
Using Polysomnography as a Predictive Tool
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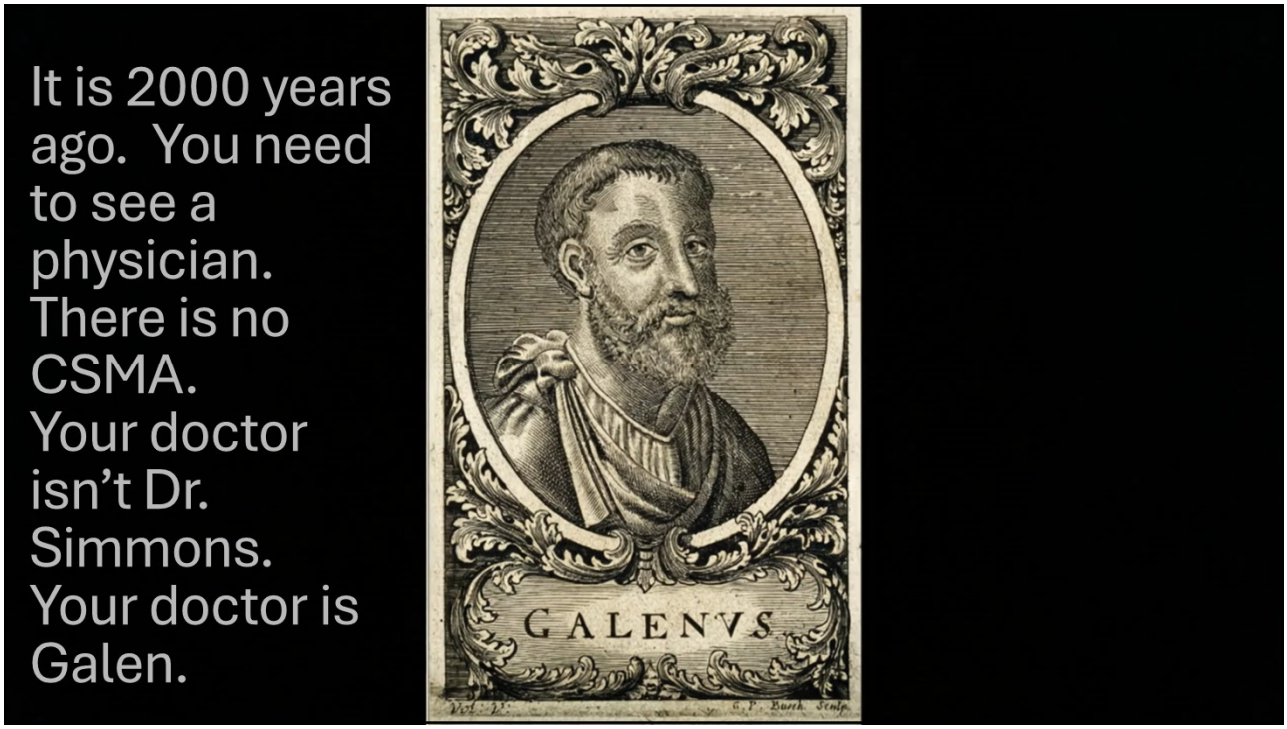
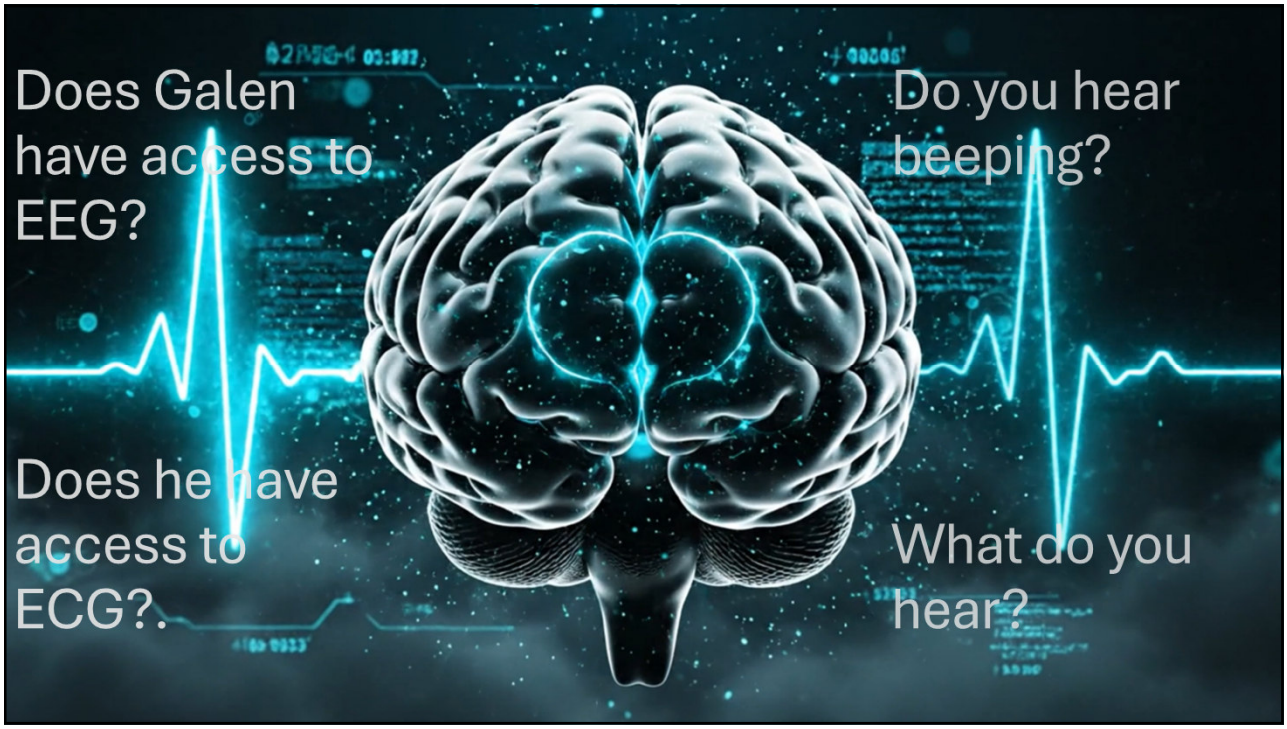
Learning Objective: The core objective of this talk is to completely reframe how dental and medical professionals view polysomnography (PSG). The audience must transition from seeing PSG as a simple, retrospective diagnostic tool for sleep apnea to understanding it as a predictive, data-rich language that can forecast systemic diseases decades before symptom onset.
NotebookLM

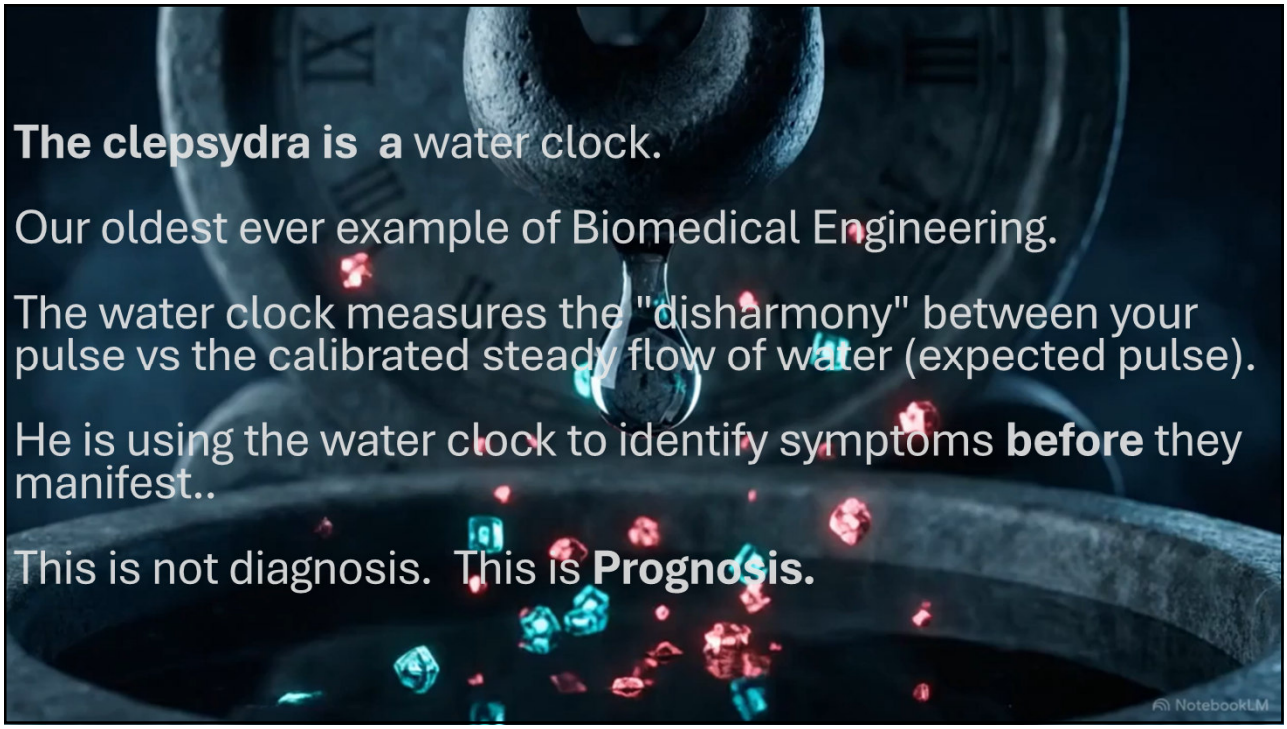
1


It is 2000 years ago. You need to see a physician. There is no CSMA. Your doctor isn't Dr. Simmons. Your doctor is Galen.
GALENVS

2


Does Galen have access to EEG?
Do you hear beeping?
Does he have access to ECG?.
What do you hear?

3


The clepsydra is a water clock.
Our oldest ever example of Biomedical Engineering.
The water clock measures the "disharmony" between your pulse vs the calibrated steady flow of water (expected pulse).
He is using the water clock to identify symptoms **before** they manifest..
This is not diagnosis. This is **Prognosis.**
NotebookLM

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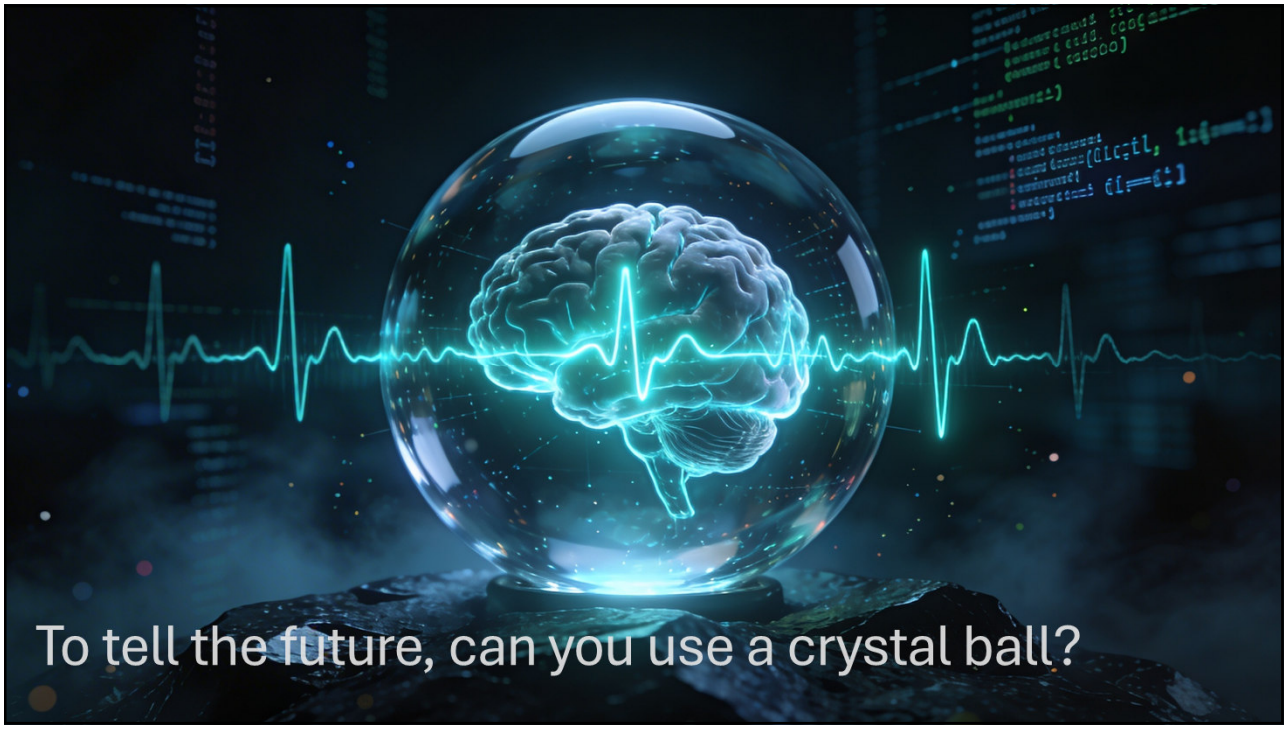
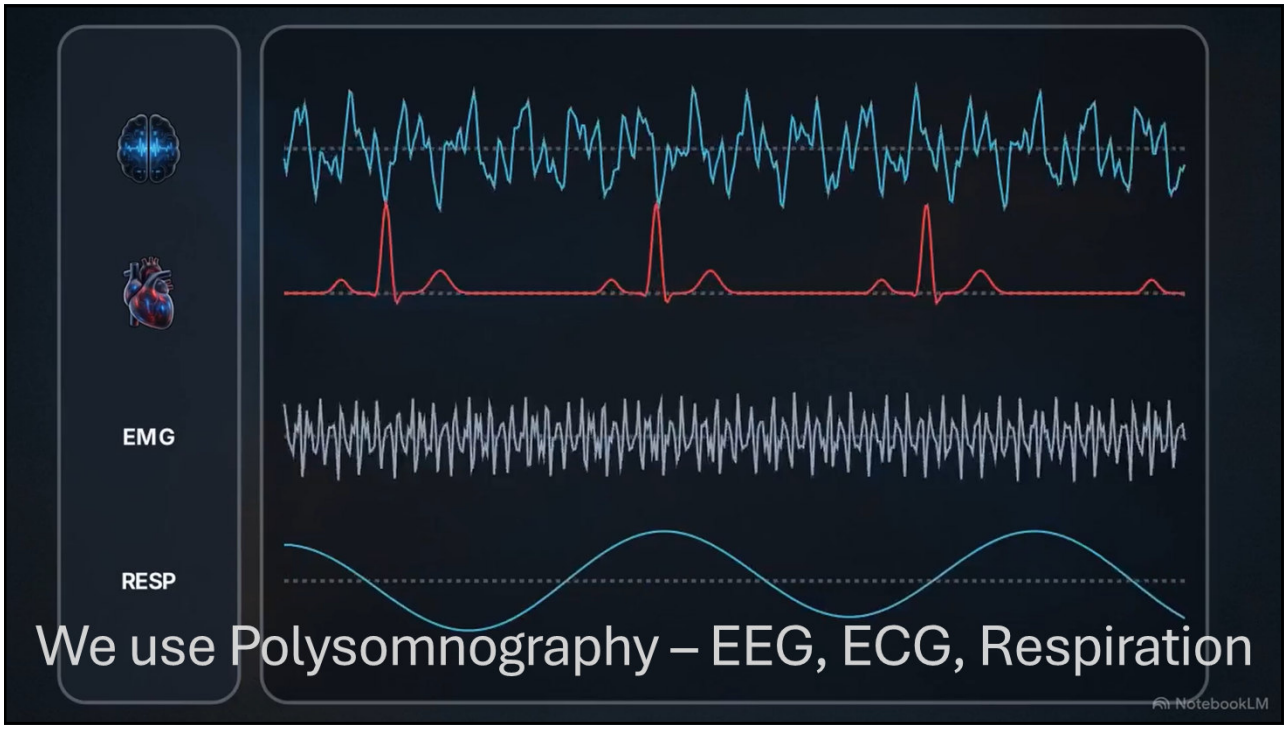

To tell the future, can you use a crystal ball?

5


To tell the future, can you use a deck of cards?

6


EMG
RESP
We use Polysomnography – EEG, ECG, Respiration
NotebookLM

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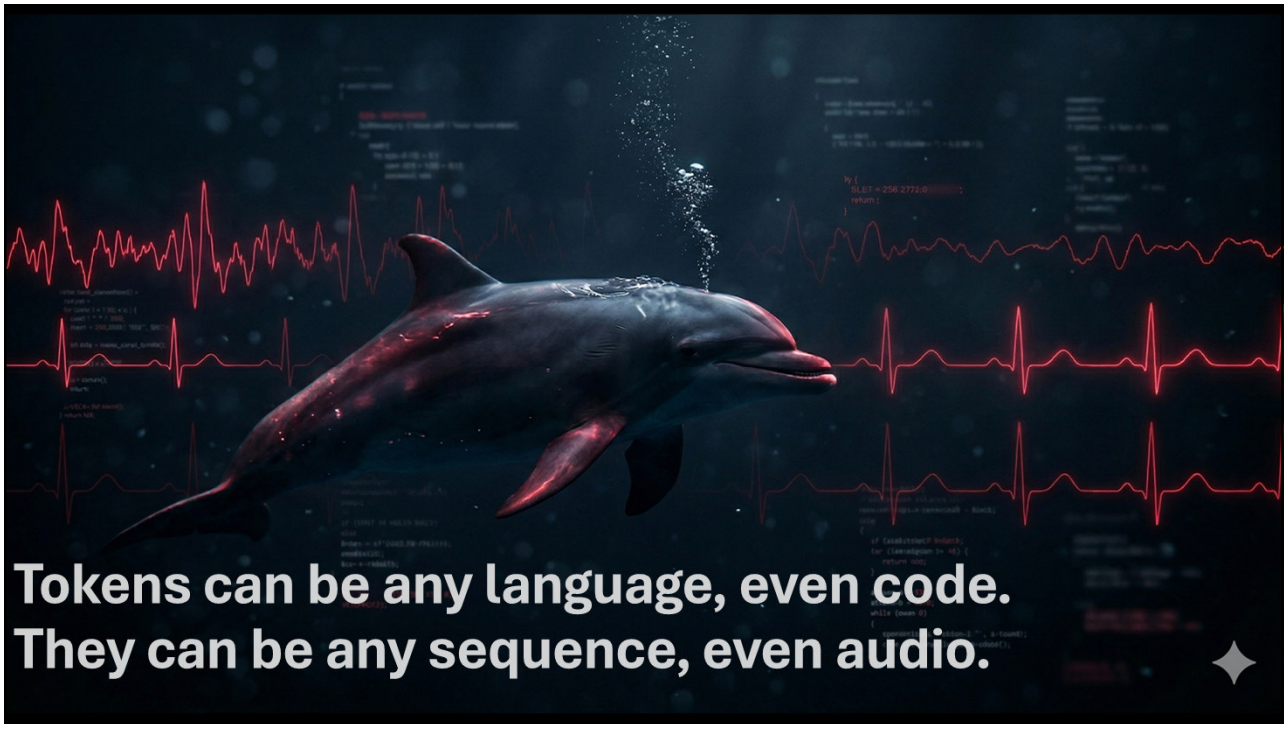
I am happy to be
99%
AIs. LLMs. GPTs.
They are all just next-token predictions.

8


I am happy
to be here
99%
Trained on all available text...
This is not machine learning.
This is machine education.

9


Tokens can be any language, even code.
They can be any sequence, even audio.

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DolphinGemma is a large language model that uses dolphin audio to help scientists study how dolphins communicate and hopefully find out what they're saying, too.
SLEEP WELL MY FRIEND.
https://deepmind.google/models/gemma/dolphingemma/

11


The team at Stanford created Sleep Foundation Model.
A multimodal sleep foundation model for disease prediction
Rahul Thapa, Magnus Ruud Kjaer, Bryan He, Ian Covert, Hyatt Moore IV, Umaer Hanif, Gauri Ganjoo, M. Brandon Westover, Poul Jennum, Andreas Brink-Kjaer, Emmanuel Mignot & James Zou
Nature Medicine volume 32, pages752–762 (2026)
https://www.nature.com/articles/s41591-025-04133-4

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5-Second Token
To tokenize PSG, we split over 5 second segments.
NotebookLM

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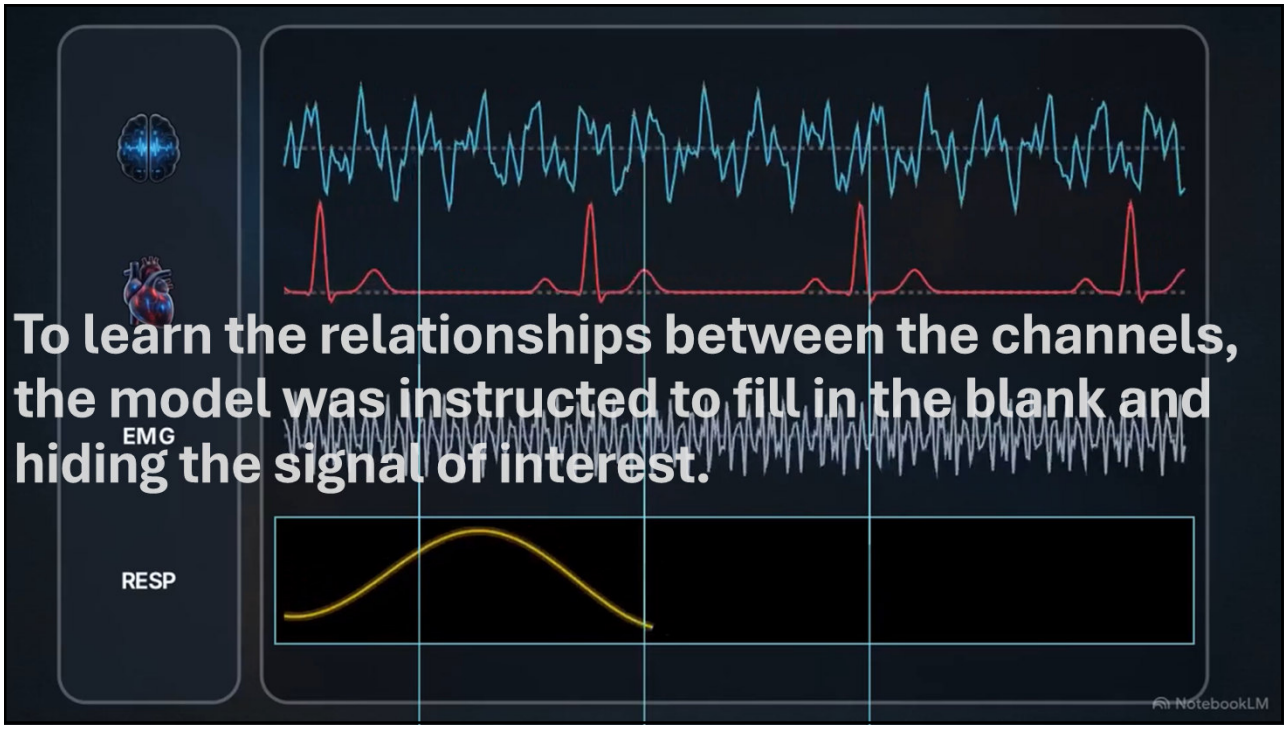
To learn the relationships between the channels, the model was instructed to fill in the blank and hiding the signal of interest.
EMG
RESP
NotebookLM

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585,000 Hours
65,000 Participants
Over a wide range of ages, diseases and acquisition systems.
NotebookLM

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A complex understanding of the relationship between all the signals was formed.
NotebookLM

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HRG
SYS
DIA
And we can now do more than just diagnose sleep disorders.

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Sleep Apnea
From one night of sleep, SleepFM accurately predicts 130 conditions.
NotebookLM

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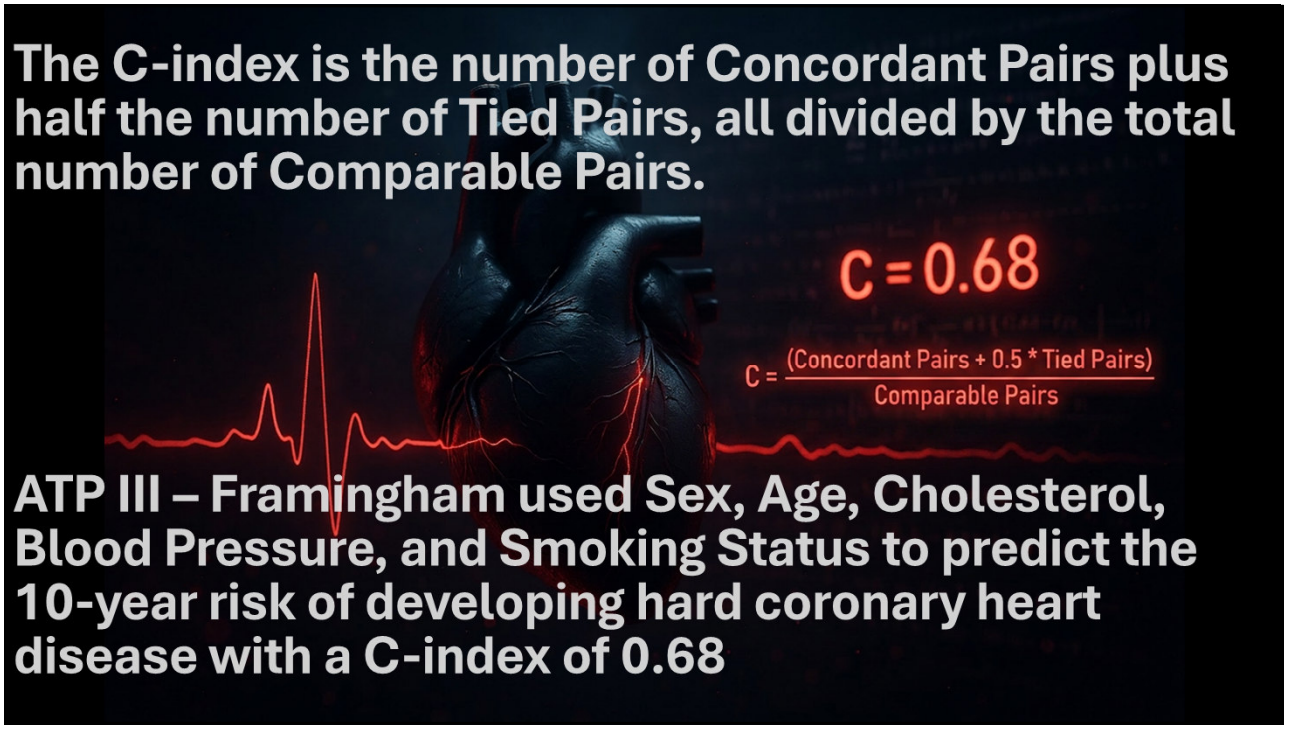
The C-index is the number of Concordant Pairs plus half the number of Tied Pairs, all divided by the total number of Comparable Pairs.
C = 0.68
C = (Concordant Pairs + 0.5 * Tied Pairs) / Comparable Pairs
ATP III – Framingham used Sex, Age, Cholesterol, Blood Pressure, and Smoking Status to predict the 10-year risk of developing hard coronary heart disease with a C-index of 0.68

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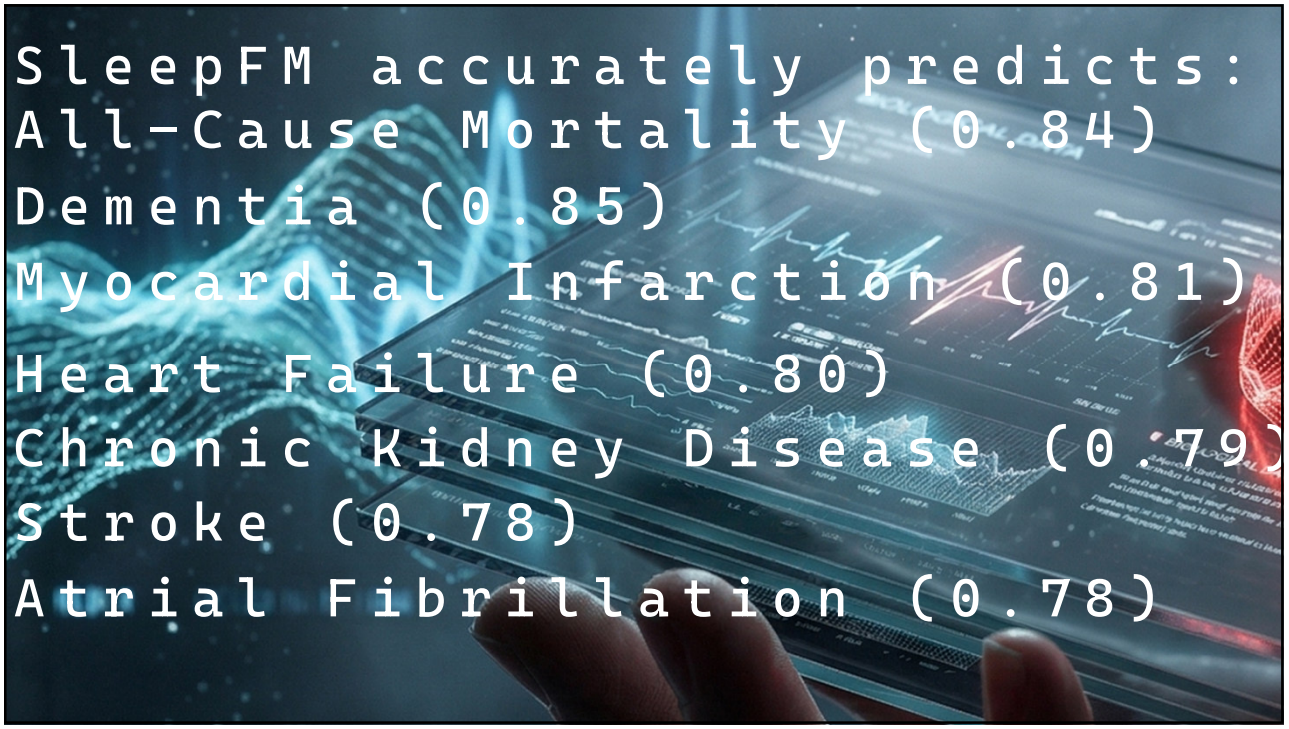
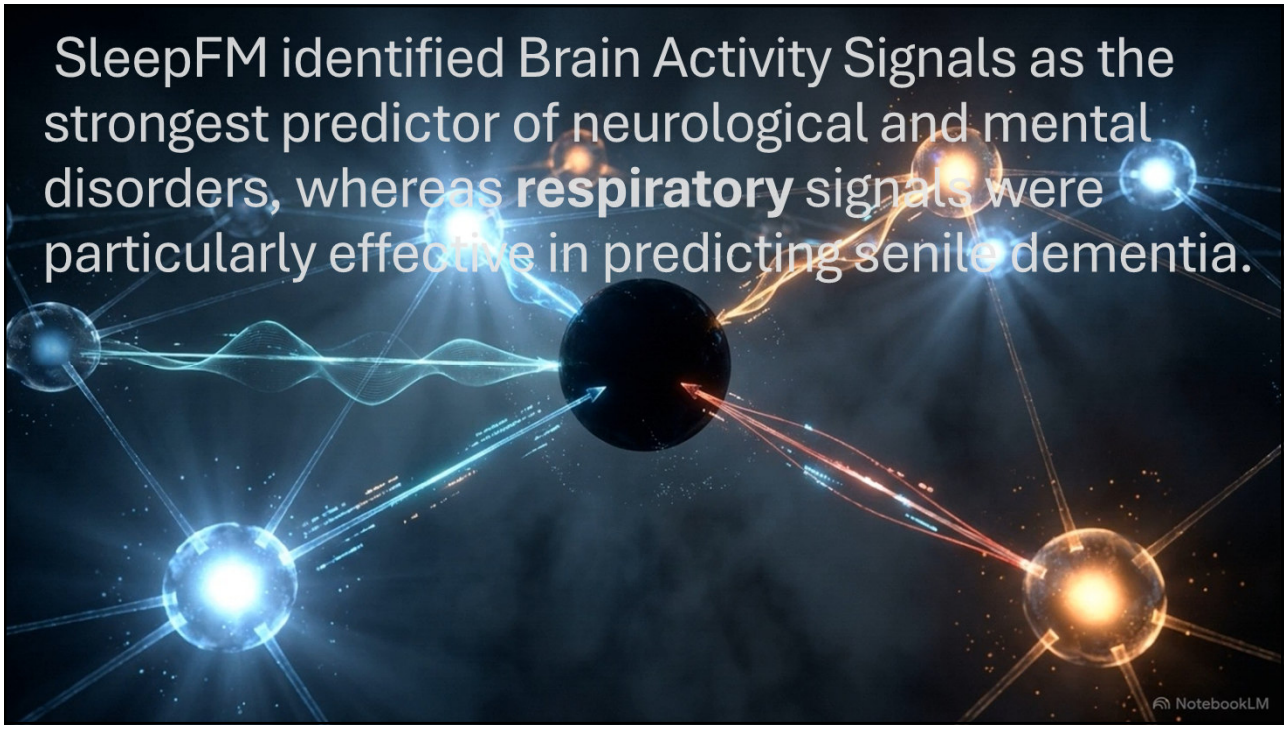

SleepFM accurately predicts:
All-Cause Mortality (0.84)
Dementia (0.85)
Myocardial Infarction (0.81)
Heart Failure (0.80)
Chronic Kidney Disease (0.79)
Stroke (0.78)
Atrial Fibrillation (0.78)

20


SleepFM identified Brain Activity Signals as the strongest predictor of neurological and mental disorders, whereas **respiratory** signals were particularly effective in predicting senile dementia.
NotebookLM

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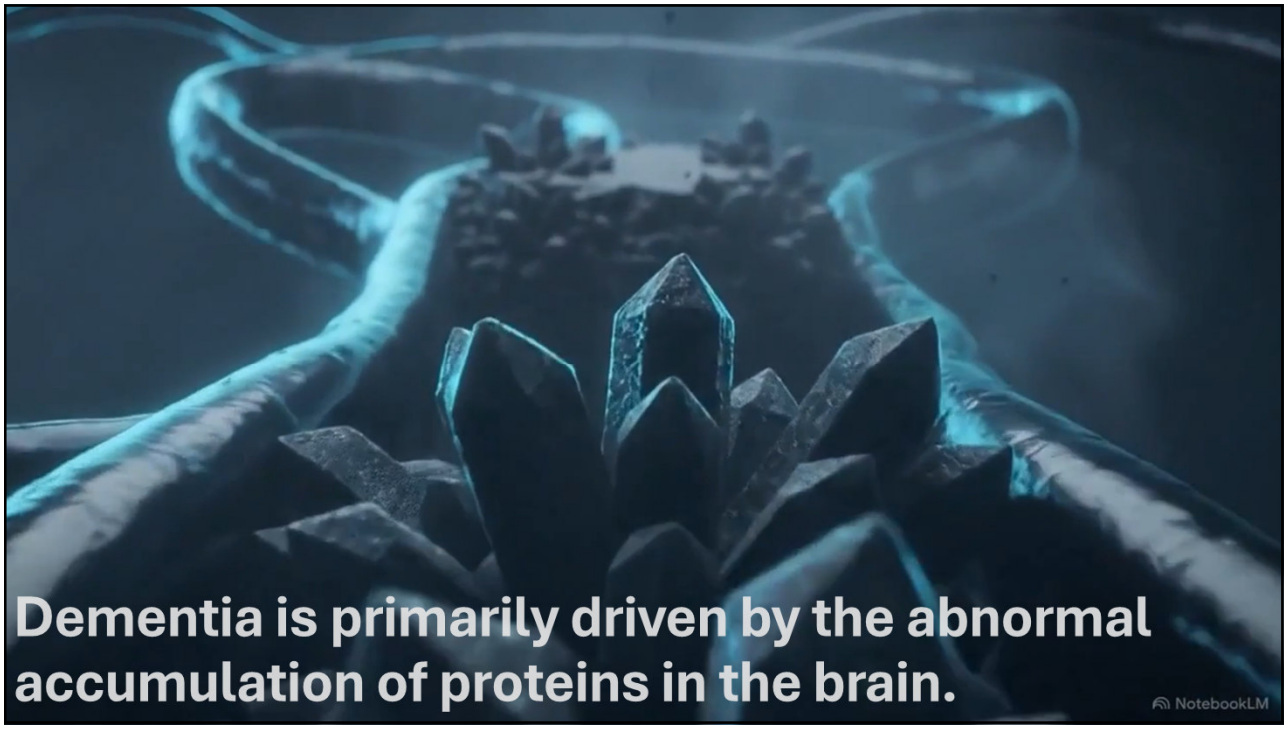
Dementia is primarily driven by the abnormal accumulation of proteins in the brain.
NotebookLM

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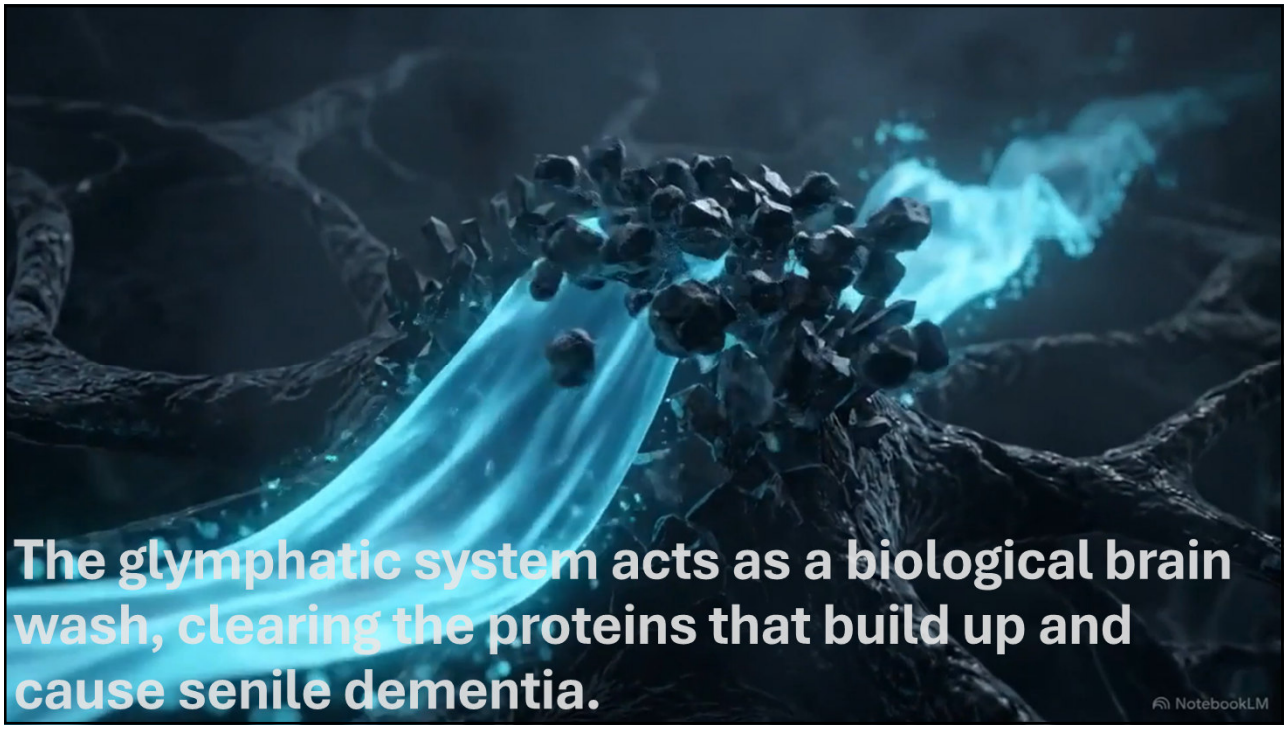
The glymphatic system acts as a biological brain wash, clearing the proteins that build up and cause senile dementia.
NotebookLM

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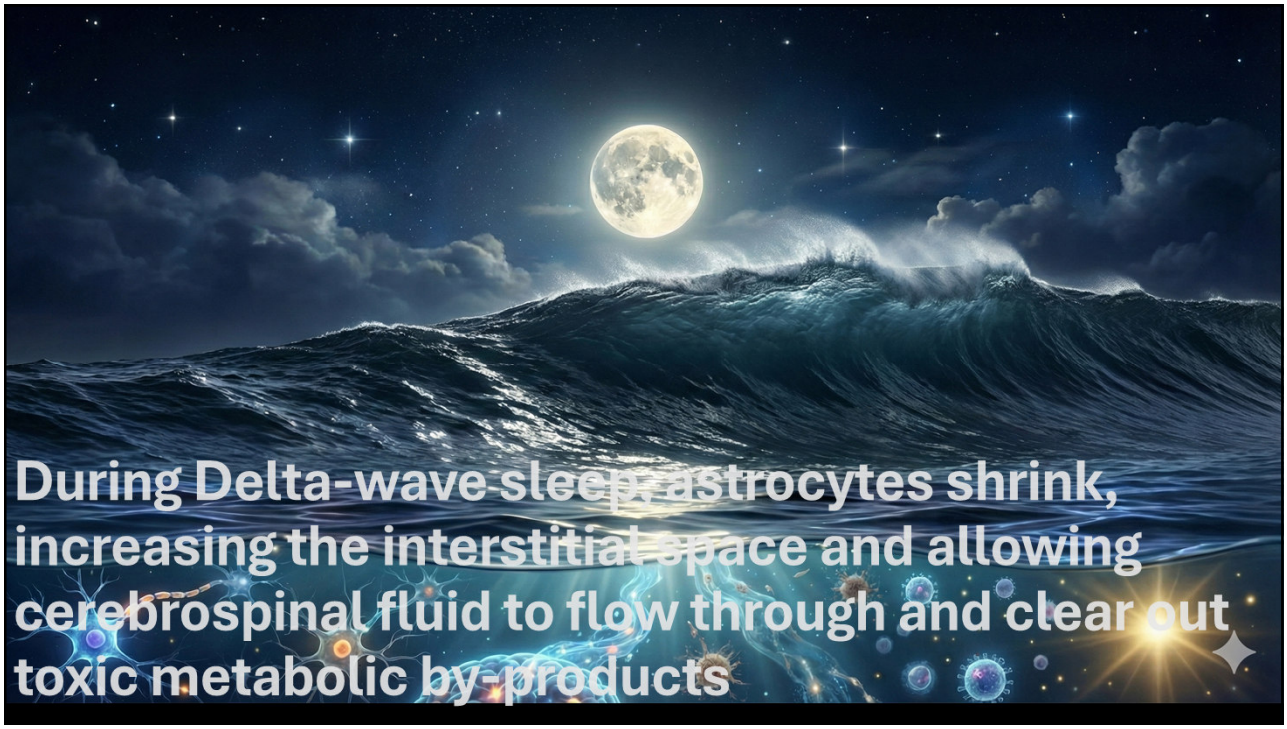
During Delta-wave sleep, astrocytes shrink, increasing the interstitial space and allowing cerebrospinal fluid to flow through and clear out toxic metabolic by-products

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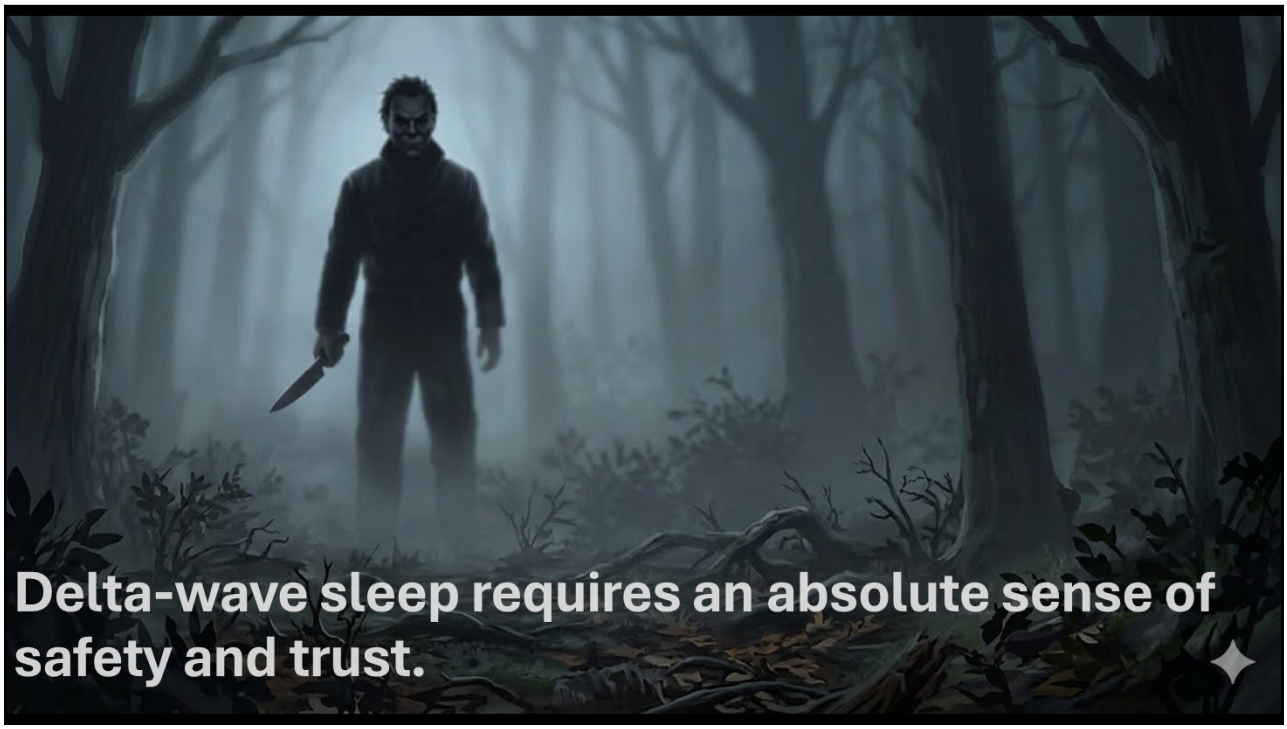
Delta-wave sleep requires an absolute sense of safety and trust.

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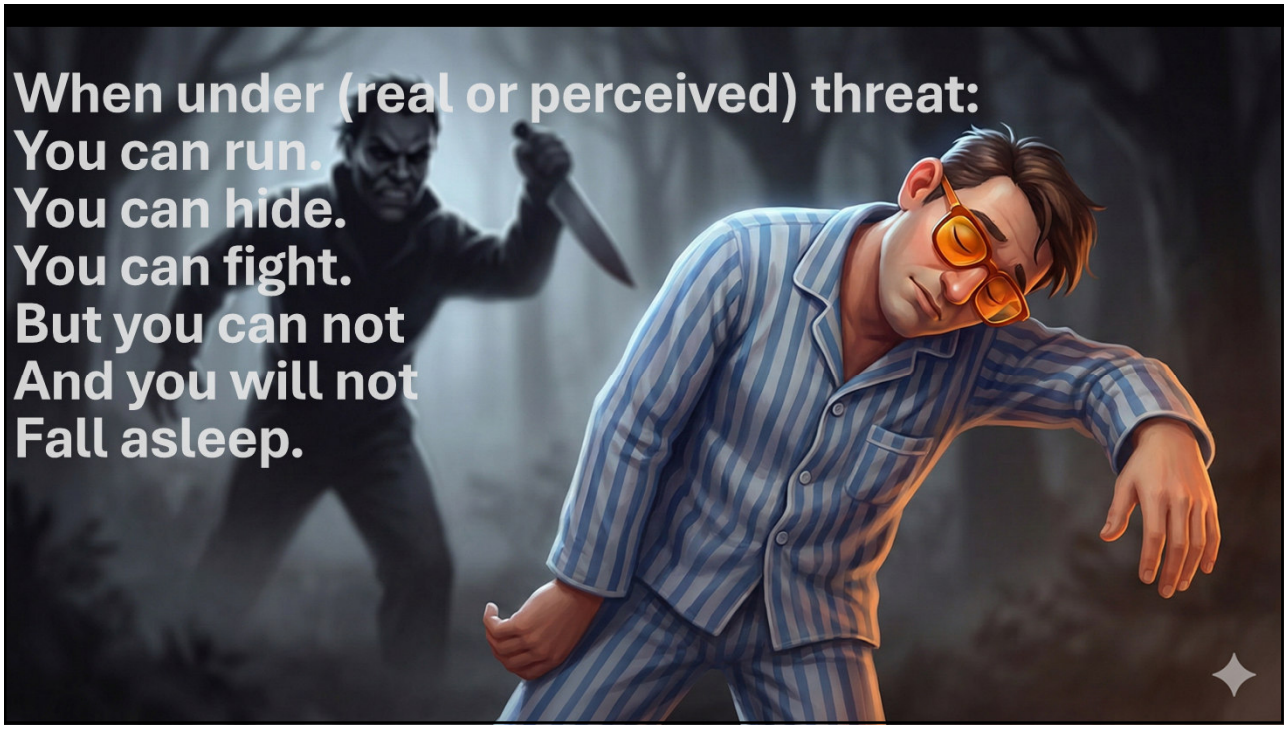
When under (real or perceived) threat:
You can run.
You can hide.
You can fight.
But you can not
And you will not
Fall asleep.

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Delta sleep can also be disrupted.
NotebookLM

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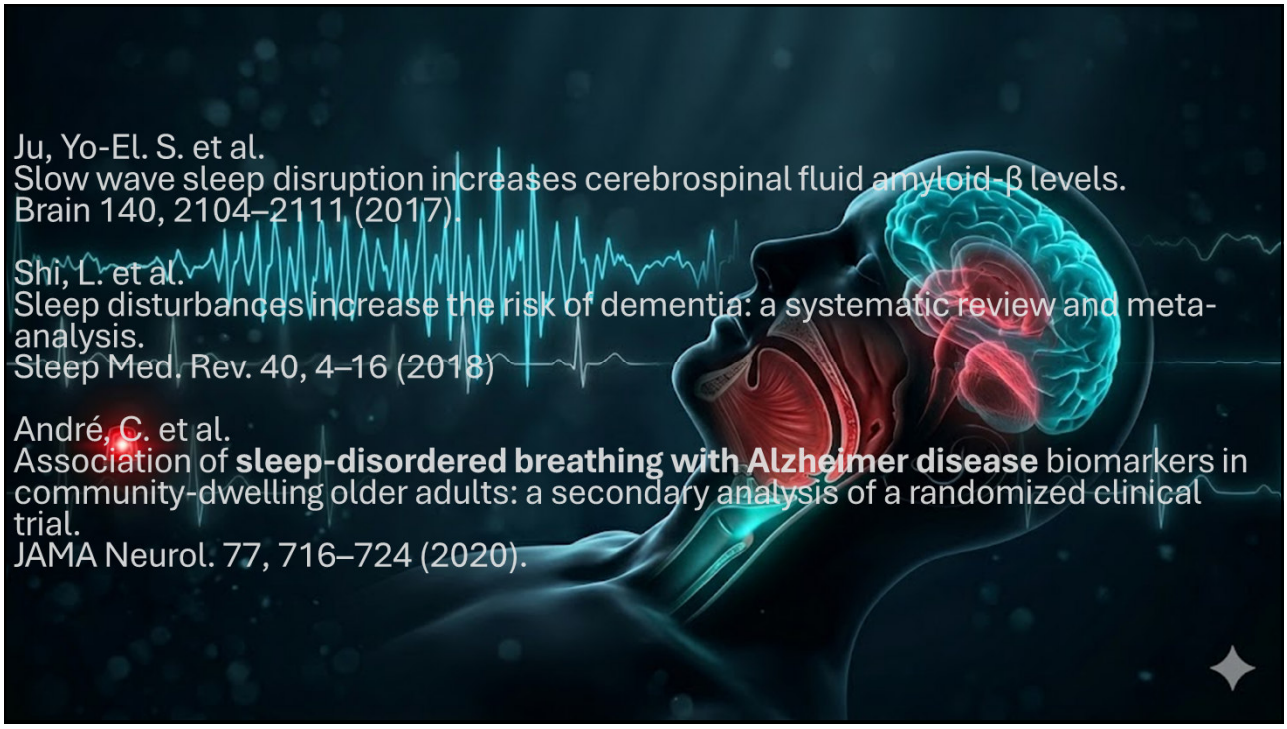
Ju, Yo-El. S. et al.
Slow wave sleep disruption increases cerebrospinal fluid amyloid-β levels.
Brain 140, 2104–2111 (2017).
Shi, L. et al.
Sleep disturbances increase the risk of dementia: a systematic review and meta-analysis.
Sleep Med. Rev. 40, 4–16 (2018)
André, C. et al.
Association of **sleep-disordered breathing with Alzheimer disease** biomarkers in community-dwelling older adults: a secondary analysis of a randomized clinical trial.
JAMA Neurol. 77, 716–724 (2020).

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You do not sleep with your finger.
You do not sleep with your wrist.
APPROXIMATE

29


Infrared
video camera
Delta
Theta
Alpha
Beta
Sigma
Sigma
Power (dB)
Frequency
RIP
RIP
PSG
This is what in-lab PSG looks like.

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This is what in-lab PSG feels like.
NotebookLM

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LAB
In-lab PSG can be logistically challenging
NotebookLM

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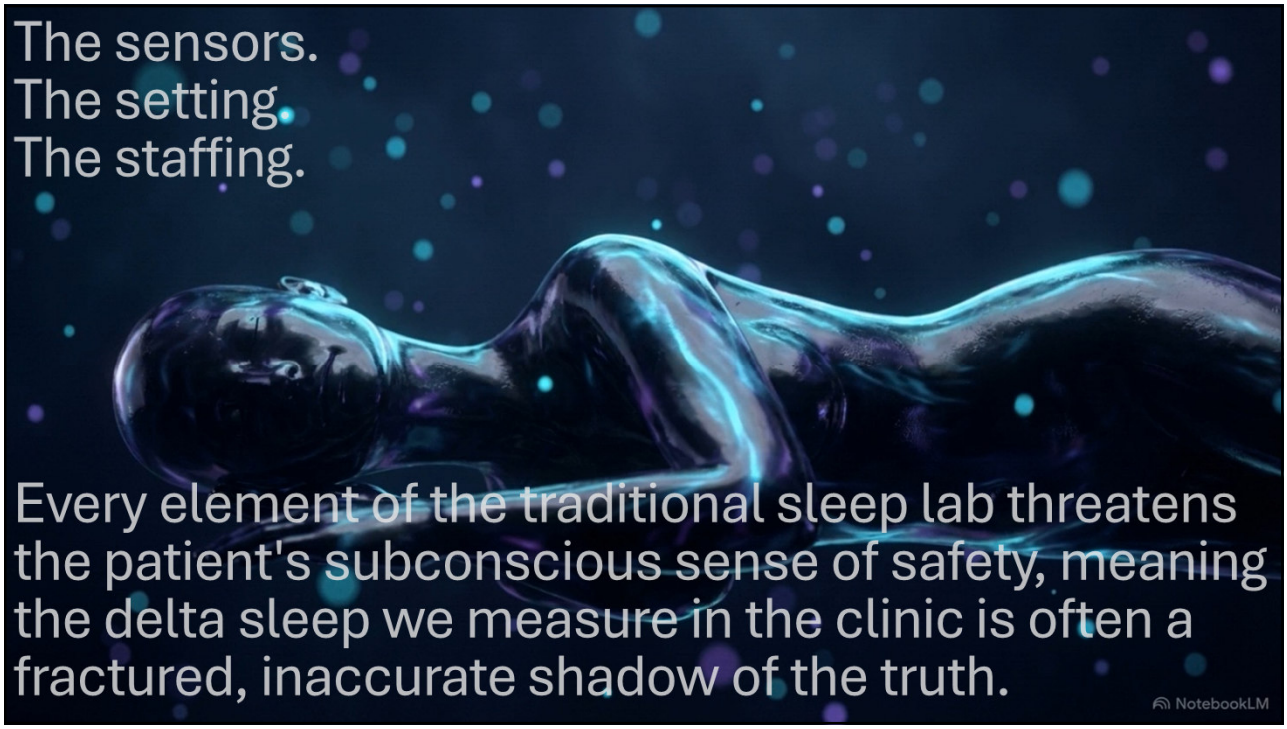
The sensors.
The setting.
The staffing.
Every element of the traditional sleep lab threatens the patient's subconscious sense of safety, meaning the delta sleep we measure in the clinic is often a fractured, inaccurate shadow of the truth.
NotebookLM

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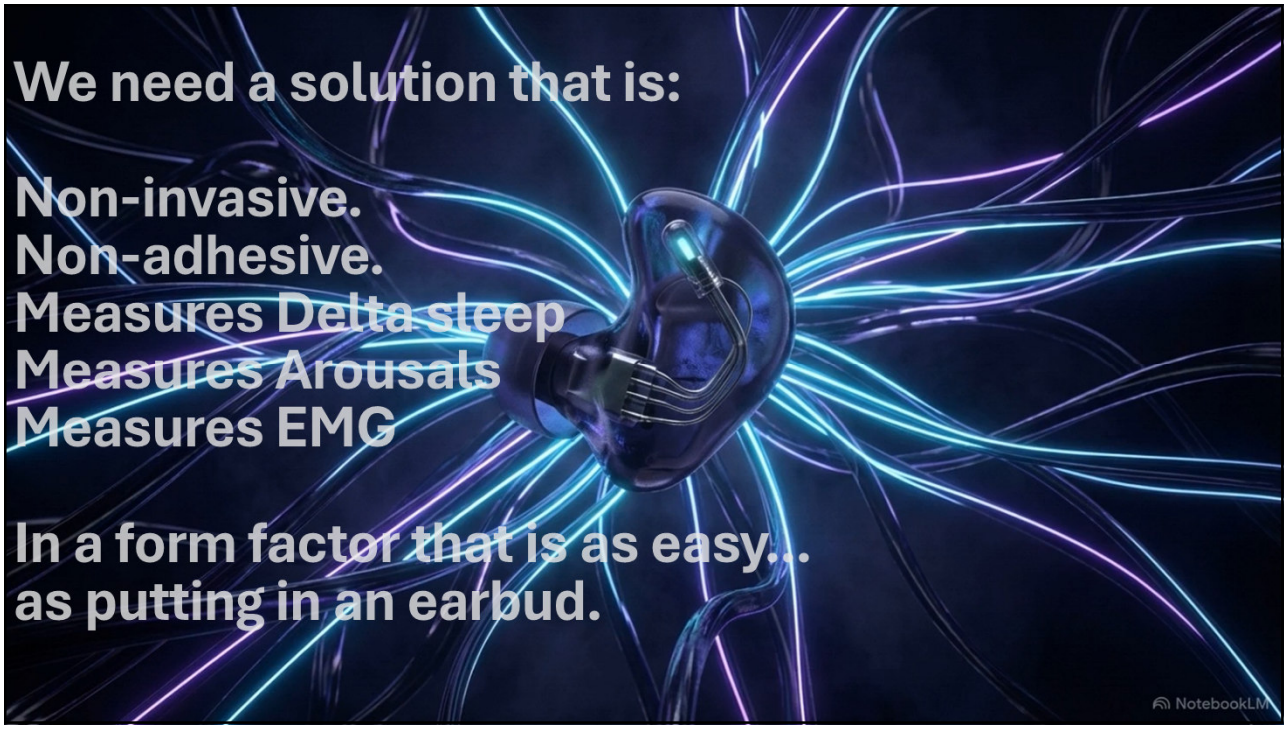
We need a solution that is:
Non-invasive.
Non-adhesive.
Measures Delta sleep
Measures Arousals
Measures EMG
In a form factor that is as easy...
as putting in an earbud.
NotebookLM

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ACTION PLAN
What is the tool we need to visualize the data, predictions and risk scores over time?
NotebookLM

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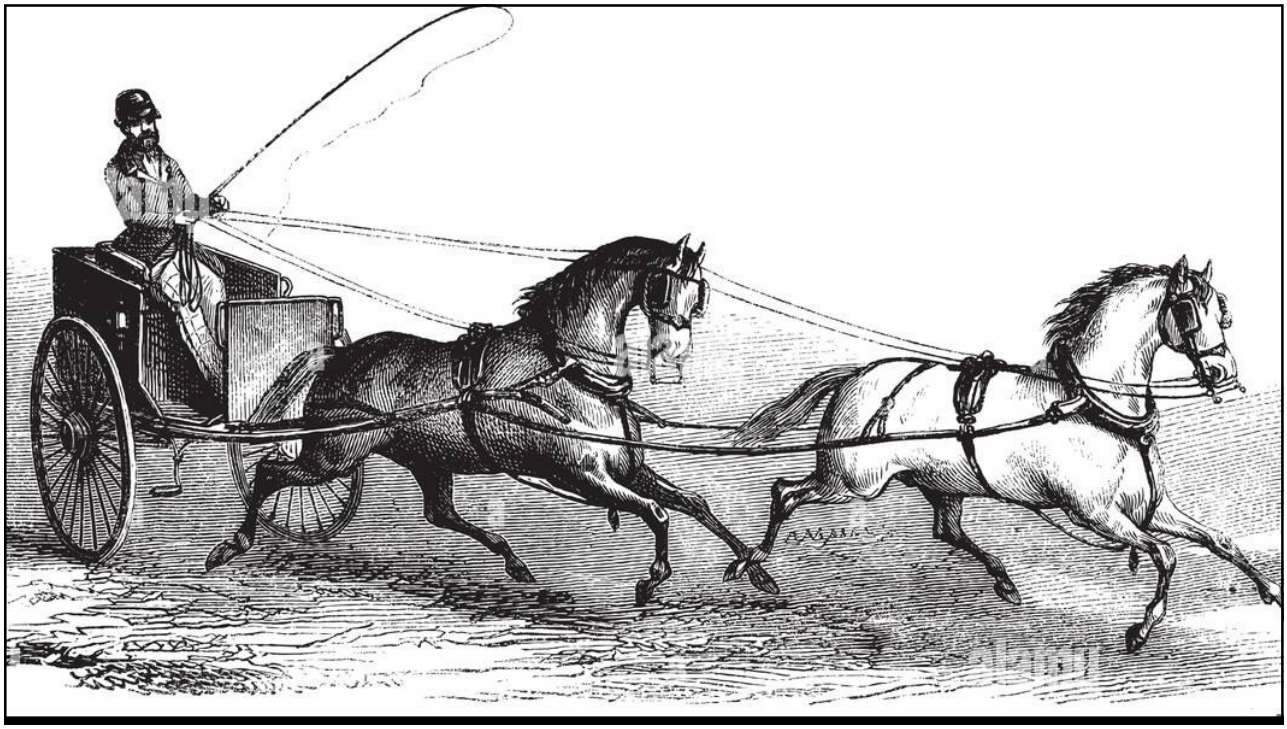

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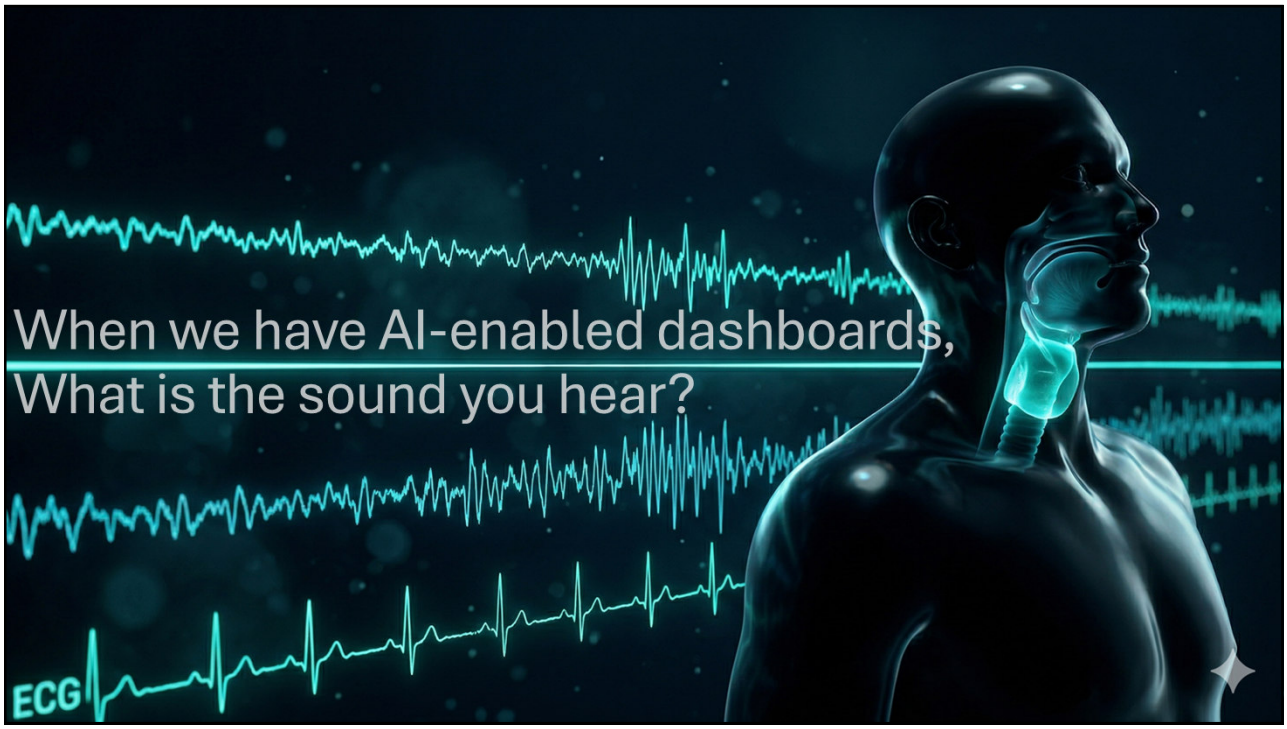
When we have AI-enabled dashboards,
What is the sound you hear?
ECG

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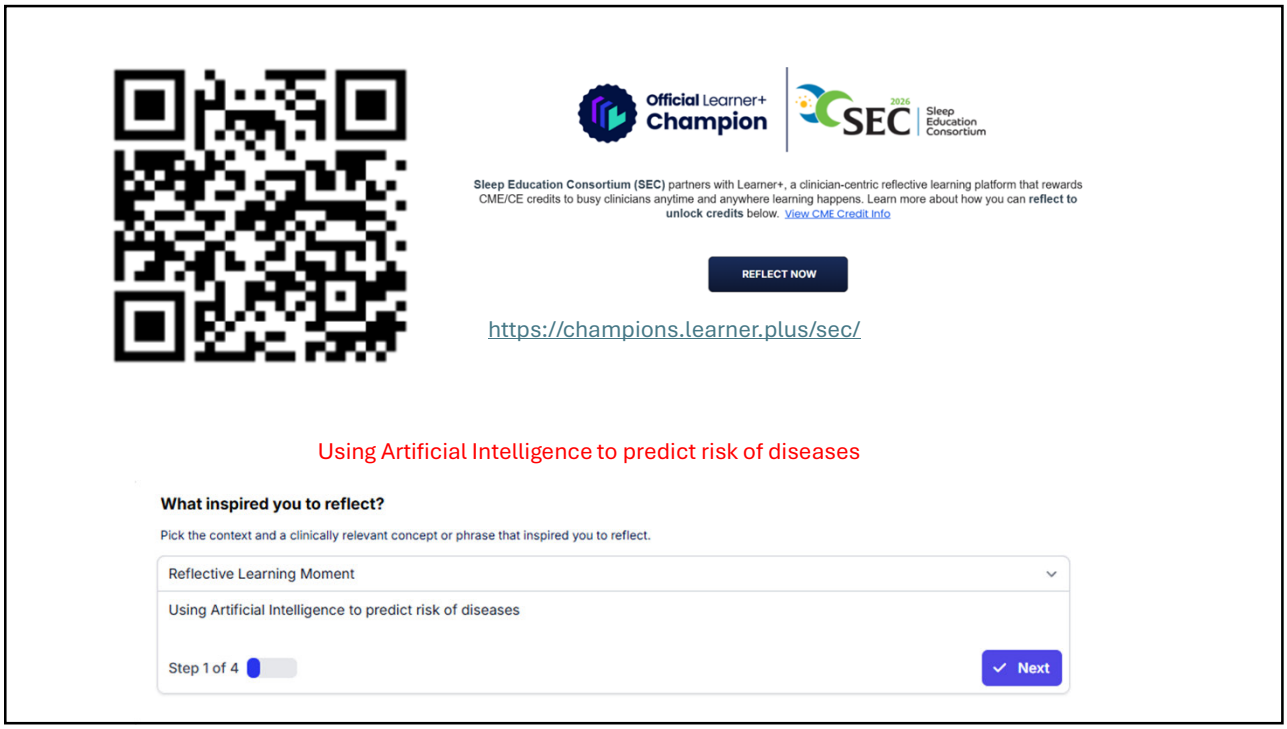
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SEC 2026 Sleep Education Consortium
Sleep Education Consortium (SEC) partners with Learner+, a clinician-centric reflective learning platform that rewards CME/CE credits to busy clinicians anytime and anywhere learning happens. Learn more about how you can reflect to unlock credits below. View CME Credit Info
REFLECT NOW
https://champions.learner.plus/sec/
Using Artificial Intelligence to predict risk of diseases
What inspired you to reflect?
Pick the context and a clinically relevant concept or phrase that inspired you to reflect.
Reflective Learning Moment
Using Artificial Intelligence to predict risk of diseases
Step 1 of 4
Next

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