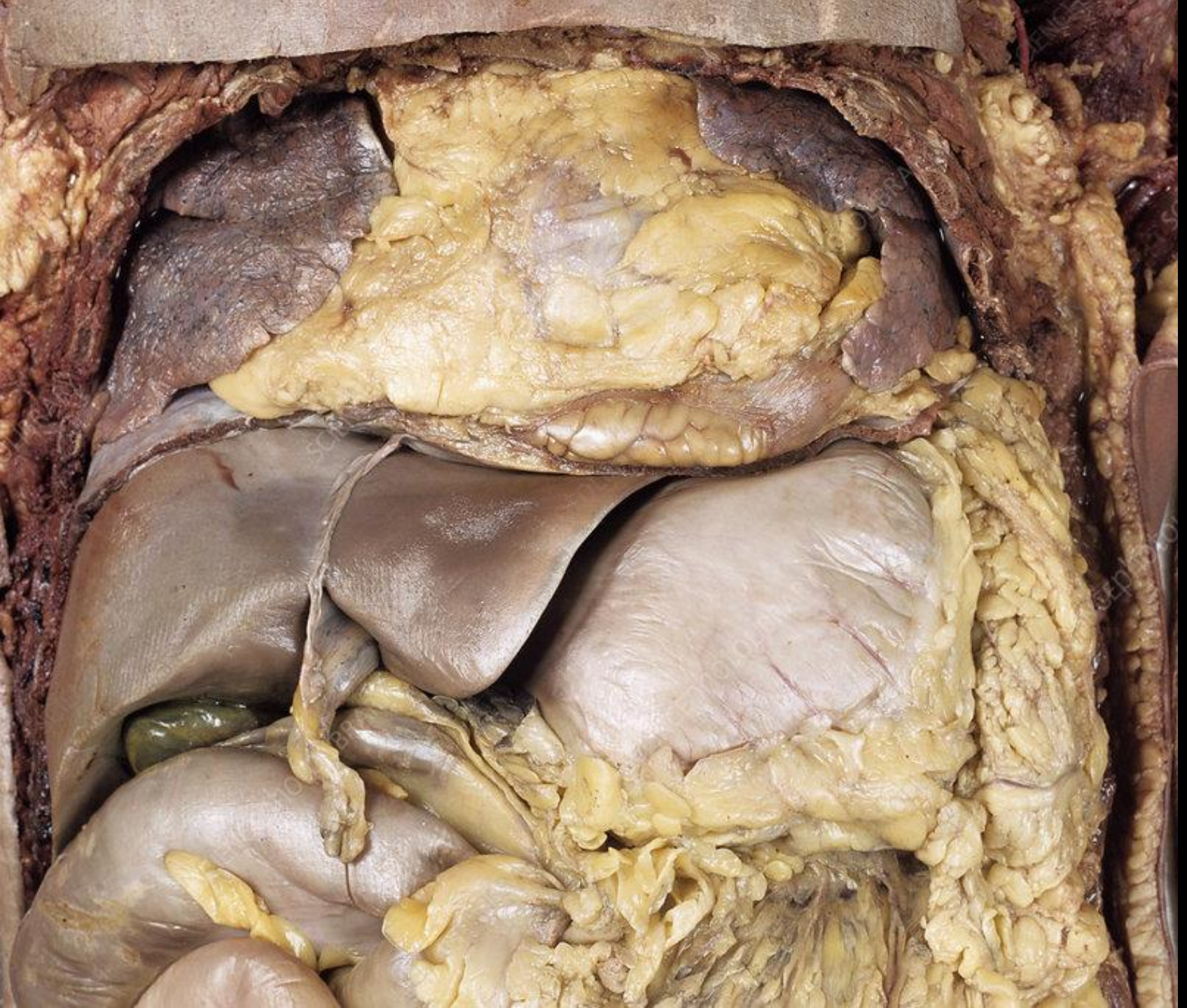
OBJECTIVES

Why does this happen?

Are ICU diagnoses important?

How can we do better?





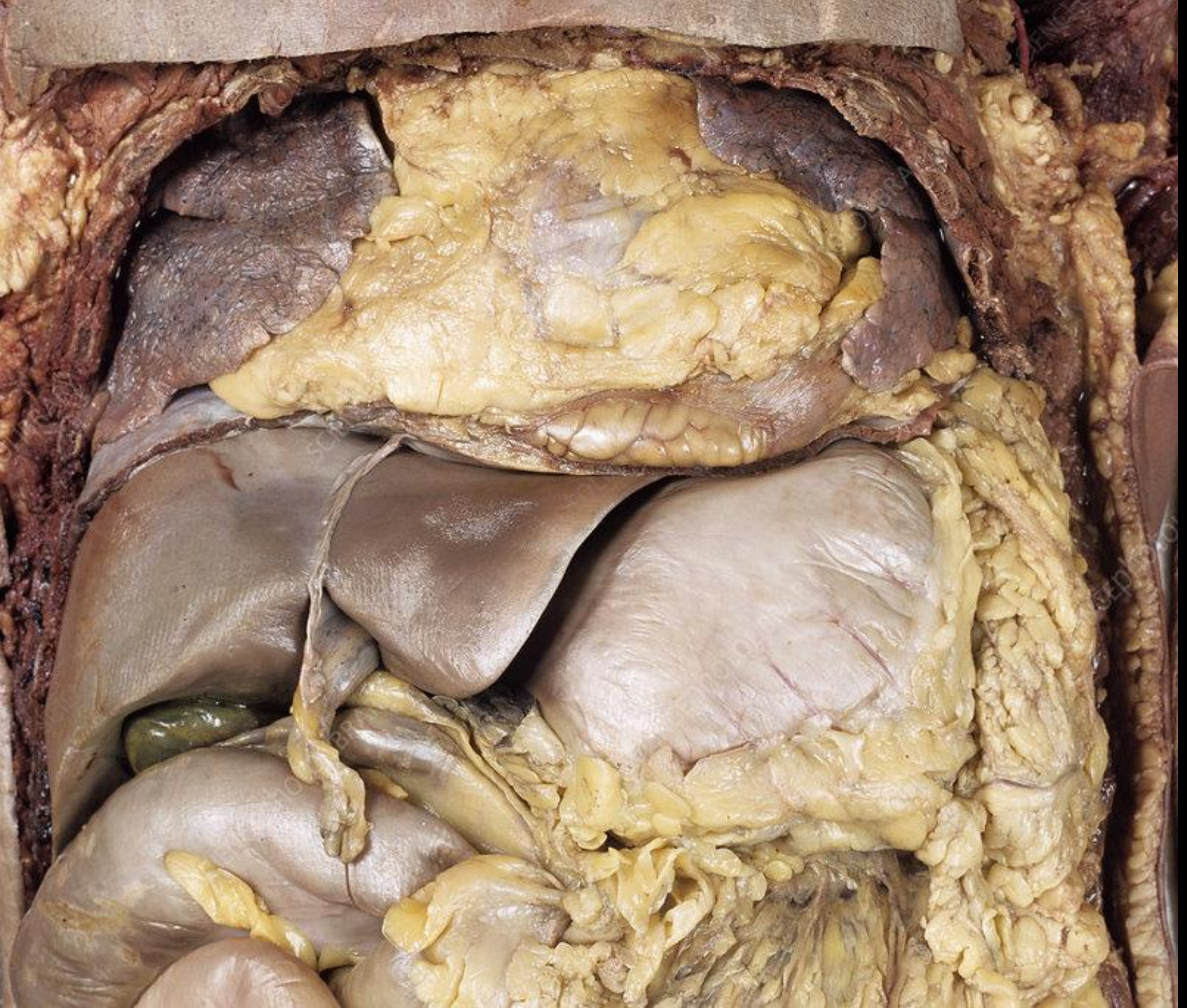
WHAT ARE WE MISSING?

Winters et al 2012 (22822241)

- Systematic review
- Autopsy studies of ICU patients
- 5863 autopsies

28% with ≥1 missed diagnosis

8% class I errors



WHAT ARE WE MISSING?

Mort et al 1999 (10075053)

- Chart review
- 149 autopsied SICU patients

41% had at ≥1 diagnostic discrepancy

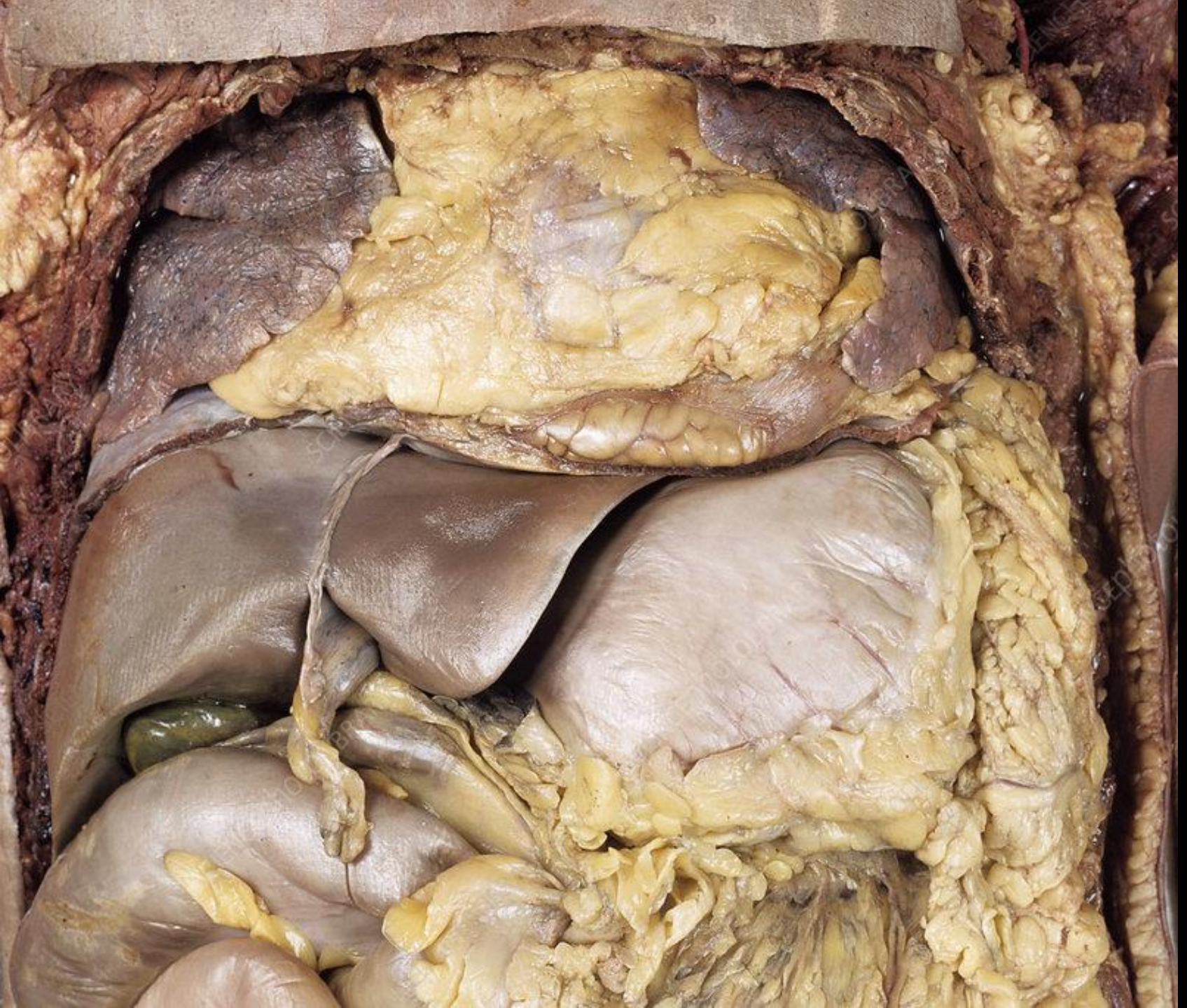
- **23%** major (**85% infectious)**

Transplant deaths:

- Only **17%** concordance

Death **<48hr**

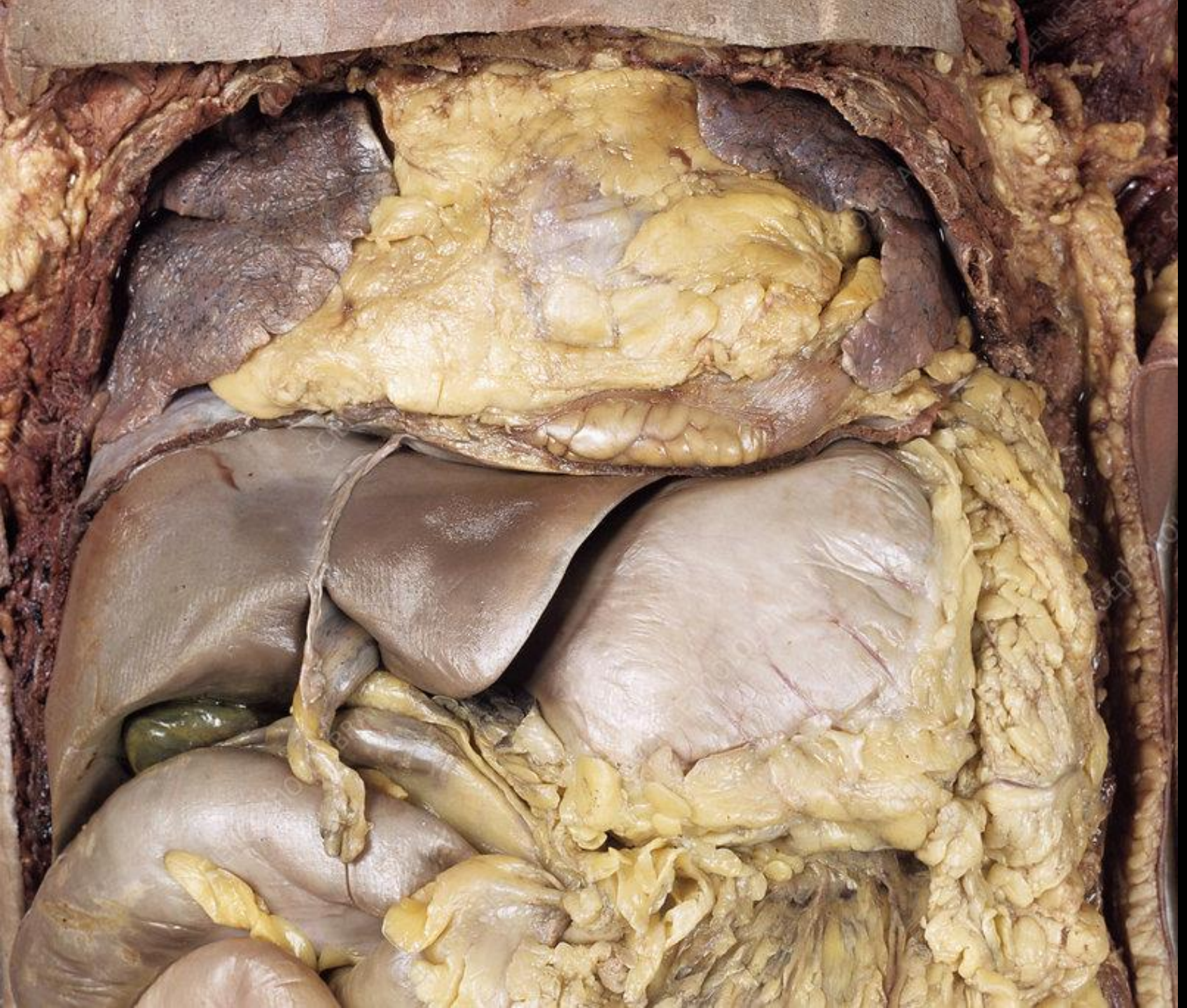
- Good diagnostic concordance



WHAT ARE WE MISSING?

Tejerina 2012, 866 general ICU patients (22001588)

- Infection most common
- **2.6% undiagnosable even on autopsy**

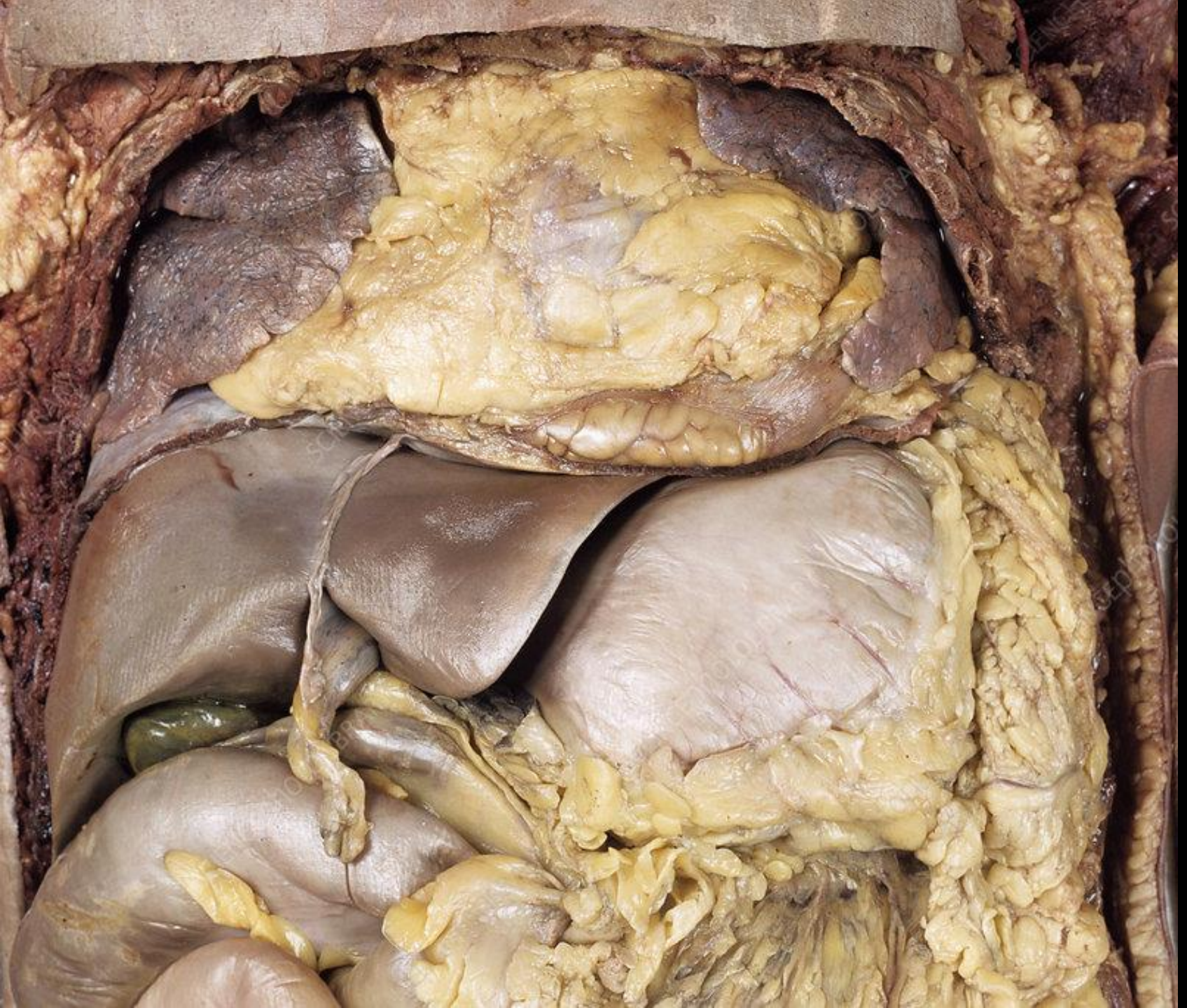


WHAT ARE WE MISSING?

Pastores 2007 (17448238)

- 1999–2005 oncology patients (658 deaths, 86 autopsies)
- 54% class I
  - 67% infectious
  - 33% cardiac
- Of 22 discordant cases...
  - 6 post-op
  - 6 hematologic malignancies
  - 6 solid tumors
  - 4 underwent HSCT
- Prolonged LOS: non-specific inflammatory and fibrosis (lung, kidney, liver)

Opportunistic infections ($n = 10$)	VRE pneumonia	2
	Legionella pneumonia	1
	PCP pneumonia	1
	Invasive aspergillosis	1
	Candida empyema	1
	VZV meningoencephalitis	1
	HSV esophagitis	1
	CMV pneumonia	1
	Disseminated necrotizing toxoplasmosis	1
Cardiac complications ($n = 5$)	Ischemic cardiomyopathy	2
	Thrombotic endocarditis	2
	Congestive heart failure	1



WHAT ARE WE MISSING?

Typical missed Class I diagnoses:

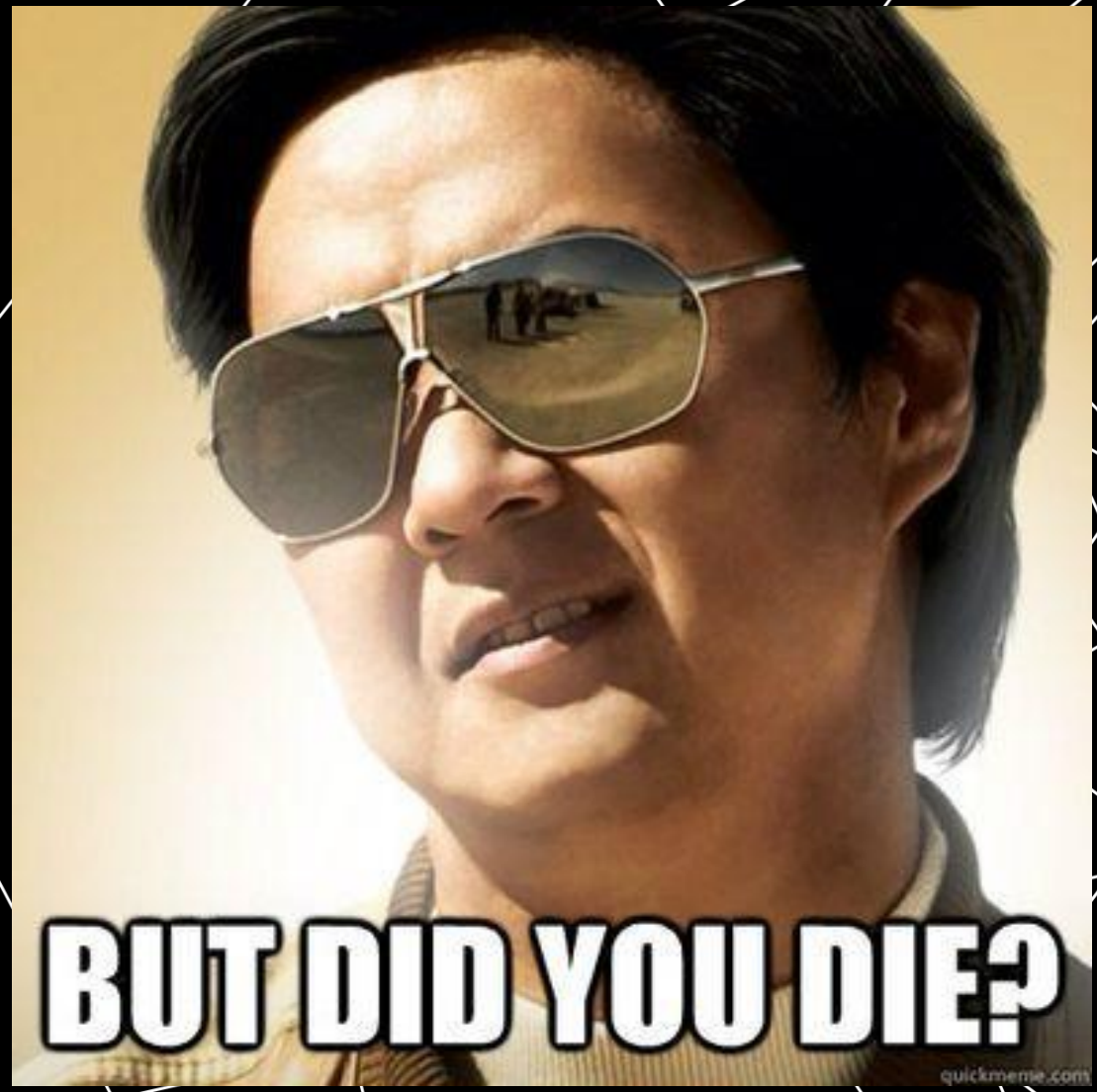
- Fungal infections, particularly aspergillosis, particularly pulmonary
- Pneumonia
- MI
- PEs
- Bowel ischemia
- Misc. infections
- Some cancer (mostly class II)

AUTOPSY CONCLUSIONS

- Missed or incorrect diagnoses are found frequently on autopsy and may have changed care
- Infectious findings predominate

However . . .

Autopsies say little about survivors



“THE PATIENT IS GETTING BETTER WHY DOES IT MATTER WHAT THEY HAD?”

Not all diagnoses make a difference

A PARABLE: CULTURE-NEGATIVE SEPSIS

Sigakis et al 2019 (chart review)

10,393 presumed septic patients

89% had negative blood cultures

Similar outcomes on all analyses

“THE PATIENT IS GETTING BETTER WHY DOES IT MATTER WHAT THEY HAVE?”

But still . . .

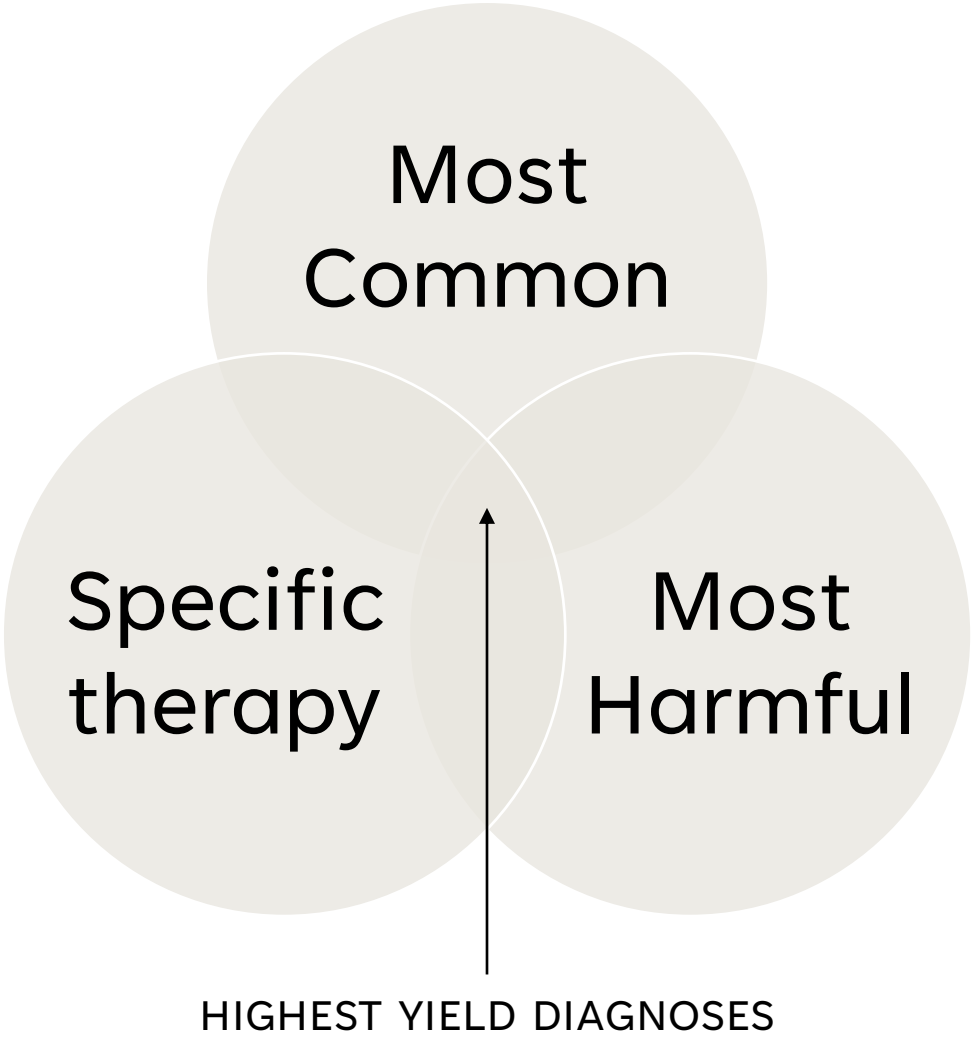
Stewardship

Recurrence

Prognosis and shared decision-making

Public health

Intellectual growth and causality


Most Common
Specific therapy
Most Harmful
HIGHEST YIELD DIAGNOSES

SPECIFIC DIAGNOSTIC CHALLENGES IN THE ICU

Limitations in H&P

Patients can’t communicate

Exams limited

Testing difficult

Acuity

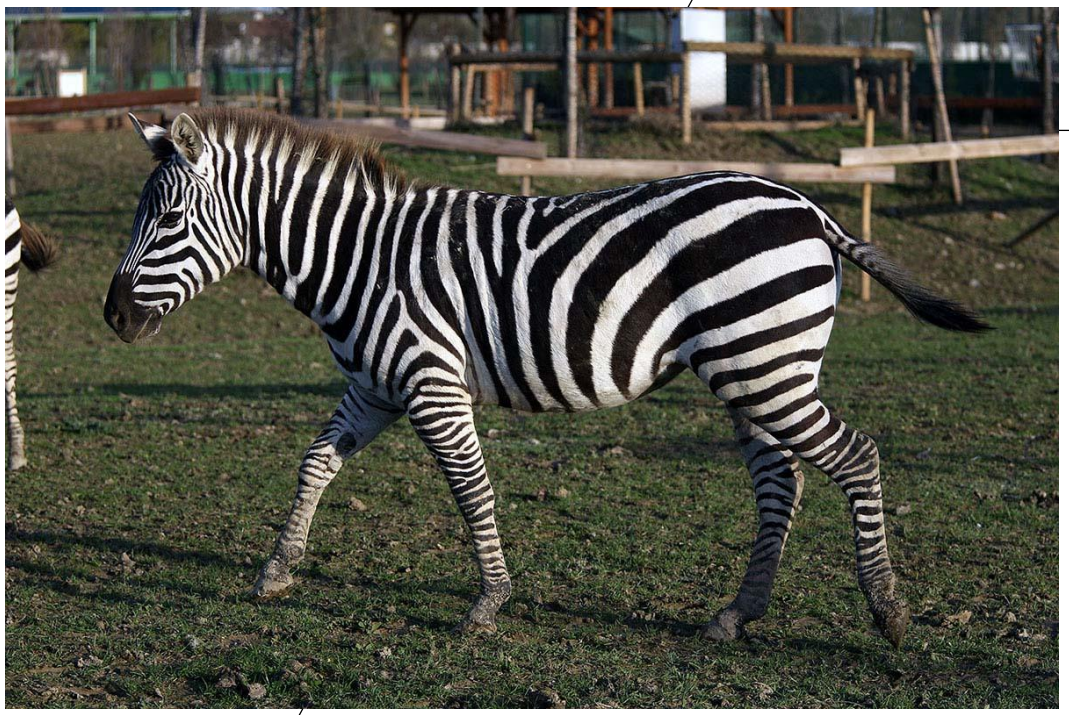
Need to prioritize treatment over diagnosis

Patient complexity

All patients have numerous abnormalities; which are red herrings?

Lack of curiosity?

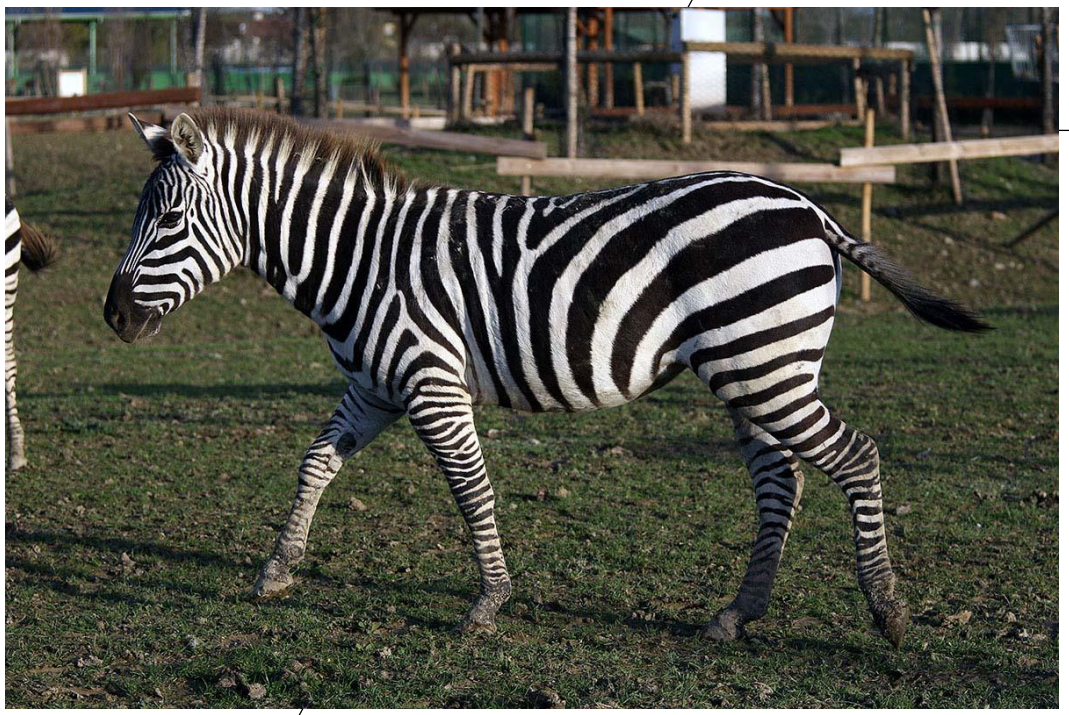
ZEBRAS OR HORSES?



Frequency of disease presentation

1. Common presentations of common diseases (“bread and butter”)
2. Uncommon presentations of common diseases (“atypical”)
3. Diseases falsely believed to be uncommon (“they walk among us”)
4. True rare diseases (“the zebras”)

ZEBRAS OR HORSES?



Frequency of disease presentation

1. Common presentations of common diseases (“bread and butter”)

COMMON TRAITS OF DIFFICULT ICU DIAGNOSES

1. It should be capable of causing critical illness, or at least occurring alongside it

2. It should not be obvious on routine screening tests

3. Forget Occam and Hickam...

The most common cause of concurrent diagnoses:

Acute illness triggering/unmasking an unrelated condition

4. The most common syndromes of “undiagnosis” in the ICU:

- Encephalopathy/weakness
- Presumed infection
- Organ failure (respiratory, shock, etc)

GETTING TO THE DIAGNOSIS

WHAT DOESN’T WORK

Machine-gun testing

(Use a shotgun)

Consulting the world

(They won’t save you)

Deferring to later

(Diagnoses don’t improve with age)

WHAT DOES WORK

A systematic approach triggered by diagnostic discrepancy

Activate your Type II thinking

Be scientists
Not oracles

Disease often tells its secrets
in a casual parenthesis.
— Wilfred Trotter

REBOOT THE ADMISSION

- Thorough history, ROS, and exam focused on high-yields pertinent to presenting syndrome
- Formulate theories and feed them back into the hypotheticodeductive (test-hypothesis-test) cycle

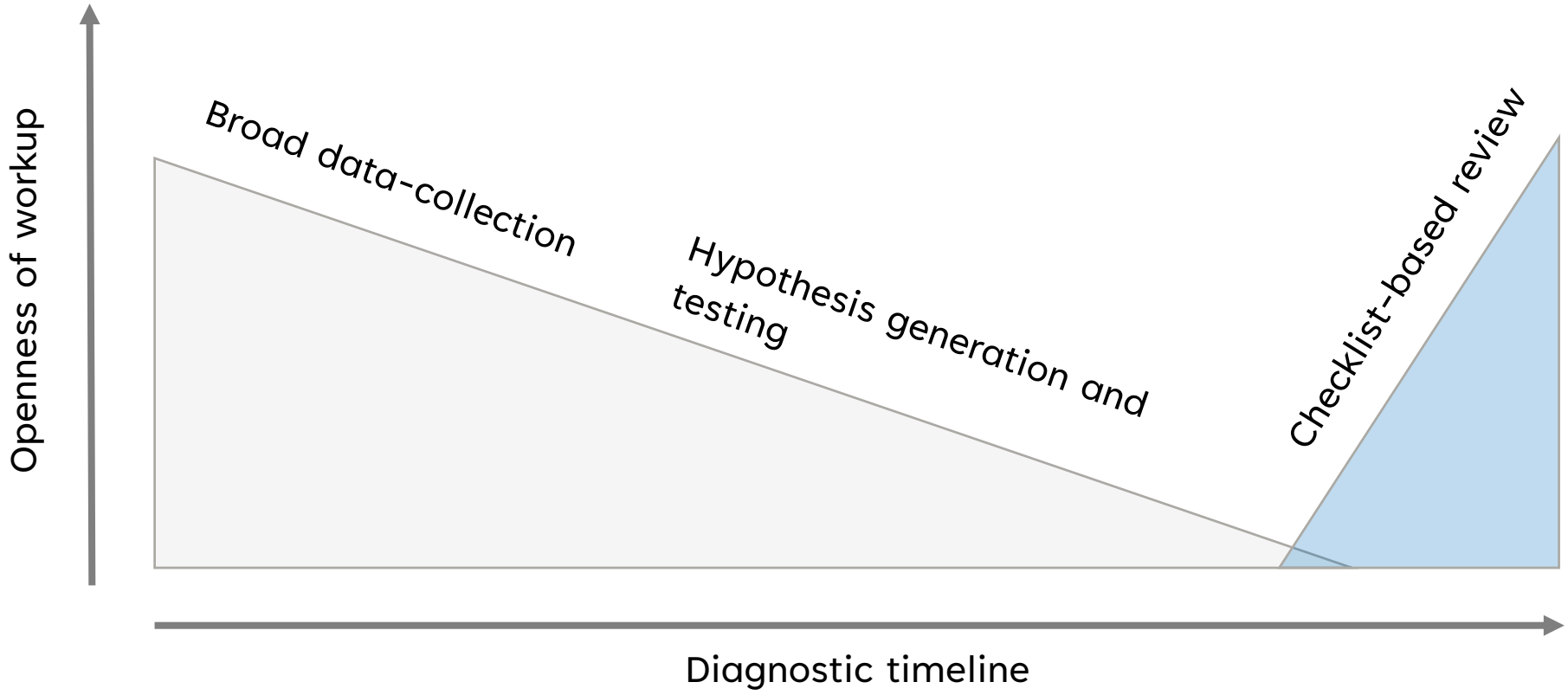
MAKE IT EXPLICIT

- Write down abnormalities and differentials
- Assign *numeric* probabilities to diagnoses
- Label syndromes as specifically as possible
- Consider test characteristics

CAUTIONS

- Avoid empiric therapy when possible
- Sutton’s Law: just do the test
- Beware your biases
  - Anchoring
  - Availability
  - Pursuit of the interesting

START OPEN-ENDED THEN LOOK FOR GAPS



THE CHECKLIST APPROACH

- Do you drink unpasteurized milk?
  - *Salmonella, Listeria, etc*
- Have you bathed or swam in wat
  - *Waterborne organisms lik*
- Have you had any acupuncture c
  - *Risk for mycobacterial int*
- Do you garden or work with plan
  - *Fungal organisms like as*
- Do you work with cadavers? Hav
  - *Chemical exposures, infe*
- Do you know of any history of ex
  - *If known*

- Touch the axillae
  - *Dryness of toxidrome*
- Palpate the lymph nodes
  - *Axillary, epitrochlear, postauricular*
- Examine the joints for pain or
  - *Septic or inflammator*
- Examine and palpate the ext
  - *Myositis*
- Inspect and palpate the temp
  - *Temporal arteritis*
- Examine the hands and feet

INFECTIOUS

Usually causing fevers or outright sepsis with negative cultures and no response to typical broad-spectrum antibiotics

- Zoonotic diseases, including tickborne
- “Exotic” organisms endemic to international settings but not the local environment
- Tuberculosis, including disseminated TB without pulmonary lesions
- Fungal infections
  - **Invasive pulmonary aspergillosis**
  - Mucormycosis
  - Endemic fungi (histoplasmosis, coccidioidomycosis, blastomycosis, etc)
- Pre-existing viral hepatitis or HIV

History/ROS

Physical Examination

Diseases

A CASE

65 yo male with hx DM, hypothyroidism, HTN
Admitted for CAP, intubated
Unable to wean

Repeat history

Expand exam

Build differentials

Review checklists

Diagnosis:
Myasthenia gravis

FINAL THOUGHTS

1. The hardest part is trying
2. Be Watson, not Holmes
3. Diagnosis doesn’t have to come before resuscitation, but it should come eventually
4. You already know how to do most of this

THANK YOU

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Blog: Critical Concepts (critcon.org)

Podcast: Critical Care Scenarios (any app)

Twitter: @critconcepts

The beginner may be overly impressed by brilliant intuitive leaps; the expert heeds intuition but realizes how unreliable it is. The beginner grasps for, and holds firmly to, an inference, sometimes in spite of contrary evidence. The expert makes the inference, cites the clues on which it is based, can offer alternative explanations, and discards the inference for a better one if contrary evidence emerges.

“Patient Interview”

Current Medical Diagnosis & Treatment: Psychiatry (second edition),