

A photograph of a doctor in a white lab coat and blue shirt, sitting at a desk and typing on a white keyboard. The background is a blurred clinical setting with a plant and shelves. The text is overlaid on the left side of the image.

# Artificial Intelligence as the *Subject* of of Clinical Research:

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# Emerging Applications of AI in Geriatrics

Clinical Decision Support Model

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Natural Language Processing (NLP) & Speech Analysis

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Image & Video Processing

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Robotics

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Wearables & Signal Processing

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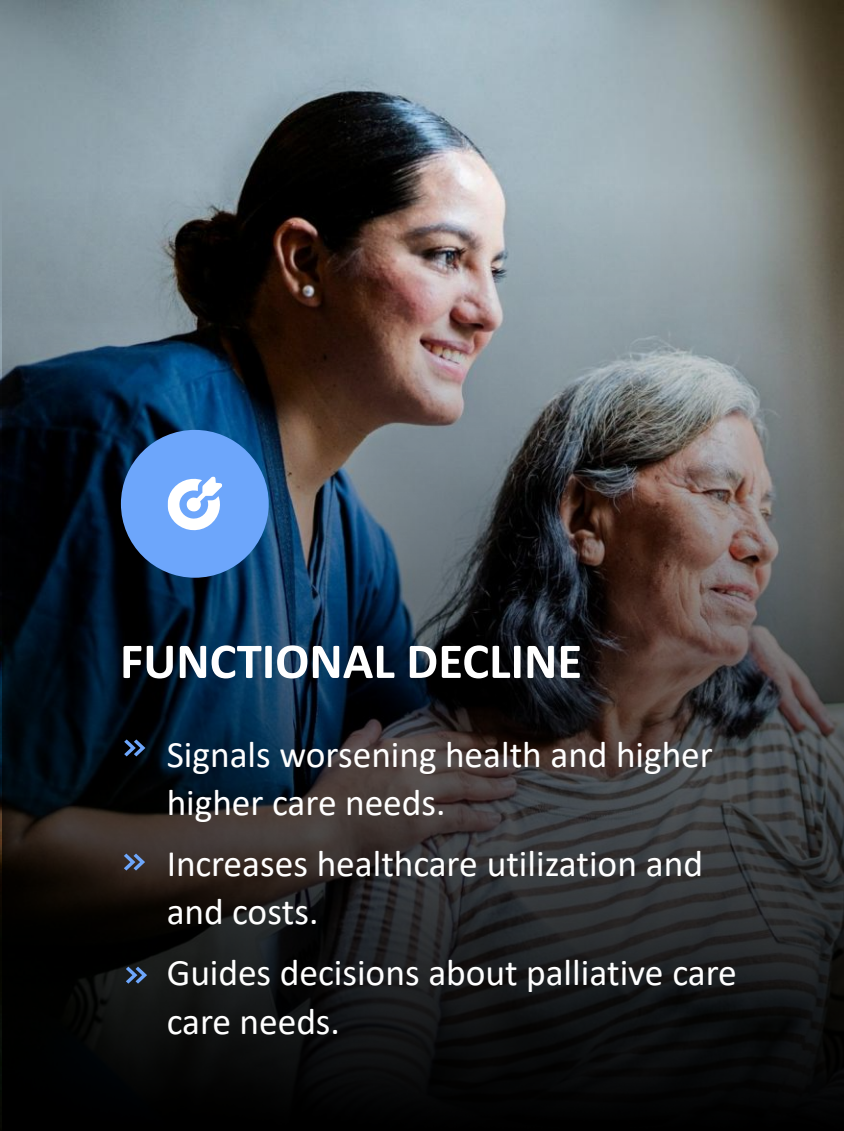


Research & Drug Development



# Use Case

# Functional Status in Older Adults



## FUNCTIONAL DECLINE

- » Signals worsening health and higher care needs.
- » Increases healthcare utilization and costs.
- » Guides decisions about palliative care needs.

## THE PROBLEM

<10%

of older adults at DUHS have functional status recorded in EHRs, despite large volumes of clinical data being available.

Can AI and machine learning (ML) help predict functional status using EHR clinical data?



## THE SOLUTION:

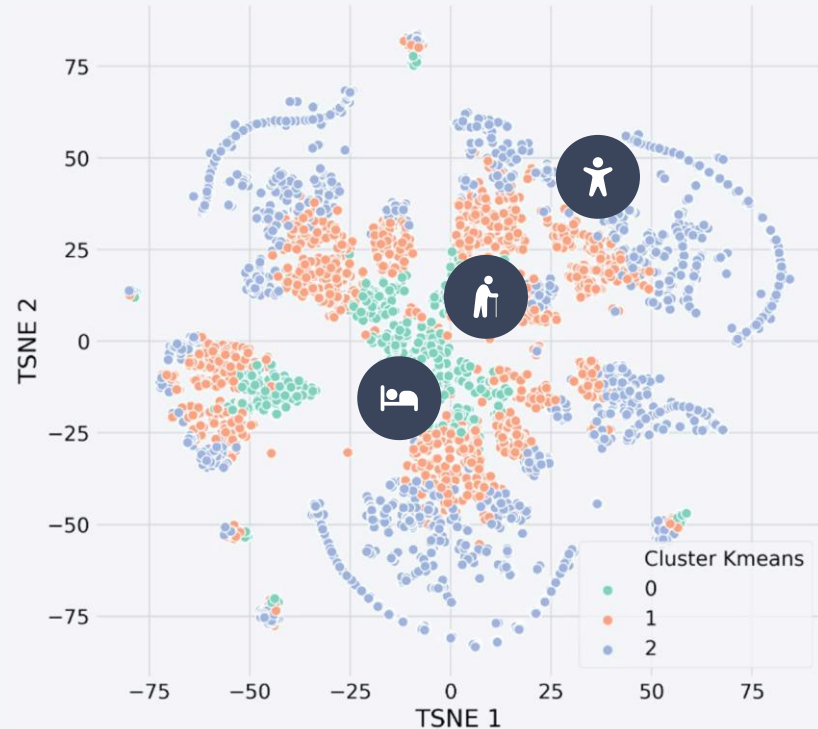
The **P**alliative **E**arly **R**ecognition of **F**unctional **O**utcomes **R**isk **M**odel (PERFORM) aims to:

- » Use EHR data and ML to identify patients with functional decline.
- » Enable early interventions to address unmet needs and improve outcomes.

N=6451

# Clustering OARS Functional Status

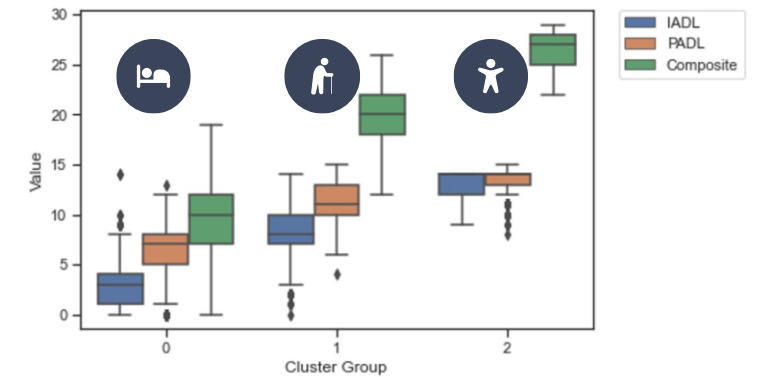
## Unsupervised Machine Learning



Who answered these questions today?

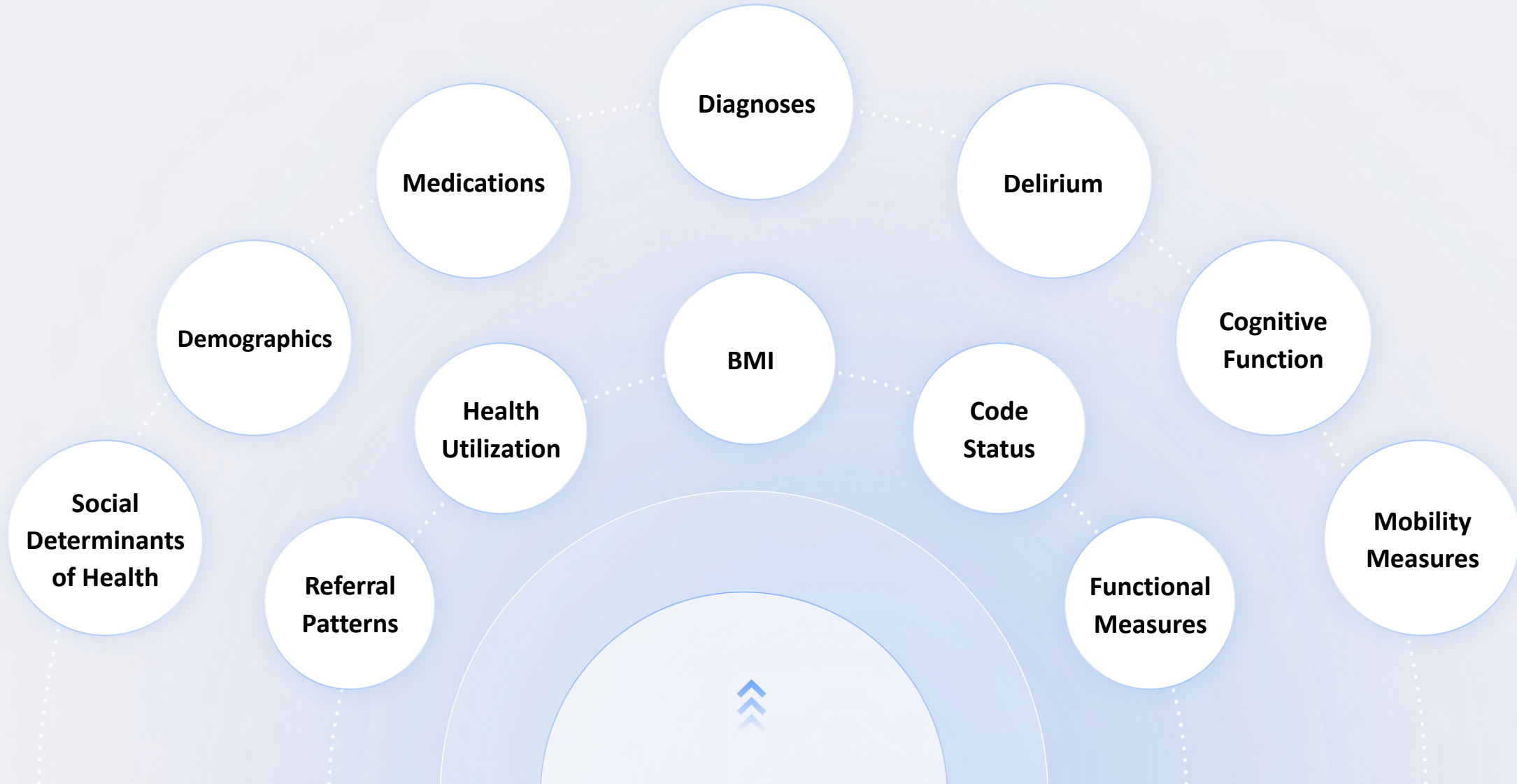
Who is completing this questionnaire?	Patient
<b>Questions about Physical Activities of Daily Living</b>	
Can you eat?	2
Can you dress and undress yourself?	1
Can you take care of your own appearance, for	1
Can you walk?	1
Can you get in and out of bed?	1
Can you take a bath or shower?	1
Do you ever have trouble getting to the bathroom	1
If you have trouble getting to the bathroom on time,	0
<b>OARS PADL Score</b>	<b>8</b>
<b>Questions about Instrumental Activities of Daily Living</b>	
Can you use the telephone?	2
Can you get to places out of walking distance?	1
Assuming you have transportation to the store,	1
Can you prepare your own meals?	1
Can you do your housework?	0
Can you take your own medicine?	0
Can you handle your own money?	0
<b>OARS IADL Score</b>	<b>5</b>
<b>Scoring</b>	
<b>OARS Composite Score</b>	<b>13</b>

## CLUSTER GROUPS BY OARS FUNCTIONAL SCORES

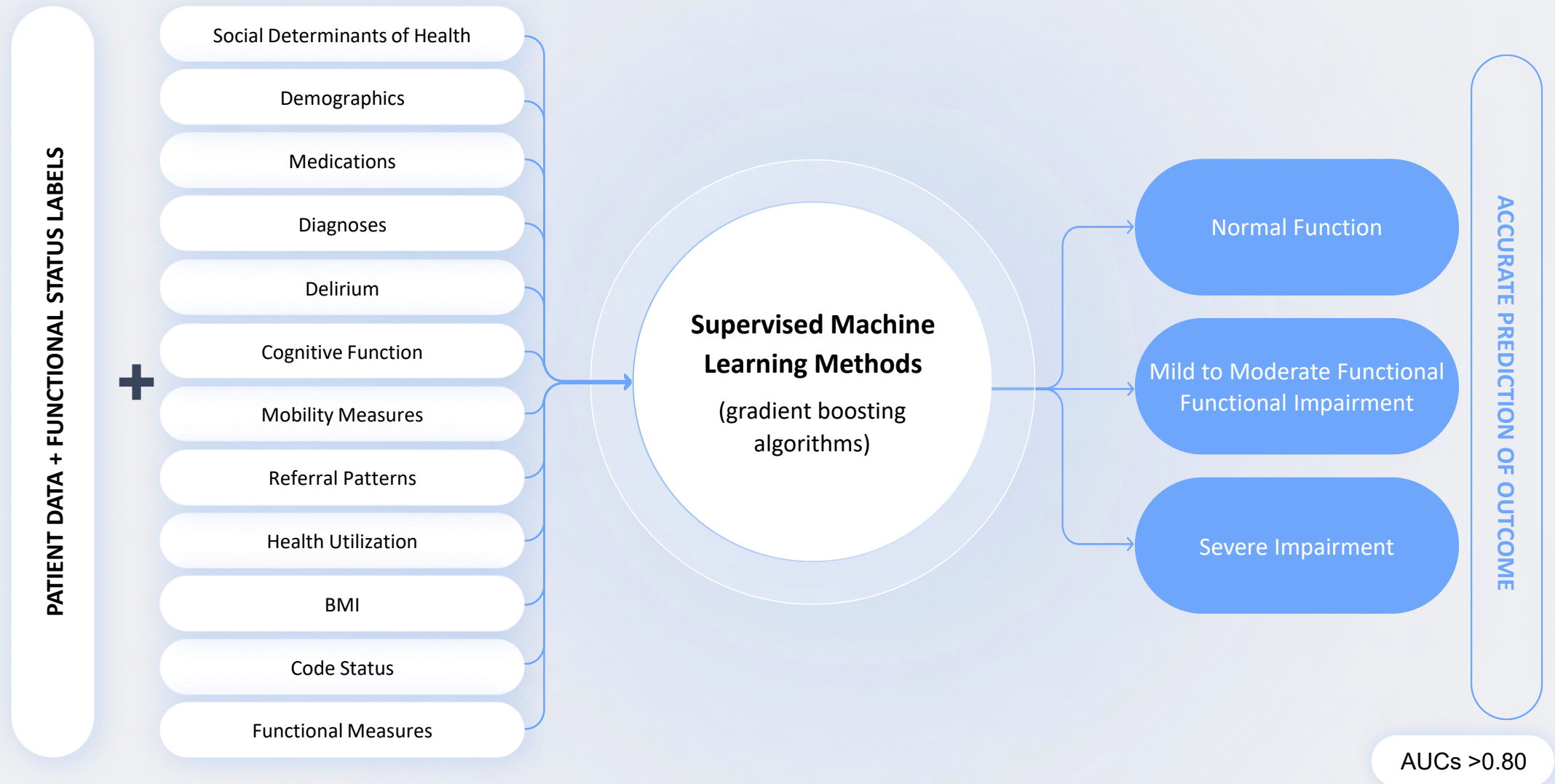


CLUSTER	# PATIENTS	AGE MEDIAN	FEMALE	1 YEAR MORTALITY
0	850	80	62%	(24%)
1	1989	75	68%	(16%)
2	3612	71	57%	(5%)

# Patterns of Clinical Markers from EHR



# Outcome Prediction Models



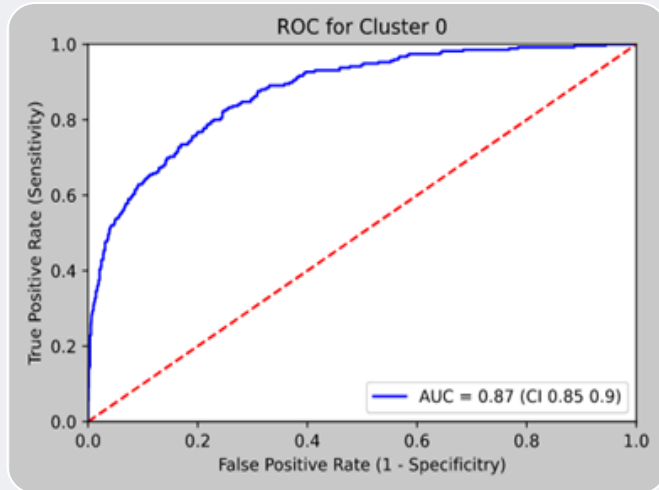
3 SEPARATE MODELS ARE TRAINED AND TESTED FOR EACH FUNCTIONAL STATUS OUTCOME

N=6451

# EHR Clinical Markers Predicting Self-Report Functional Status

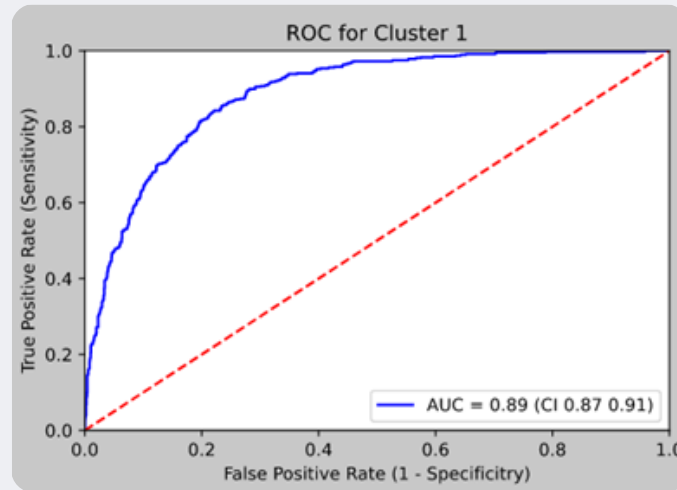
Who answered these questions today?	Patient
Who is completing this questionnaire?	
Questions about Physical Activities of Daily Living	
Can you eat?	1, 2
Can you dress and undress yourself?	1
Can you take care of your own appearance, for example, combing your hair, brushing your teeth, or washing your face?	1
Can you walk?	1
Can you get in and out of bed?	1
Can you take a bath or shower?	1
Do you ever have trouble getting to the bathroom?	1
If you have trouble getting to the bathroom on time, how often?	0
OARS PADL Score	8
Questions about Instrumental Activities of Daily Living	
Can you use the telephone?	2
Can you get to places out of walking distance?	1
Assuming you have transportation to the store, can you get to the store?	1
Can you prepare your own meals?	1
Can you do your housework?	0
Can you take your own medicines?	0
Can you handle your own money?	0
OARS IADL Score	5
Scoring	
OARS Composite Score	13

### Severe Impairment



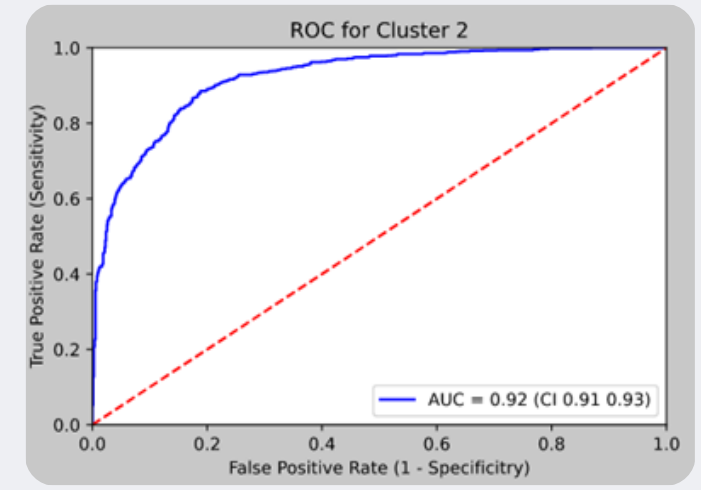
AUC 0.87

### Mild to Moderate Impairment



AUC 0.89

### Normal Function

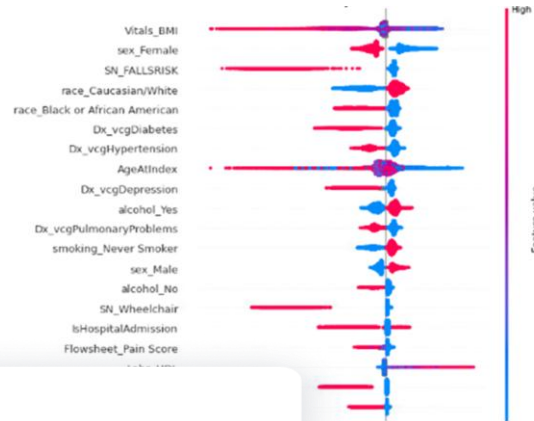


AUC 0.92

# Patterns of EHR Clinical Markers



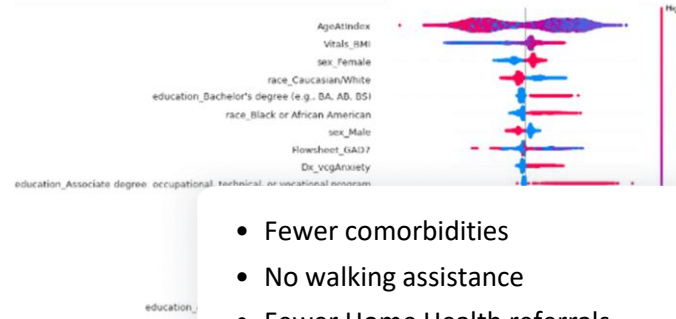
## FEATURES (SHAP) Severe Impairment



- Dementia/Cog Imp
- Hospitalizations
- Mobility Impairment
- Home Health Users
- ADL impairments



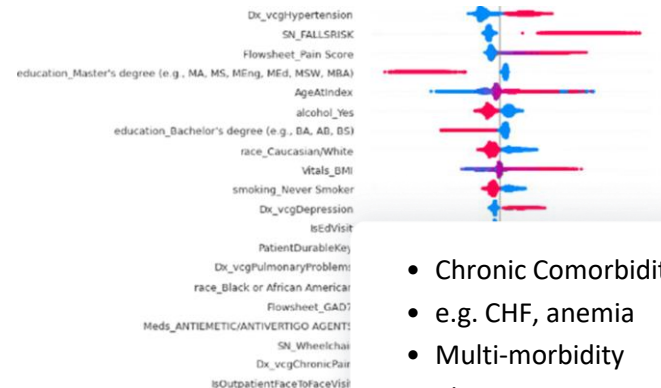
## FEATURES (SHAP) Normal Function



- Fewer comorbidities
- No walking assistance
- Fewer Home Health referrals



## FEATURES (SHAP) Mild/Moderate Impairment



- Chronic Comorbidities
- e.g. CHF, anemia
- Multi-morbidity
- Chronic pain



## SHAP values

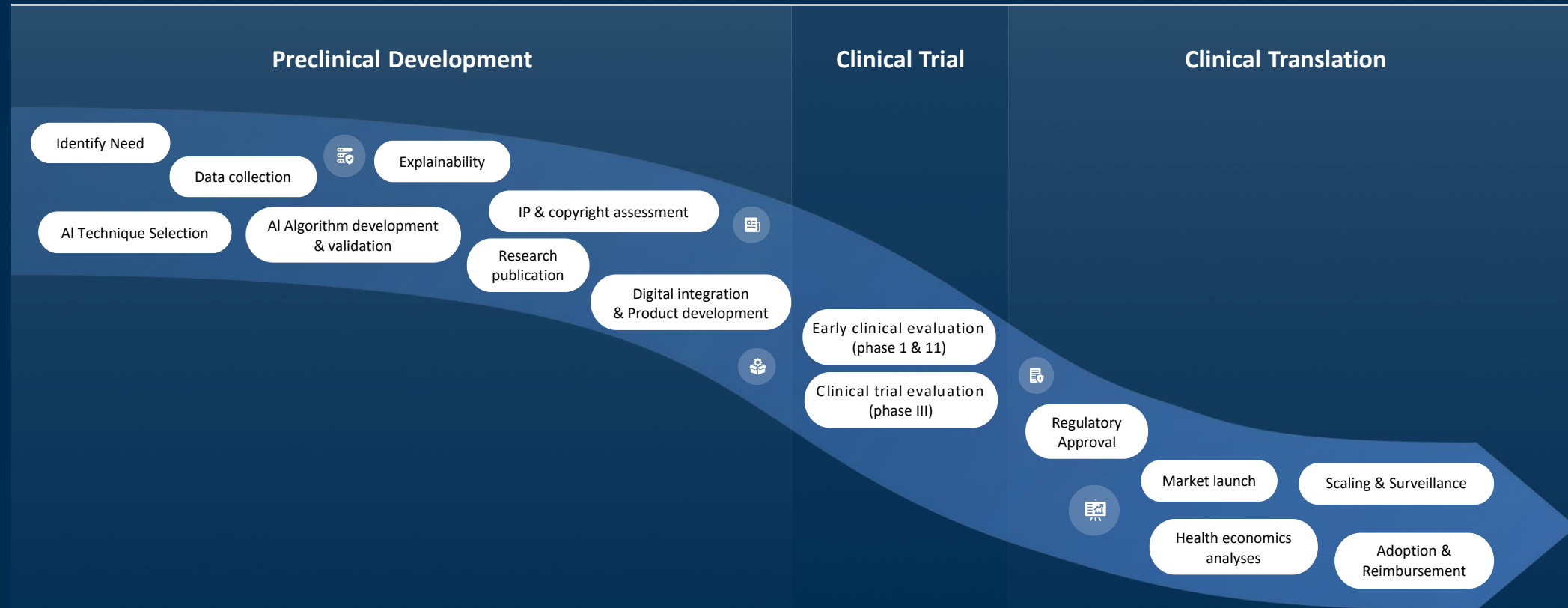
quantify the contribution contribution that each feature brings to the prediction made by the the model

# Translational Pathway: AI-Driven Solutions for Clinical Medicine

AI developmental lifecycle which transitions technology from algorithm development to bedside use, and takes over and takes over five years from concept to implementation.

## RESEARCH & DEVELOPMENT

## CLINICAL IMPLEMENTATION



# Ambient AI



Ambient AI are tools that use **generative generative AI to transcribe medical encounters** between a clinician and patient into medical notes.



These tools **capture conversations between patients and clinicians, organize the information, and integrate** it into electronic health records (EHRs).

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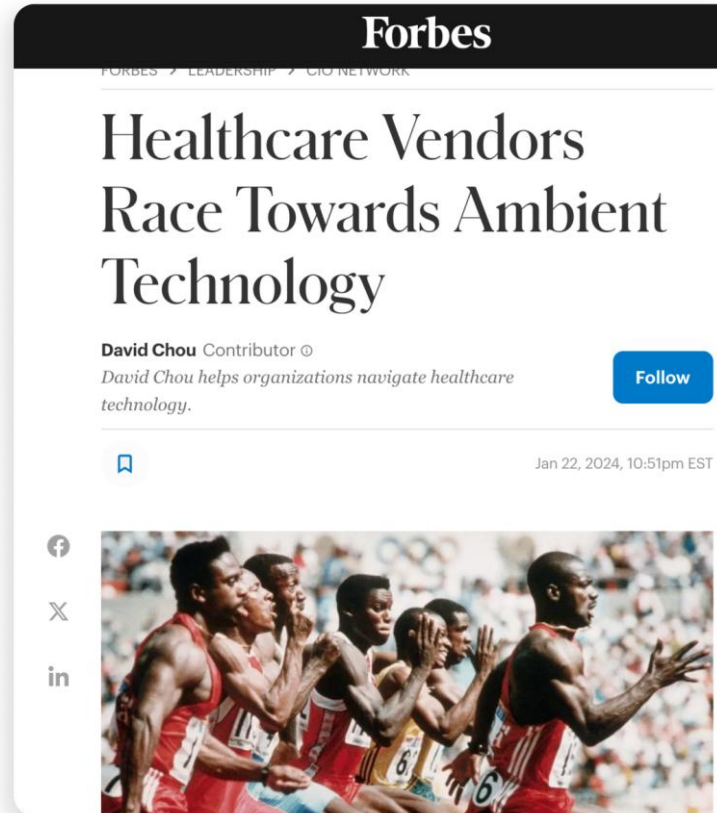
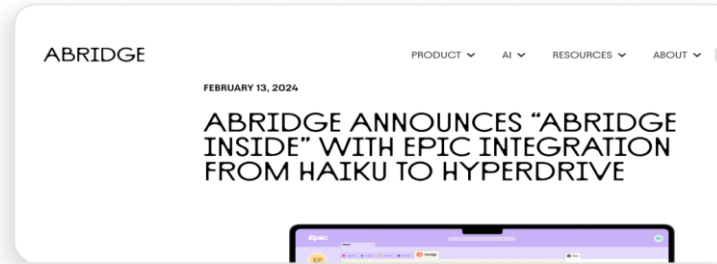
## **FUTURE FEATURES INCLUDE:**

- Suggesting LOS and CPT codes
- Pending orders
- Updating diagnoses
- Preparing prior authorizations

Through a preliminary survey, about **96%** of physicians reported that the technology was use, and **78%** reported that it expedited clinical clinical note taking. About two-thirds reported that reported that it saved time.

"That's the win here," said Gary Fritz, chief of applications at Stanford Health Care. "An hour hour saved, for instance, can help rebalance a a provider's too-often overburdened day and and cognitive load."

## Ambient AI Technology in Clinical Care







## Ambient Listening Helps Primary Care Doctors Finish Notes Faster

### ABSTRACT

University of Michigan Health - West introduced ambient listening technology to draft physicians' notes, better capturing each person's story, improving the exam room experience, and saving physicians an average of 10 minutes per day.

### How They Did It

-  Integrated Nuance DAX with Epic to draft notes from visit audio recordings
-  Trained physicians on how to let the system learn from their edits to improve over time
-  Communicated with patients about the change and measured improvements in patient experience scores
-  Used Epic Signal to measure improvements in physician efficiency



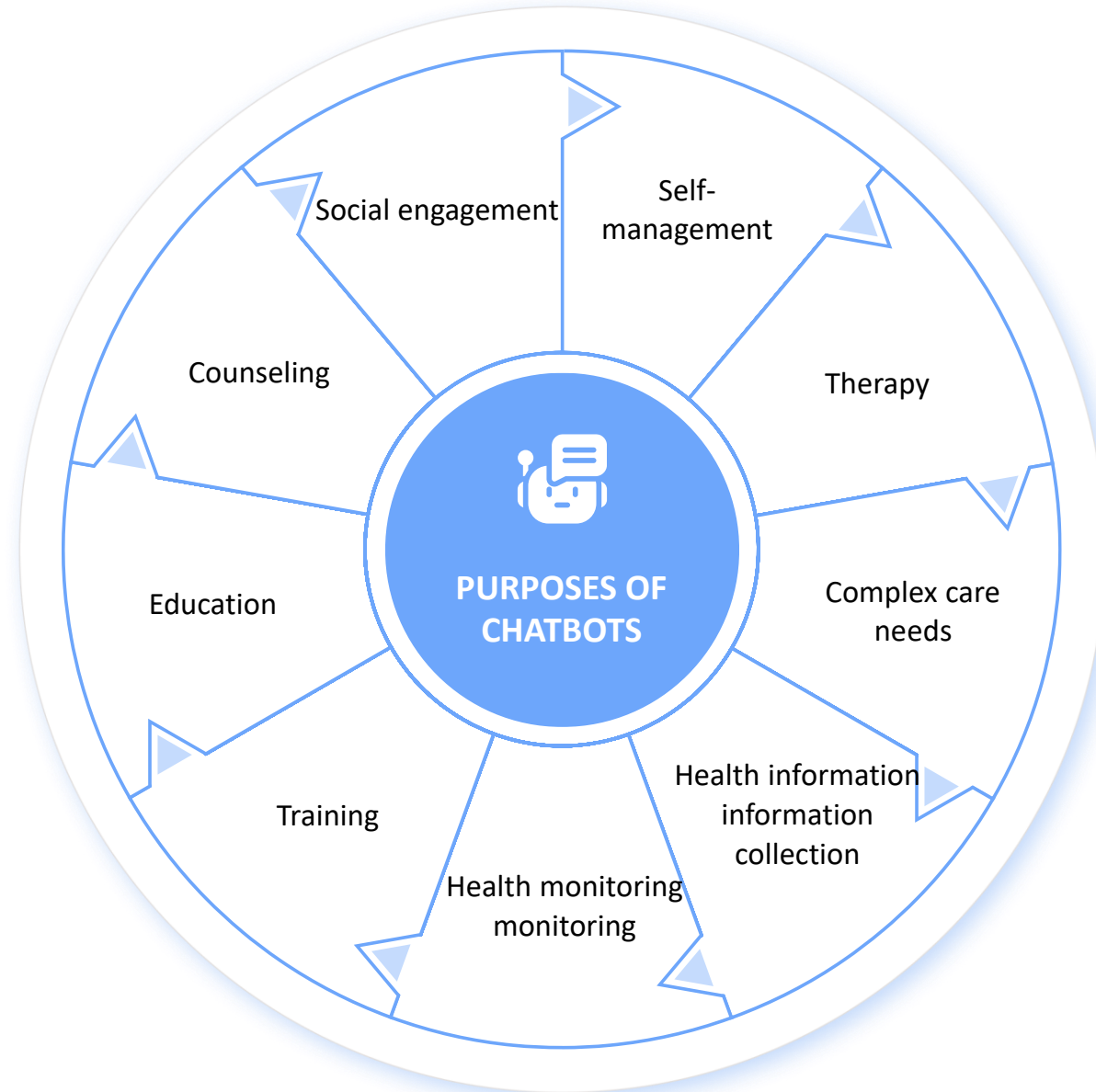
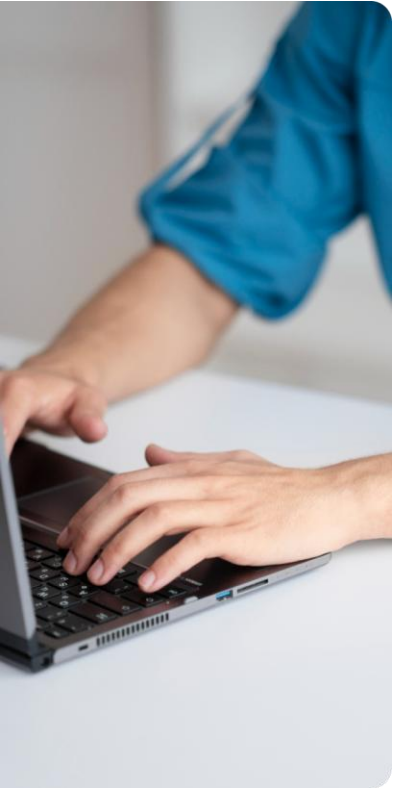
Menu

Stanford Medicine / News Center / AI helps with clinical notes

## Ambient artificial intelligence technology to assist Stanford Medicine clinicians with taking notes

Stanford Medicine integrates AI-powered listening technology that takes notes for health care providers, allowing them to spend more time with patients and less time on administrative tasks.

# Potential of Generative AI Chatbots in Geriatrics



# Evaluating Generative AI for Deprescribing: Accuracy, Safety, and Clinical Utility

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 **Duke University**  
School of Medicine



# **FAME: DEPRESCRIBING Electronic Case Review for Older Adults at Risk for Falls**

VA Patient Safety Center of Inquiry  
VA Deprescribing Collaborative

# FAME Program Methods



**Identify High Risk Patients**  
DVAHCS veterans  $\geq 65$  yo  
Positive fall screening health factor  
Prescription for  $\geq 1$  target fall-related medication



**Complete electronic case review**  
Deprescribing recommendation  
completed and presented to interdisciplinary team



**Alert Prescriber**  
Deprescribing recommendations sent to primary care  
and/or mental health provider



**Telephone Visit**  
Deprescribing plan reviewed with veteran and/or  
caregiver in telephone visit

## Target Med Classes:

- Alpha-adrenergic antagonists
- Anticholinergics
- Antidepressants
- Antiepileptics
- Antihyperglycemics
- Antipsychotics
- Benzodiazepines
- Diuretics
- Sedative/hypnotics

## Exclusion Criteria:

- Life expectancy  $< 6$  months
- Residing in long-term care
- Inpatient or psychiatric instability
- Target drugs medically necessary or discontinued

# Generative AI, Large Language Models

## RETROSPECTIVE

N=100 patient cases

Generative AI deprescribing recommendations

vs.

FAME deprescribing recommendations

## Safety and Harm



My patient is an 89 year old female with chronic kidney disease, hypertension, depression, back pain, and with two recent falls. She takes gabapentin 300 mg TID, citalopram 20 mg daily, and cetirizine 10 mg daily. Recent labs include a sodium of 146, eGFR of 52, and HgA1c of 7.0, and hct 38. Please recommend the best medication to deprescribe for this patient and a deprescribing regimen.



Considering the patient's age, history of falls, and chronic kidney disease (CKD) with a decreased estimated glomerular filtration rate (eGFR) of 52, it is advisable to deprescribe gabapentin, which can cause dizziness and imbalance and may contribute to the risk of falls. To deprescribe gabapentin safely, a gradual tapering regimen is recommended:

1. **Deprescribing Medication:** Gabapentin 300 mg TID
2. **Deprescribing Regimen:**
  - **Week 1:** Reduce the evening dose to 200 mg while keeping the morning and afternoon doses unchanged.
  - **Week 2:** Reduce the morning dose to 200 mg while keeping the afternoon dose at 300 mg.
  - **Week 3:** Reduce the afternoon dose to 200 mg.
  - **Week 4:** Further reduce the morning dose to 100 mg.

Regenerate

# Generative AI Platform VA GPT

## Prompt Generation

### R - Role:

Designate a specific role for the AI to act as.

### I - Instructions:

Outline the action the AI should take.

### S - Steps:

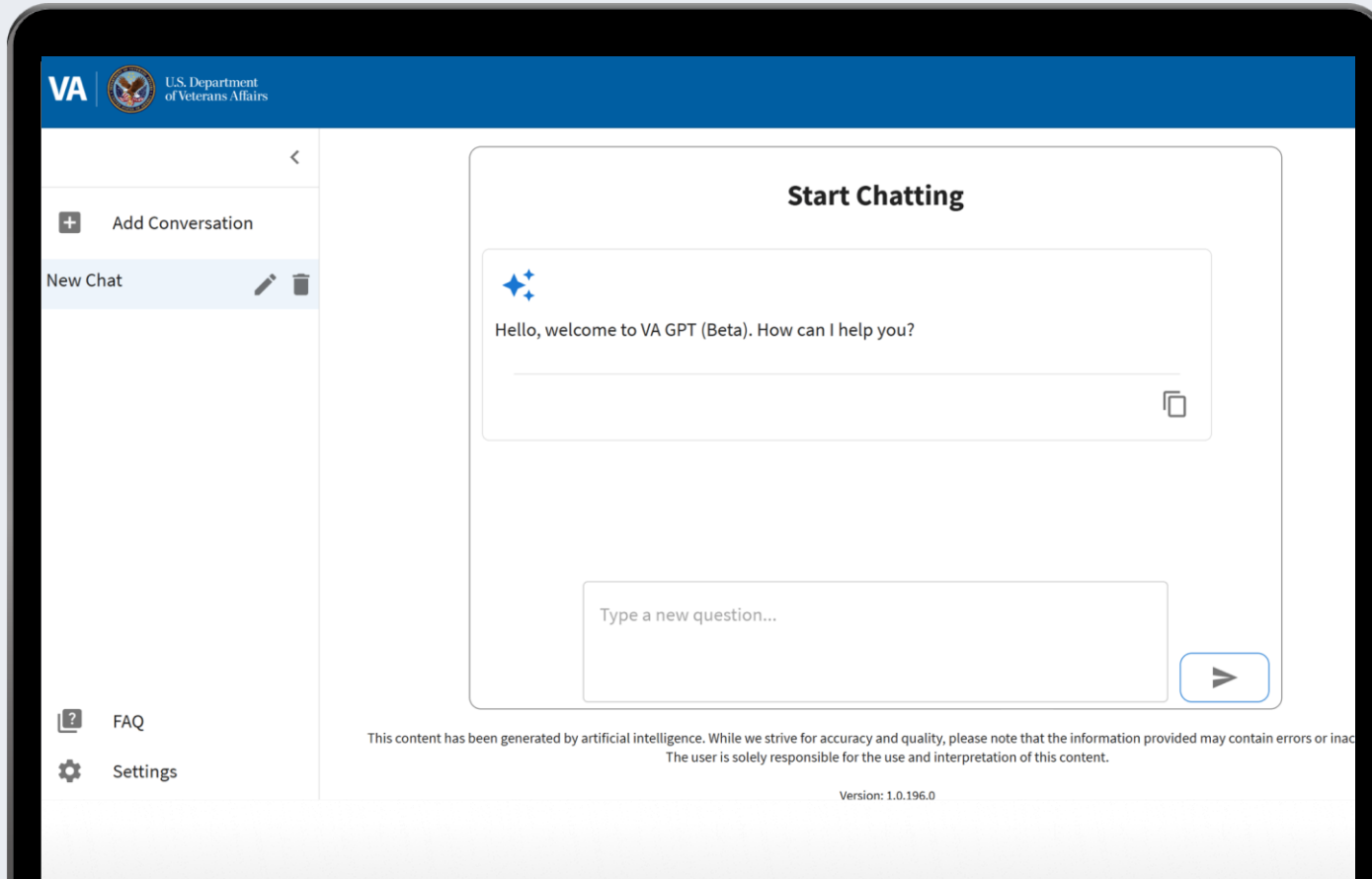
Give exact, sequential stages for the desired action.

### E - End goal:

Detail the desired objective or outcome of the task.

### N - Narrowing:

Provide constraints or specific requirements (e.g., length, tone).



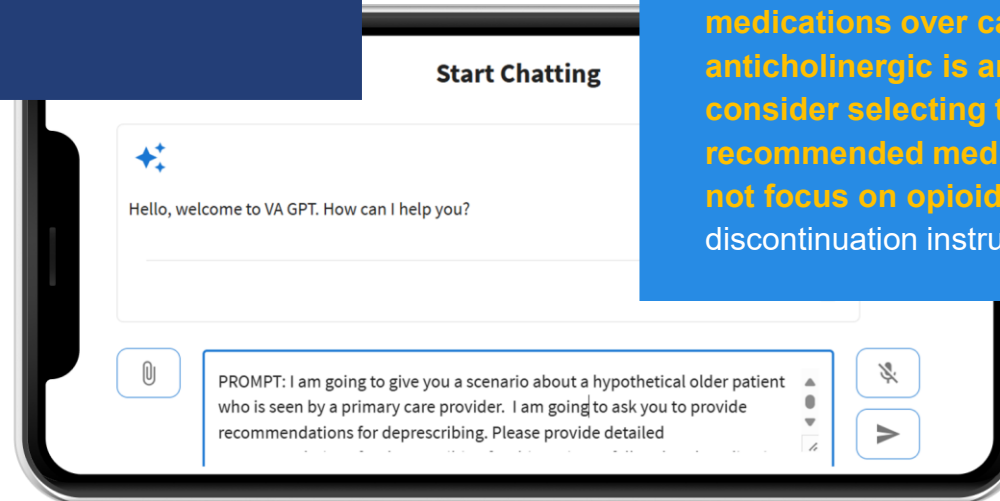
# Prompt Refinement

## Original Prompt

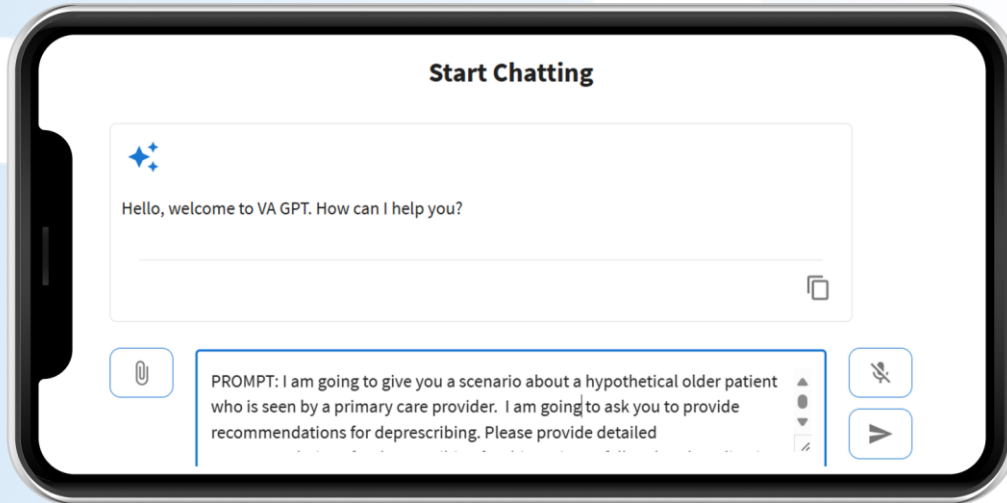
I am going to give you a scenario about a hypothetical older patient who is seen by a primary care provider. I am going to ask you to provide recommendations for deprescribing. Please provide detailed recommendations for deprescribing for this patient's falls-related medications. Please select top 3 medications to deprescribe. Please give tapering or discontinuation instructions if applicable.

## Revised Prompt

I am going to give you a scenario about a hypothetical older patient who is seen by a primary care provider. I am going to ask you to provide recommendations for deprescribing. Please provide detailed recommendations for deprescribing for this patient's falls-related medications. Please select top 3 medications to deprescribe. **Please focus on CNS acting medications over cardiovascular medications. If an anticholinergic is among the listed medications, consider selecting this medication as one of the three recommended medications for deprescribing. Please do not focus on opioid medications.** Please give tapering or discontinuation instructions if applicable.



# VA GPT Output



Given the provided list of active medications and considering the patient's fall risk factors, as well as central nervous system (CNS) effects and anticholinergic properties, here are the top three medications recommended for deprescribing:

1. Diazepam 5 mg (for anxiety)

**Rationale:** Diazepam is a benzodiazepine with significant sedative and muscle relaxant properties, which can increase the risk of falls, especially in older adults. It also has a long half-life, increasing the risk of accumulation and prolonged CNS effects. **Deprescribing Plan:**

Gradually taper the dose to minimize withdrawal symptoms, including rebound anxiety, insomnia, and agitation.

Week 1: Reduce to 2.5 mg three times a day.

Week 2: Reduce to 2.5 mg twice a day.



Monitor for return of urinary symptoms or other side effects. Consider non-pharmacological interventions for managing urinary symptoms.

Additional Recommendations:

**Comprehensive Review:** A full medication review should be performed to identify other potentially problematic medications that might have been omitted.

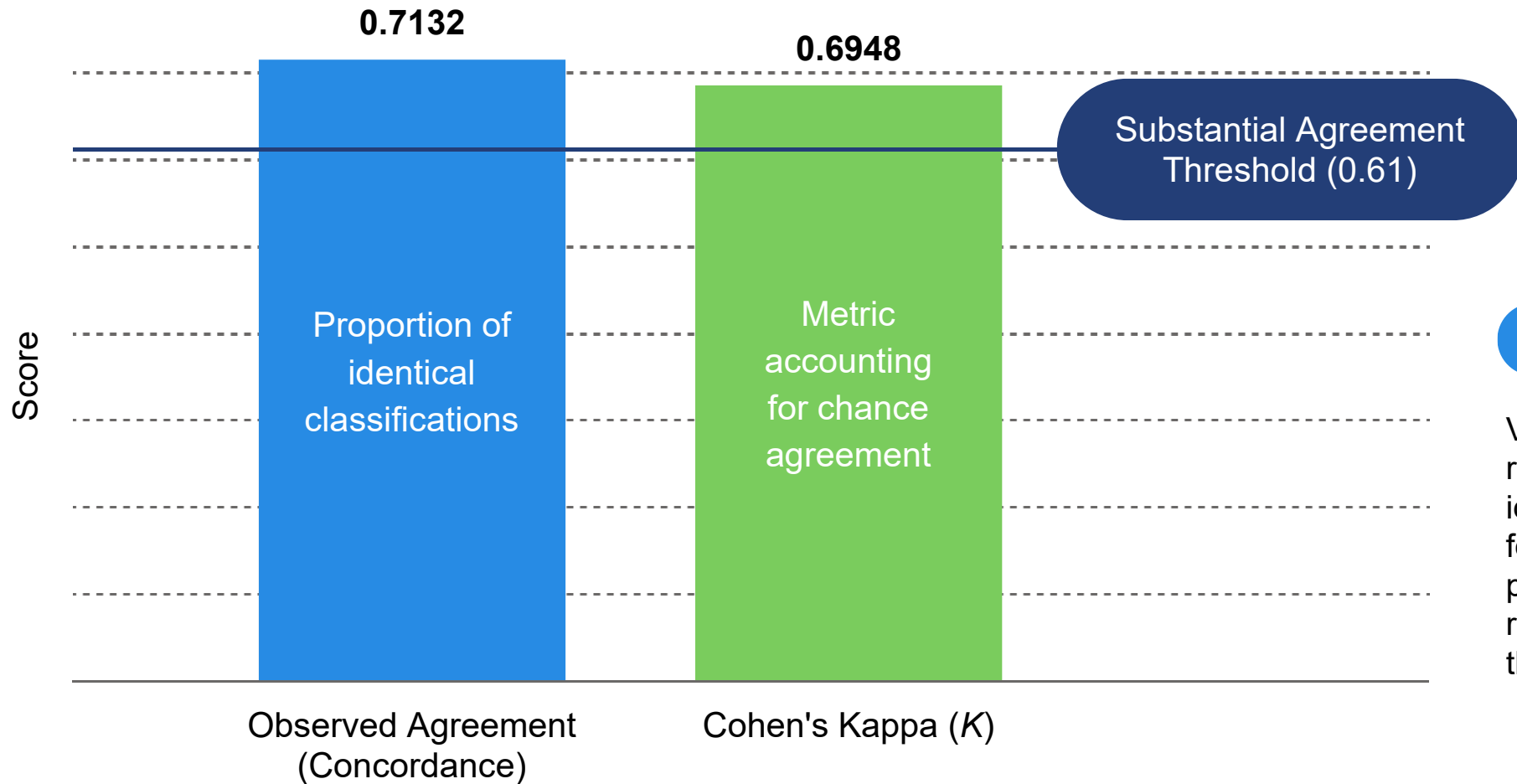
**Monitor and Consult:** Any changes to medication should be done under close supervision with frequent follow-up appointments to assess the patient's response.

**Non-Pharmacological Alternatives:** Consider non-pharmacological treatments such as physical therapy, cognitive-behavioral therapy, lifestyle modifications, or other supportive therapies as appropriate.

**Patient and Caregiver Education:** Educate the patient and caregivers about the importance of adhering to the tapering schedule and monitoring for withdrawal symptoms or new symptoms.

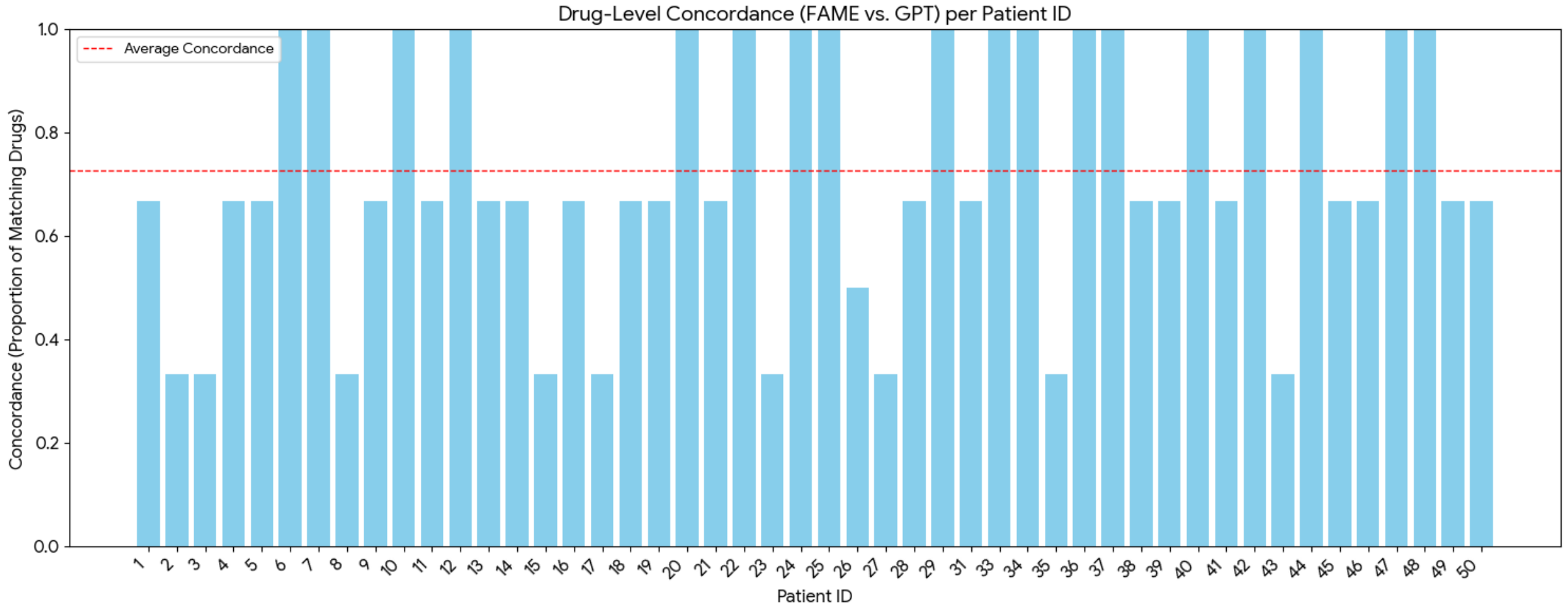


# Agreement and Concordance Statistics (FAME vs. VA GPT)

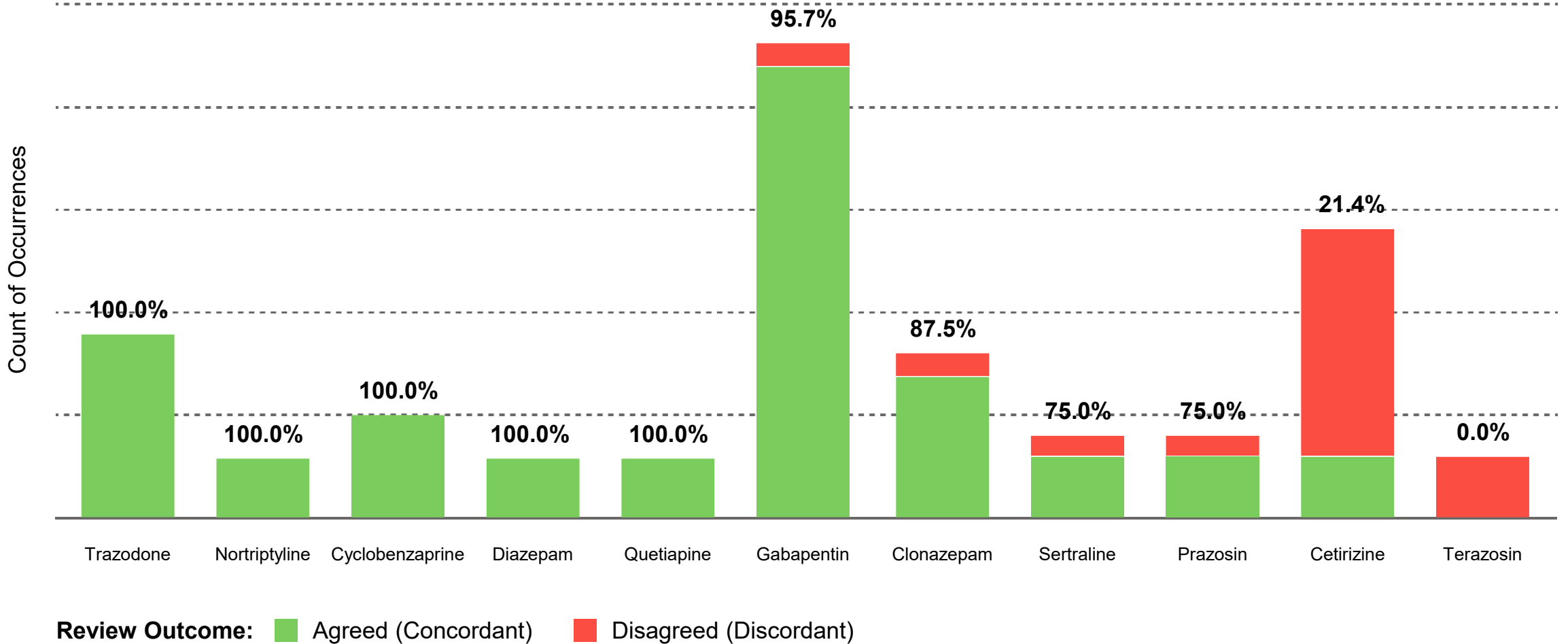


VA GPT demonstrates high reliability for individual drug identification but low fidelity for providing an entire, perfectly concordant list of recommended medications at the patient level.






# Results



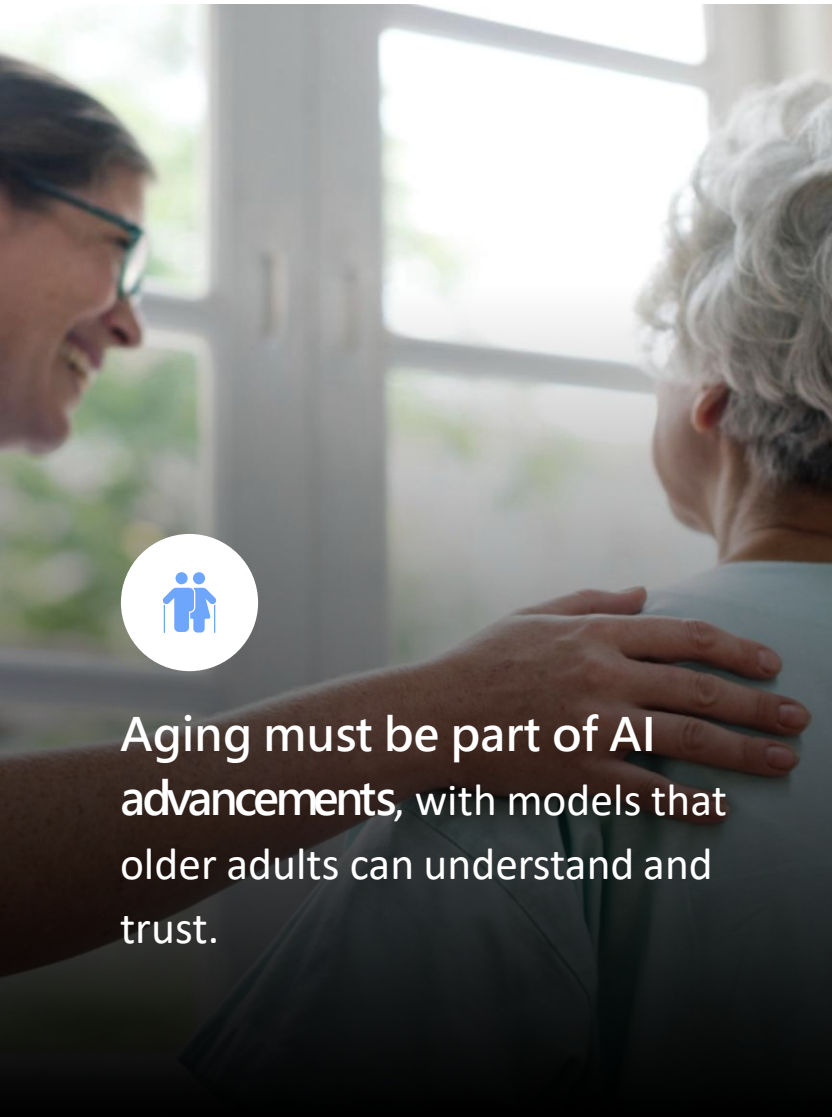
# Medication (FAME vs. VA GPT)



# Content Analysis of VA GPT Output

HELM CRITERION	AI CORE FINDING	SAFE INTEGRATION TAKEAWAY
 <b>Accuracy</b>	Consistently and correctly prioritized <b>high-risk CNS and anticholinergic medications</b> for falls	Excellent for <b>initial risk screening and prioritization</b>
 <b>Uncertainty</b>	<b>Mandatory cautions</b> for gradual tapering and close monitoring for withdrawal.	Requires <b>mandatory human clinical vetting</b> before implementation (Clinical Decision Support only)
 <b>Efficiency</b>	Rapidly generates structured, multi-week <b>tapering schedules</b> and non-drug alternatives	<b>Streamlines clinical workflow</b> by providing immediate draft plans and supportive measures
 <b>Fairness/Bias</b>	Targets common, risky <b>off-label prescribing</b> (e.g., Trazodone for sleep) prevalent in geriatric care	Helps <b>reduce continuation bias</b> by flagging high-risk, chronic convenience prescribing
 <b>Patient Education</b>	Consistent inclusion of <b>non-pharmacological alternatives</b> (CBT, physical therapy, etc.) to support deprescribing	Enhances care by integrating <b>holistic, non-drug support</b> directly into the plan

# AI and Clinical Research



Aging must be part of AI advancements, with models that older adults can understand and trust.



Build AI + Aging Community



Match Ideas with Resources



Translational Pathway Algorithm to Bedside



AI tools are like frogs - some turn into princes and worth pursuing, while others are not.  
Focus on tools that work and move forward