

Innovations in Medical Education

New Ways to Engage the Learner

Teaching of Tomorrow



UMass Chan
MEDICAL SCHOOL



©2023-2024 Clinical Faculty Development Center

Disclosure

- I have no actual or potential conflict of interest in relation to this program/presentation.
- Specific programs and networks will be discussed as examples. These are examples only of materials available and are not specifically endorsed by the TOT program.

Objectives

Participants will be able to:

- Identify methods that learners are increasingly using for medical education
- Recognize opportunities to use innovative methods to better engage learners
- Recognize potential risks of innovative methods in medical education





Innovative/Novel Methods

What are some innovative/novel methods that learners are using?

Textbooks are a Thing of the Past...

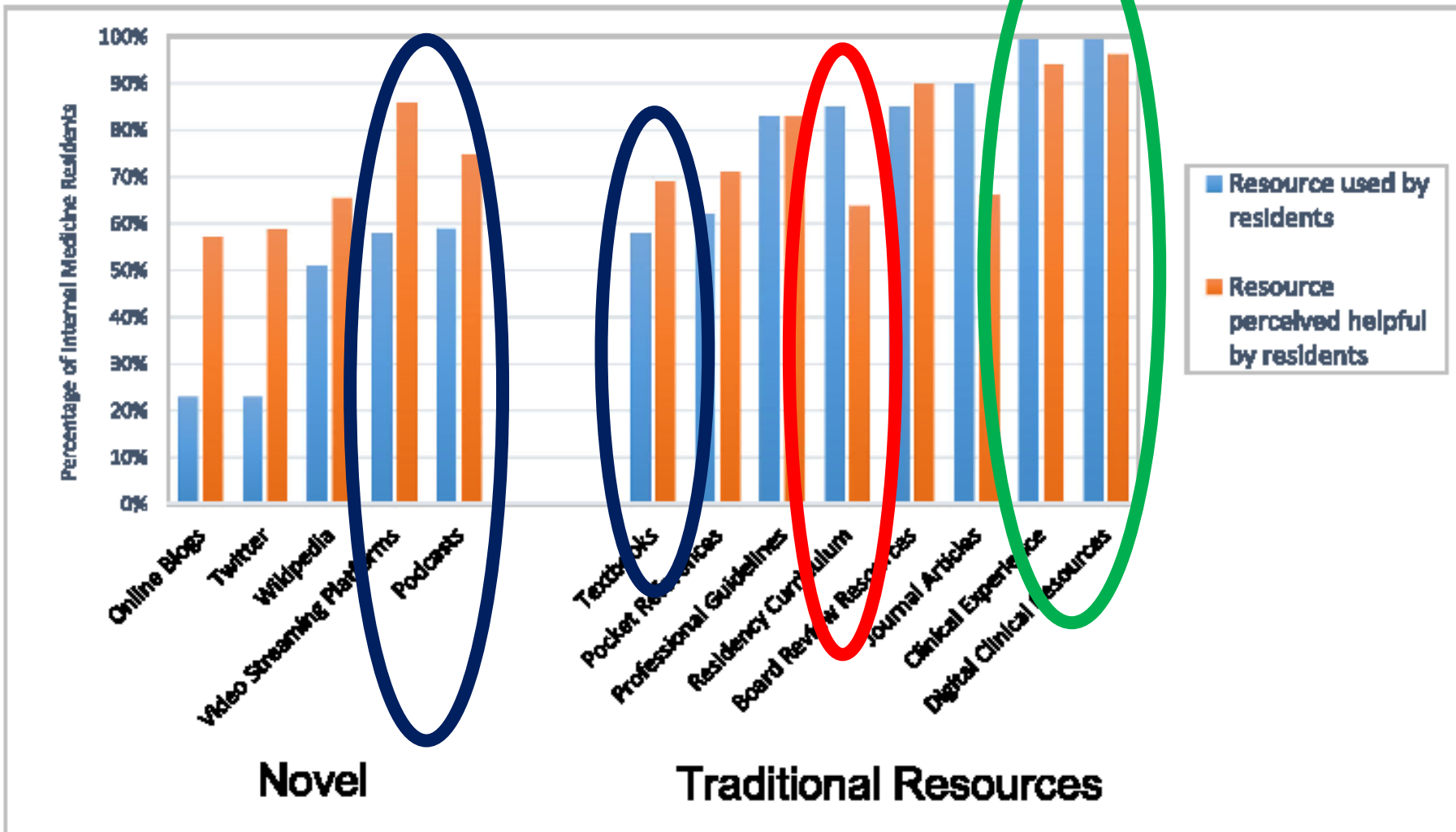


Figure 1 Resource use and perceived helpfulness by internal medicine residents for acquisition of either general medical knowledge or point-of-care learning. This graph demonstrates the combined percentage of IM residents who used each resource for either point of care decision-making or general medical knowledge and the percentage of residents who found each resource helpful among users.

Innovative/Novel Methods

Digital Media

- Social Media
- Podcasts
- Streaming Platforms
- Visual Media
- Blogs/Internet Search

Other “Innovative” Methods

- Simulation
- AI Platforms
- Remote Access Learning

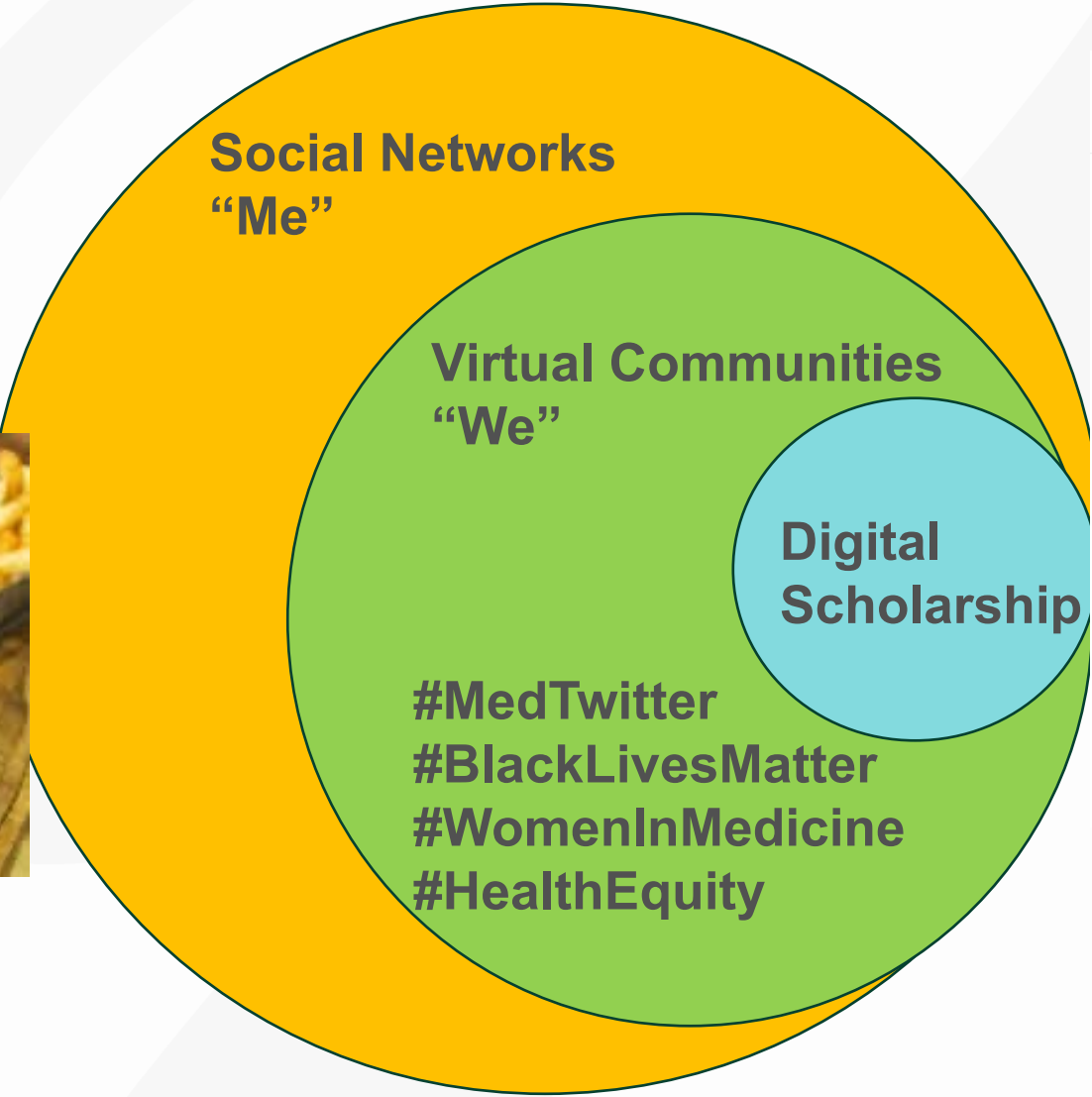


FOAM – Free Open Access Medical Education

“FOAM is a collection of resources, a community and an ethos. The FOAM community spontaneously emerged from the collection of constantly evolving, collaborative and interactive open access medical education resources being distributed on the web with one objective — to make the world a better place. FOAM is independent of platform or media — it includes blogs, podcasts, tweets, Google hangouts, online videos, text documents, photographs, facebook groups, and a whole lot more.... FOAM should not be seen as a teaching philosophy or strategy, but rather as a globally accessible crowd-sourced educational adjunctto augment traditional educational principles.”

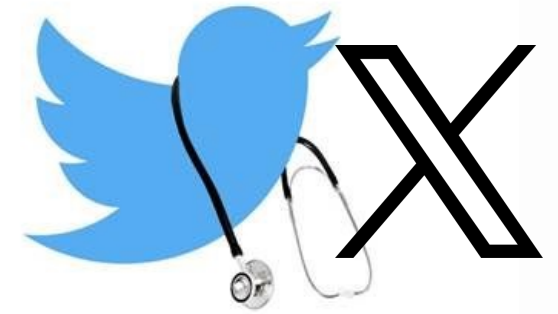


Social Media



Social Media

- Content available on many platforms
- Twitter/X one of most used now
 - Tweetorials – Quick informational series of tweets, often interactive



Tony Breu
@tony_breu



1/15

[How] does caffeine act as a diuretic?

I've long assumed that my morning cup of coffee directly results in my morning trip to the bathroom.

But, is it just the ingestion of fluid, or is there something specific about caffeine/coffee?

Grab a cup and let's find out. pic.twitter.com/oJjc88CaJh

6/12/20, 3:46 PM

Tony Breu @tony_breu · Sep 14
1/14
Why do we feel cold (i.e., experience "chills") when we have a fever? Shouldn't we feel hot?

And what are rigors?

Answers to these questions will help us better understand when we

When do you think is the best time to draw them?

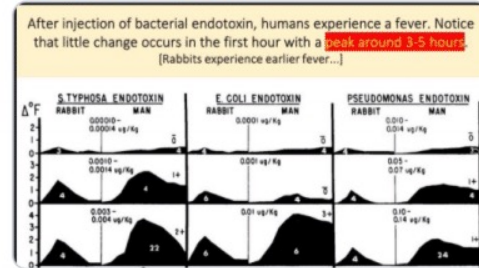
Just after fever	22.8%
Just after chills/rigors	40.2%
Just before fever	18.5%
Just before chills/rigors	18.4%

4,677 votes · Final results

Tony Breu @tony_breu · Sep 14
2/
Bacteremia exposes us to exogenous pyrogens. For example, the cell wall of gram-negative rods contains lipopolysaccharide (LPS; endotoxin).

When injected into humans LPS induces fever. But, there is a 3-5 hour delay between exposure and peak fever.

pubmed.ncbi.nlm.nih.gov/4897836/

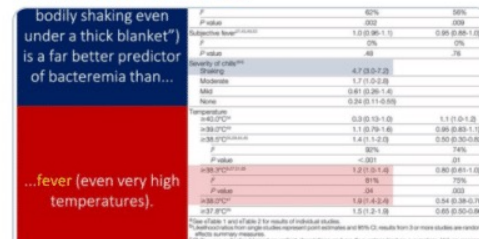


Tony Breu @tony_breu · Sep 14
3/
The delay between clinical bacteremia and fever was demonstrated in 1932 by Weiss and Ottenberg.

Their conclusion: Obtain blood cultures BEFORE fever. If only it were easy to predict future fevers!

[Maybe we can as you'll see in tweet 10 below.]

academic.oup.com/jid/article-ab...



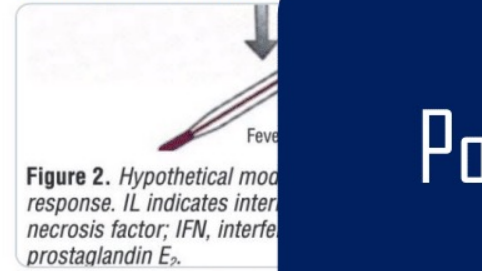
...fever (even very high temperatures).

Tony Breu @tony_breu · Sep 14
4/
Why is there a delay between bacteremia and fever?

There's a lot to be done!

- LPS induces endogenous pyrogens (e.g., IL-6) which...
- Increase the hypothalamic set-point, resulting in...
- Thermogenesis, vasoconstriction, etc., and...
- Fever

pubmed.ncbi.nlm.nih.gov/9759682/



Tony Breu @tony_breu · Sep 14
5/
During this period between bacteremia and fever we may feel cold (i.e., we experience chills).

Why? There are at least two possible explanations.

- 1 Peripheral vasoconstriction → fall in skin temperature → "I'm cold!"
- 2 Direct central signal → "I'm cold!"

Which is it?

Vasoconstriction	43.3%
Central signal	56.7%

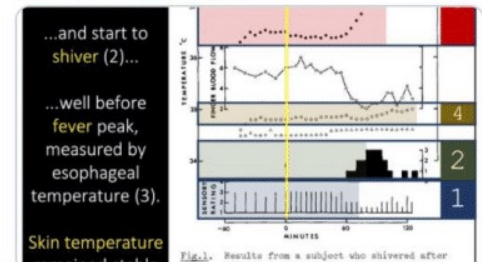
2,411 votes · Final results

Tony Breu @tony_breu · Sep 14
6/
In one study, subjects were placed in water at a stable temperature and injected with a pyrogen.

Before fever, they felt cold. This was despite a stable skin temperature.

chills must therefore arise from some central action of pyrogens

pubmed.ncbi.nlm.nih.gov/7189863/



Tony Breu @tony_breu · Sep 14
Replying to @tony_breu
7/
Why would an "I'm cold!" signal be sent?

This signal drives behavioral changes that aid with heat retention as our body aims to raise core temperature.

"I'm cold!" propels us to put on a blanket, seek shelter, etc.

body wants us to be!

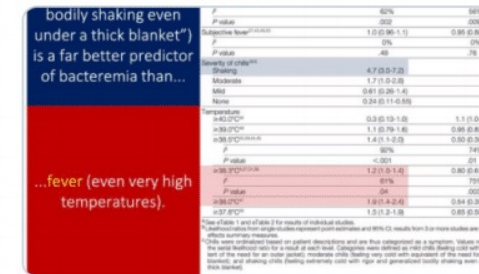
Tony Breu @tony_breu · Sep 14
9/
We don't always require the rapid-onset fever that rigors produce. But bacteremia is a scenario where it might make sense.

So, is there an association between rigors and bacteremia?

Yes!

In fact, rigors predictor bacteremia better than fever.

pubmed.ncbi.nlm.nih.gov/22851117/



Tony Breu @tony_breu · Sep 14
10/
Should we say "culture if shakes" instead of "culture if spikes"?

Maybe. Remember the order of events:

- 1 Bacteremia
- 2 Increased temperature set-point
- 3 "I'm cold" and 4 Rigors
- 5 Fever

Chills and rigors should appear before a fever. And closer to the

Tony Breu @tony_breu · Sep 14
11/
While rigors occur closer to bacteremia than fever (and therefore better predict positive cultures), there is still a delay. They're not perfect.

But, if you obtain blood cultures within 2 hours of rigors there is increased likelihood of positivity.

pubmed.ncbi.nlm.nih.gov/30059771/

ABSTRACT
Objective: To determine whether the time lag between blood culture draw and the start of shaking chills is associated with blood culture positivity.
Methods: A prospective observational study was undertaken from January 2013 to March 2015 at a referral center in Okinawa, Japan. All enrolled patients were adults with an episode of shaking chills who were newly admitted to the division of infectious diseases. The study exposure was the time lag between blood culture draw and the most recent episode of shaking chills.
Results: Among patients whose blood cultures were obtained within 2 h after shaking chills started, the blood culture positivity was 53.6% (52/97), whereas among patients whose blood cultures were obtained after more than 2 h, the positivity was 37.6% (44/117) ($p=0.019$). The adjusted odds ratio of blood culture positivity for samples drawn within 2 h after shaking chills was 1.88 (95% confidence interval 1.01–3.51, $p=0.046$). *Escherichia coli* were the most frequently detected bacteria (58/105).
Conclusions: The positivity of blood cultures obtained within 2 h after the start of the most recent shaking chills was higher than that for blood cultures obtained after 2 h.
© 2018 The Authors. Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Tony Breu @tony_breu · Sep 14
12/

If you could obtain blood cultures at any of the following periods, which would you choose?

Just after fever	1.2%
Just after chills/rigors	46.9%
Just before fever	16.6%
Just before chills/rigors	35.4%

2,292 votes · Final results

Tony Breu @tony_breu · Sep 14
13/ - SUMMARY - Part 1

- The order of events: bacteremia and exogenous pyrogen exposure → increase temperature set-point → chills/rigors → fever
- We may feel cold chills as a cue to drive behavioral change (e.g., put on a sweater)
- Rigors promote rapid heat production

Tony Breu @tony_breu · Sep 14
14/14 - SUMMARY - Part 2

- By the time fever occurs, bacteremia may have already cleared
- Because rigors occur before fever (i.e., temporally closer to bacteremia), they are better predictors of positive blood cultures
- Neither is perfect



Posted 9/14/20

Tony Breu @tony_breu · Sep 14
1/14
Why do we feel cold (i.e., experience "chills") when we have a fever? Shouldn't we feel hot?

And what are rigors?

Answers to these questions will help us better understand when we should obtain blood cultures.

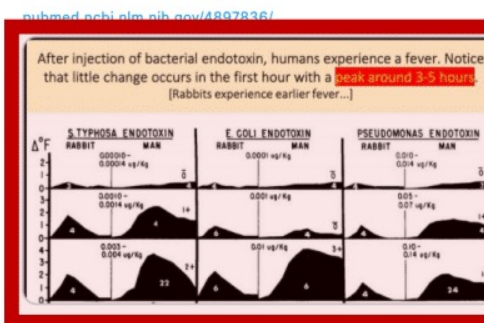
When do you think is the best time to draw them?

Option	Percentage
Just after fever	22.8%
Just after chills/rigors	40.2%
Just before fever	18.5%
Just before chills/rigors	18.4%

4,677 votes · Final results

Tony Breu @tony_breu · Sep 14
2/
Bacteremia exposes us to exogenous pyrogens. For example, the cell wall of gram-negative rods contains lipopolysaccharide (LPS; endotoxin).

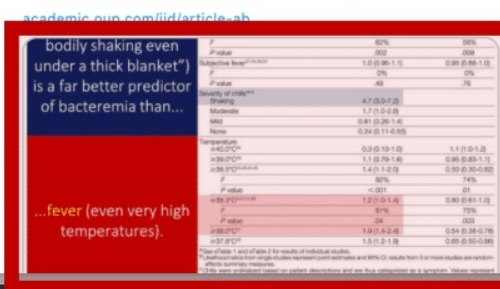
When injected into humans LPS induces fever. But, there is a 3-5 hour delay between exposure and peak fever.



Tony Breu @tony_breu · Sep 14
3/
The delay between clinical bacteremia and fever was demonstrated in 1932 by Weiss and Ottenberg.

Their conclusion: Obtain blood cultures BEFORE fever. If only it were easy to predict future fevers!

[Maybe we can as you'll see in tweet 10 below.]



Tony Breu @tony_breu · Sep 14
4/
Why is there a delay between bacteremia and fever?

There's a lot to be done!

- LPS induces endogenous pyrogens (e.g., IL-6) which...
- Increase the hypothalamic set-point, resulting in...
- Thermogenesis, vasoconstriction, etc., and...
- Fever

Figure 2. Hypothetical model for the febrile response. IL indicates interleukin; TNF, tumor necrosis factor; IFN, interferon; and PGE₂, prostaglandin E₂.

Tony Breu @tony_breu · Sep 14
5/
During this period between bacteremia and fever we may feel cold (i.e., we experience chills).

Why? There are at least two possible explanations.

- 1 Peripheral vasoconstriction → fall in skin temperature → "I'm cold!"
- 2 Direct central signal → "I'm cold!"

Which is it?

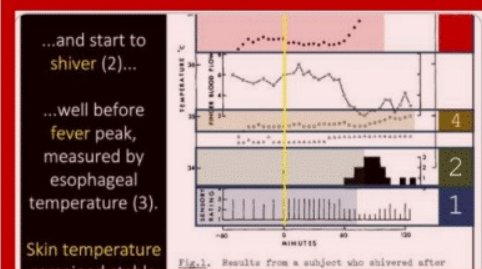
Option	Percentage
Vasoconstriction	43.3%
Central signal	56.7%

2,411 votes · Final results

Tony Breu @tony_breu · Sep 14
6/
In one study, subjects were placed in water at a stable temperature and injected with a pyrogen.

Before fever, they felt cold. This was despite a stable skin temperature.

chills must therefore arise from some central action of pyrogens



Tony Breu @tony_breu · Sep 14
Replying to @tony_breu
7/
Why would an "I'm cold!" signal be sent?

Graphics

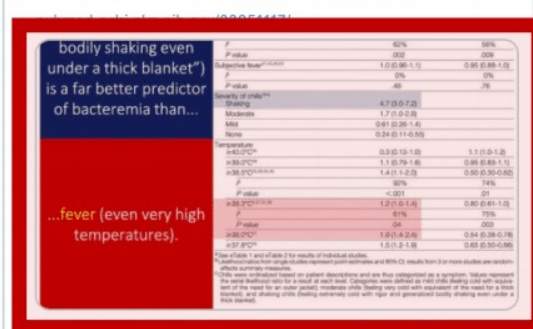
PubMed.gov Heat production from shivering
pubmed.ncbi.nlm.nih.gov

Tony Breu @tony_breu · Sep 14
9/
We don't always require the rapid-onset fever that rigors produce. But bacteremia is a scenario where it might make sense.

So, is there an association between rigors and bacteremia?

Yes!

In fact, rigors predictor bacteremia better than fever.



Tony Breu @tony_breu · Sep 14
10/
Should we say "culture if shakes" instead of "culture if spikes"?

Maybe. Remember the order of events:

- 1 Bacteremia
- 2 Increased temperature set-point
- 3 "I'm cold" and 4 Rigors
- 5 Fever

Chills and rigors should appear before a fever. And closer to the

Tony Breu @tony_breu · Sep 14
11/
While rigors occur closer to bacteremia than fever (and therefore better predict positive cultures), there is still a delay. They're not perfect.

But, if you obtain blood cultures within 2 hours of rigors there is increased likelihood of positivity.

pubmed.ncbi.nlm.nih.gov/3005977/

Objective: To determine whether the time lag between blood culture draw and the start of shaking chills is associated with blood culture positivity.

Methods: A prospective observational study was undertaken from January 2013 to March 2015 at a referral center in Okinawa, Japan. All enrolled patients were adults with an episode of shaking chills who were newly admitted to the division of infectious diseases. The study exposure was the time lag between blood culture draw and the most recent episode of shaking chills.

Results: Among patients whose blood cultures were obtained within 2 h after shaking chills started, the blood culture positivity was 53.6% (52/97), whereas among patients whose blood cultures were obtained after more than 2 h, the positivity was 27.6% (44/159) (p=0.019). The adjusted odds ratio of blood culture positivity for samples drawn within 2 h after shaking chills was 1.88 (95% confidence interval 1.01-3.51, p=0.046). Escherichia coli were the most frequently detected bacteria (58/105).

Conclusions: The positivity of blood cultures obtained within 2 h after the start of the most recent shaking chills was higher than that for blood cultures obtained after 2 h.

© 2018 The Authors. Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Tony Breu @tony_breu · Sep 14
12/
Before concluding, let me re-ask a version of the original question.

If you could obtain blood cultures at any of the following periods, which would you choose?

Option	Percentage
Just after fever	1.2%
Just after chills/rigors	46.9%
Just before fever	16.6%
Just before chills/rigors	35.4%

2,292 votes · Final results

Tony Breu @tony_breu · Sep 14
13/ - SUMMARY - Part 1

- The order of events: bacteremia and exogenous pyrogen exposure → increase temperature set-point → chills/rigors → fever
- We may feel cold chills as a cue to drive behavioral change (e.g., put on a sweater)
- Rigors promote rapid heat production

Tony Breu @tony_breu · Sep 14
14/14 - SUMMARY - Part 2

- By the time fever occurs, bacteremia may have already cleared
- Because rigors occur before fever (i.e., temporally closer to bacteremia), they are better predictors of positive blood cultures
- Neither is perfect



Posted 9/14/20

Hyperlinks

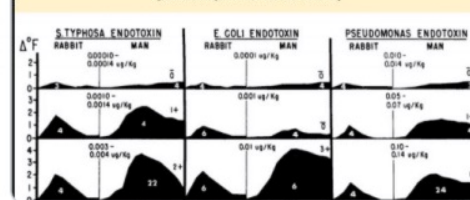
Tony Breu @tony_breu · Sep 14

2/
Bacteremia exposes us to exogenous pyrogens. For example, the cell wall of gram-negative rods contains lipopolysaccharide (LPS; endotoxin).

When injected into humans LPS induces fever. But, there is a 3-5 hour delay between exposure and peak fever.

pubmed.ncbi.nlm.nih.gov/4897836/

After injection of bacterial endotoxin, humans experience a fever. Notice that little change occurs in the first hour with a peak around 3-5 hours. [Rabbits experience earlier fever...]



1 4 58

Tony Breu @tony_breu · Sep 14

3/
The delay between clinical bacteremia and fever was demonstrated in 1932 by Weiss and Ottenberg.

Their conclusion: Obtain blood cultures BEFORE fever. If only it were easy to predict future fevers!

[Maybe we can as you'll see in tweet 10 below.]

academic.oup.com/jid/article-ab-...

...fever (even very high temperatures).

...fever (even very high temperatures).

Tony Breu @tony_breu · Sep 14

4/
Why is there a delay between bacteremia and fever?

There's a lot to be done!

- LPS induces endogenous pyrogens (e.g., IL-6) which...
- Increase the hypothalamic set-point, resulting in...
- Thermogenesis, vasoconstriction, etc., and...
- Fever

pubmed.ncbi.nlm.nih.gov/9759682/

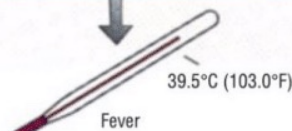


Figure 2. Hypothetical model for the febrile response. IL indicates interleukin; TNF, tumor necrosis factor; IFN, interferon; and PGE₂, prostaglandin E₂.

1 2 57

Tony Breu @tony_breu · Sep 14

5/
During this period between bacteremia and fever we may feel cold (i.e., we experience chills).

Why? There are at least two possible explanations.

- 1 Peripheral vasoconstriction → fall in skin temperature → "I'm cold!"
- 2 Direct central signal → "I'm cold!"

Which is it?

Vasoconstriction 43.3%
Central signal 56.7%

2,411 votes · Final results

1 5 27

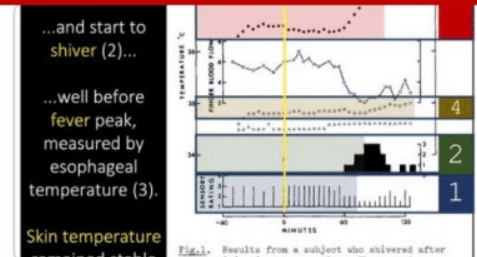
Tony Breu @tony_breu · Sep 14

6/
In one study, subjects were placed in water at a stable temperature and injected with a pyrogen.

Before fever, they felt cold. This was despite a stable skin temperature.

Chills must therefore arise from some central action of pyrogens

pubmed.ncbi.nlm.nih.gov/7189863/



Tony Breu @tony_breu · Sep 14

Replying to @tony_breu

7/
Why would an "I'm cold!" signal be sent?

This signal drives behavioral changes that aid with heat retention as our body aims to raise core temperature.

"I'm cold!" propels us to put on a blanket, seek shelter, etc.

👉 We ARE cold compared with what our body wants us to be!

1 6 75

Tony Breu @tony_breu · Sep 14

8/
If we require a rapid increase in temperature we might also experience violent shivering.

aka shaking chills
aka RIGORS

The muscle contractions of rigors result in rapid heat production (thermogenesis) aiding fever onset

Heat production from shivering - PubMed
Heat production from shivering
pubmed.ncbi.nlm.nih.gov

1 3 60

Tony Breu @tony_breu · Sep 14

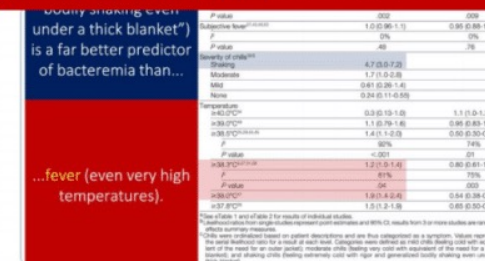
9/
We don't always require the rapid-onset fever that rigors produce. But bacteremia is a scenario where it might make sense.

So, is there an association between rigors and bacteremia?

Yes!

In fact, rigors predictor bacteremia better than fever.

pubmed.ncbi.nlm.nih.gov/22851117/



1 16 82

Tony Breu @tony_breu · Sep 14

10/
Should we say "culture if shakes" instead of "culture if spikes"?

Maybe. Remember the order of events:

- 1 Bacteremia
- 2 Increased temperature set-point
- 3 "I'm cold" and 4 Rigors
- 5 Fever

Chills and rigors should appear before a fever. And closer to the

Tony Breu @tony_breu · Sep 14

11/
While rigors occur closer to bacteremia than fever (and therefore better predict positive cultures), there is still a delay. They're not perfect.

But, if you obtain blood cultures within 2 hours of rigors there is increased likelihood of positivity.

pubmed.ncbi.nlm.nih.gov/30059771/

Objective: To determine whether the time lag between blood culture draw and the start of shaking chills is associated with blood culture positivity.
Methods: A prospective observational study was undertaken from January 2013 to March 2015 at a referral center in Okinawa, Japan. All enrolled patients were adults with an episode of shaking chills who were newly admitted to the division of infectious diseases. The study exposure was the time lag between blood culture draw and the most recent episode of shaking chills.
Results: Among patients whose blood cultures were obtained within 2 h after shaking chills started, the blood culture positivity was 53.6% (52/97), whereas among patients whose blood cultures were obtained after more than 2 h, the positivity was 27.6% (44/117) (p=0.019). The adjusted odds ratio of blood culture positivity for samples drawn within 2 h after shaking chills was 1.88 (95% confidence interval 1.01-3.51, p=0.046). Escherichia coli were the most frequently detected bacteria (58/105).
Conclusions: The positivity of blood cultures obtained within 2 h after the start of the most recent shaking chills was higher than that for blood cultures obtained after 2 h.
© 2018 The Authors. Published by Elsevier Ltd on behalf of International Society for Infectious Diseases. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1 13 69

Tony Breu @tony_breu · Sep 14

12/
Before concluding, let me re-ask a version of the original question.

If you could obtain blood cultures at any of the following periods, which would you choose?

Just after fever 1.2%
Just after chills/rigors 46.9%
Just before fever 16.6%
Just before chills/rigors 35.4%

2,292 votes · Final results

1 4 18

Tony Breu @tony_breu · Sep 14

13/ - SUMMARY - Part 1
■ The order of events: bacteremia and exogenous pyrogen exposure → increase temperature set-point → chills/rigors → fever
■ We may feel cold chills as a cue to drive behavioral change (e.g., put on a sweater)
■ Rigors promote rapid heat production

1 10 76

Tony Breu @tony_breu · Sep 14

14/14 - SUMMARY - Part 2
■ By the time fever occurs, bacteremia may have already cleared
■ Because rigors occur before fever (i.e., temporally closer to bacteremia), they are better predictors of positive blood cultures
■ Neither is perfect

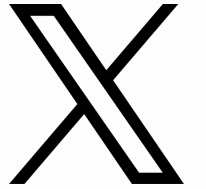
6 17 102



Posted 9/14/20

Social Media – Other Uses

- Accessibility to Experts
 - Authors often post links to recently published articles
 - Can have active discussion regarding studies
- Opportunities for mentorship / Community of peers
- Resources for advocacy



Social Media – Pros + Cons

PROS

- Brief, high-yield teaching points
- Self-directed
- Relevant, up-to-date info

CONS

- Teaching points dictated by person posting
- ? Reliability / “Peer Reviewed”
- ? Issues of privacy



Podcasts

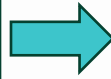
- Podcasts – Episodic series of spoken word audio files.
- TONS of medical podcasts out there aimed at every specialty and audience you can think of
- Broad scope for teachers and learners
 - Small scale “conference” – Can have content directed at learners but don’t need to sync up schedules of teachers and learners
 - Large scale with national audience



This Photo by Unknown Author is licensed under [CC BY-SA-NC](#)

Why Podcasts

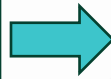
Widely accepted and used by learners



92% reported the podcast made it easier to find time to study, 97% reported that it helped them learn new information, 97% reported that it helped them apply knowledge clinically and 100% reported that they would recommend it to others

McCarthy & Porada 2020

Evidence of knowledge gain



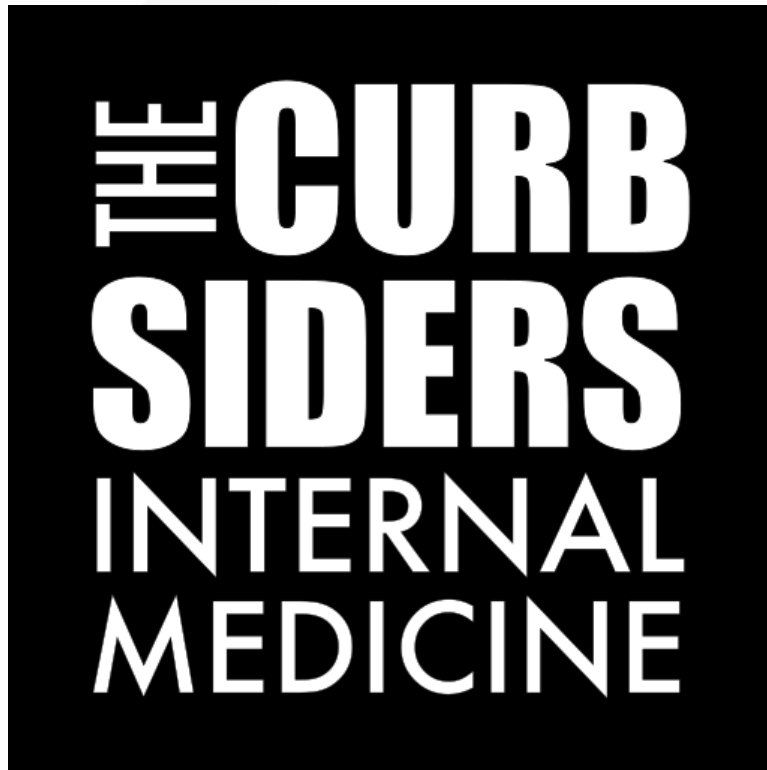
After listening to 10 minute podcast lessons, scores on stroke quiz increased from 86% to 92%, scores on bronchiolitis quiz increased from 69% to 92%

Alla and Kirkman, 2014



Podcasts

- Can speak to every stage of learner



Podcasts – Pros + Cons

PROS

- Relevant, up-to-date info
- Self-directed
- Time flexibility
- Entertaining/Engaging

CONS

- ? Reliability
- Inability to directly answer questions



Video/Streaming Platforms

- Lots of videos with applicability to medical education
 - Procedural training
 - Exam findings
 - Interviews
 - Lectures



Videos/Streaming – Pros + Cons

PROS

- Self-directed
- Easy to find
- Can help demonstrate teaching points when not readily available in person

CONS

- ? Reliability
- ? Privacy



Other Innovative Methods - Simulation

- Not a new concept but has continued to evolve with technology
- Many studies show benefits in teaching skills and procedures/surgeries with improvement in patient outcomes
 - Hands on learning often favored by the learners
 - Strategy to promote patient safety in medical education
 - Can address low frequency learning events that are high stakes
 - High value for both observer and participants



Other Innovative Methods - Simulation

- Great tool but requires a lot of resources
 - Physical space
 - Trained faculty and staff
 - Expensive equipment

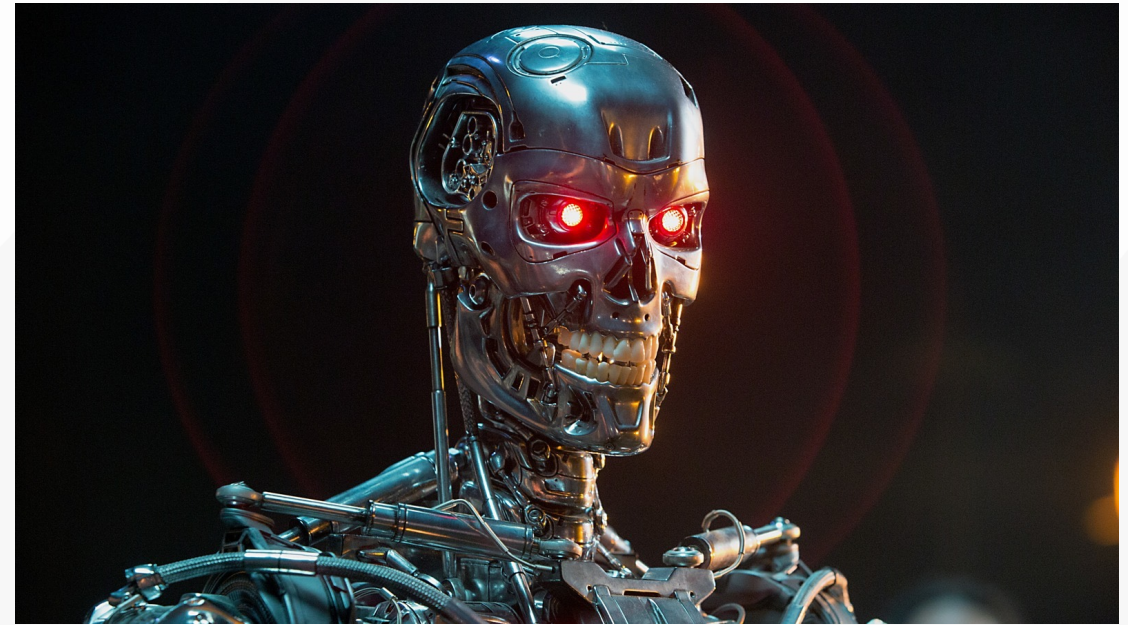


The New Debate - AI

The Future of Medicine/Medical Education

VS

...It's the end



This isn't new...

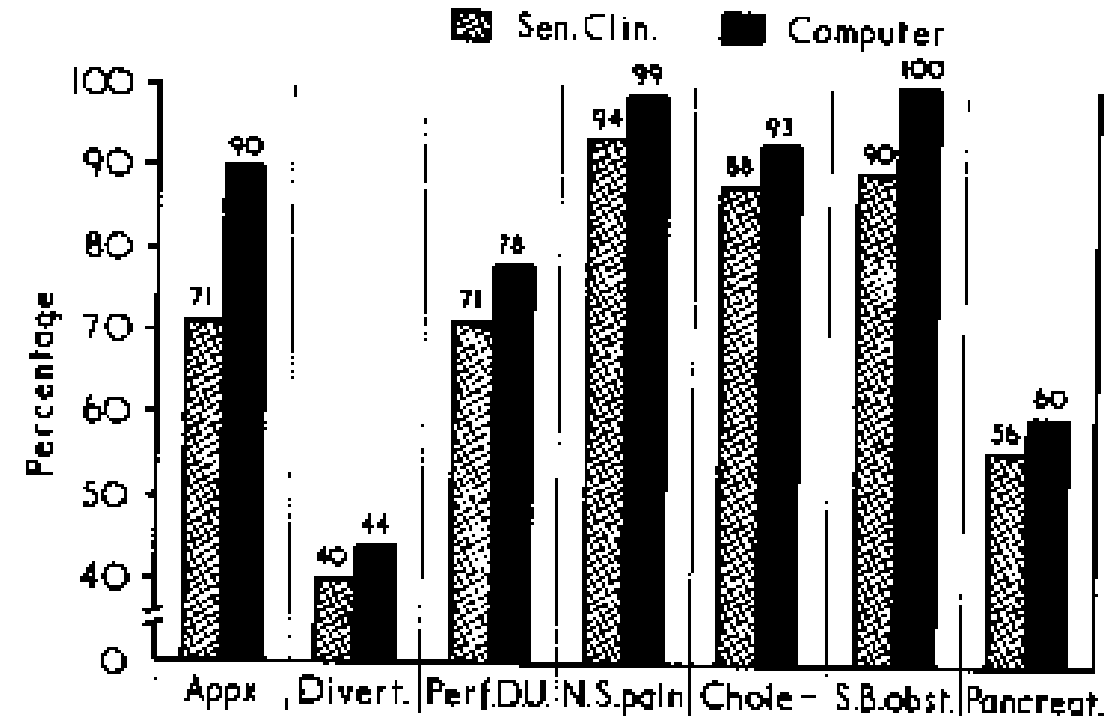
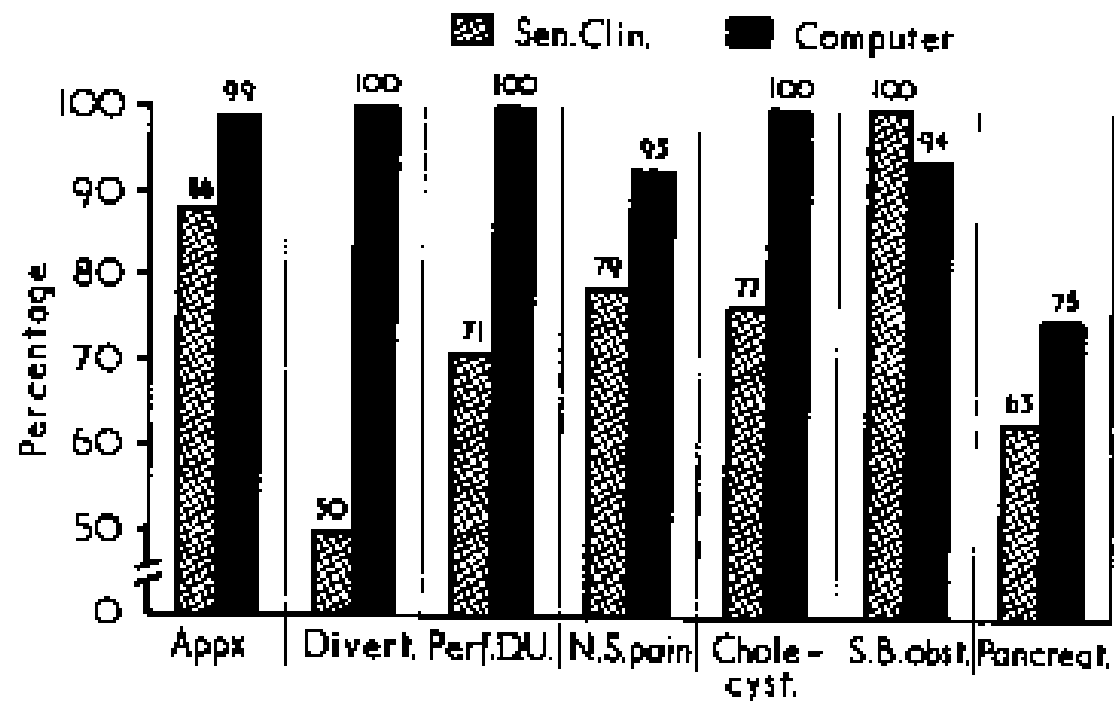


FIG.
CONT
to be

Computer-aided Diagnosis of Acute Abdominal Pain

ision

An a F. T. de DOMBAL, D. J. LEAPER, J. R. STANILAND, A. P. McCANN, JANE C. HORROCKS

abdc *British Medical Journal*, 1972, 2, 9-13

How reliable are AI/LLM platforms?

Standardized Tests

- ChatGPT has been found to in some studies to pass the boards.
 - “Performs at the expected level of a third year medical student” with passing scores on USMLE Step 1 and Step 2 exams. (earlier models)
Gilson et al. JMIR Med Educ 2023;9:e45312
 - Performs at level of orthopedic intern on their In-Training exams. Had difficulty with more complex questions.
Lum Z. Clinical Orthopaedics and Related Research, August 2023.

Clinical Decision Making

- ChatGPT performed well in clinical reasoning evaluations with the AI model providing the correct diagnosis in 64% of challenging cases and as it's top diagnosis in 39% in NEJM Clinicopathologic Conferences (similar rates to medical experts)
Kanjee et al. NEJM, July 2023

Ways to Utilize AI



- ChatGPT
 - Chatbot that provides human language information based on available info
 - Does not provide references on where obtained information from
- Open Evidence / Clinical Key AI
 - New Chatbot being developed with Elsevier that reviews medical literature and provides summary of info/recommendations
 - Provides citations that guide answers provided

OpenEvidenceTM

Potential Uses for AI in Medical Education

- Study Aides
 - Could potentially be used to supplement learning
 - Helps deliver information in short, easy to understand, summaries
- Clinical reasoning
 - Platforms have shown ability to generate differential diagnoses
 - Assist learners in clinical reasoning
 - Reduce biases/premature closure

Potential Risks

- Learners becoming dependent on AI
 - This should be seen as a supplemental way to learn...not replacing other resources
- Biases
 - Recent studies have shown that Chat GPT can propagate, or even amplify, harmful societal biases, raising concerns about its use for clinical decision support
 - Zack et al. The Lancet Digital Health. Jan 2024

Where do we go from here?

- AI as a tool in medical education is here and not going anywhere
 - Some studies have shown that >50% of learners are already using!
- Imperative that educators learn to utilize so we can guide our learners best we can...make sure they understand capabilities and limitations
- Our patients are using it...we need to be ready

Computer-aided Diagnosis of Acute Abdominal Pain

F. T. de DOMBAL, D. J. LEAPER, J. R. STANILAND, A. P. McCANN, JANE C. HORROCKS

British Medical Journal, 1972, 2, 9-13

What the computing system does is to help the clinician in an area where previous studies (de Dombal *et al.*, 1972a) have shown him to be relatively weak—namely, in the statistical analysis of large volumes of data. In such a case the clinician merely uses the computer to augment his own capabilities and judgement; and indeed there is ample precedent for this. To take one obvious example, the clinician often uses a stethoscope to augment his ability to hear sounds emanating from within a body cavity. Sometimes the clinical picture is clear-cut; in this instance the clinician merely uses his stethoscope to confirm his previous assessment of the patient. Sometimes the results which the clinician obtains from the use of the stethoscope are difficult to interpret or are at odds with what the clinician “feels” about the case—in such circumstances the clinician is at liberty to disregard the evidence from his “machine.”

The GNOME: Where Can We Fit These In?



G

Goals

N

Needs

O

bjectives

M

ethods

E

valuation

Innovative GNOME - Methods

Clinical knowledge

- All novel methods have potential applications

Clinical skills/procedures

- Videos
- Sim
- AI

Health Systems Science

- Social media
- Podcasts



Breakout Sessions

- Are there methods that we've discussed that you're using or may plan to use in your teaching?
- Other methods not discussed that you've found helpful and think others should be aware of?
- Do you have any hesitations or concerns with these methods in medical education?

Thank You!

- Special thanks to colleagues who actively use some of these methods and contributed to content in slides
 - Dr. Tony Breu
 - Dr. Adam Rodman
 - Dr. Christopher Chiu
 - Dr. Justin Berk
 - Dr. Kirsti Martin

Resources

- Alla A, Kirkman MA. PodMedPlus: an online podcast resource for junior doctors. Med Educ. Nov 2014
- Bernstein et al; A Nationwide Survey of Educational Resource Utilization and Perception Among Internal Medicine Residents; J Gen Intern med; 35(6); 1598-604
- Cooper et al; Visual Media in Medical Education; Journal of Grad Med Ed; June 2021
- Cooper A, Rodman A. AI and Medical Education: A 21st Century Pandora's Box; N Engl J Med 2023; 389:385-387
- Curran et al. A Review of Digital, Social, and Mobile Technologies in Health Professional Education. Journal for Contin Edu in Health Professions; 37(3); 2017
- Gilson et al. How Does ChatGPT Perform on the United States Medical Licensing Examination? The Implications of Large Language Models for Medical Education and Knowledge Assessment, JMIR Med Educ 2023;9:e45312
- Kanjee C, Crowe B, Rodman A. Accuracy of a Generative Artificial Intelligence Model in a Complex Diagnostic Challenge. N Engl J Med 2023; 330 (1)
- Lum, Zachary C. Can Artificial Intelligence Pass the American Board of Orthopaedic Surgery Examination? Orthopaedic Residents Versus ChatGPT. Clinical Orthopaedics and Related Research 481(8), August 2023.
- McCarthy J, Porada K. Serving up Peds Soup: Podcast-based paediatric resident education. Med Educ. May 2020
- Rodman A., & Trivedi, S. Podcasting: A Roadmap to the Future of Medical Education. In Seminars in nephrology. May 2020
- Zack et al. Assessing the potential of GPT-4 to perpetuate racial and gender biases in health care: a model evaluation study. The Lancet Digital Health. 6(1). Jan 2024