Penn Medicine

AI in Healthcare: The Bright Side

Revolutionizing diagnostics, treatment and drug discovery

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Overview of AI in Healthcare

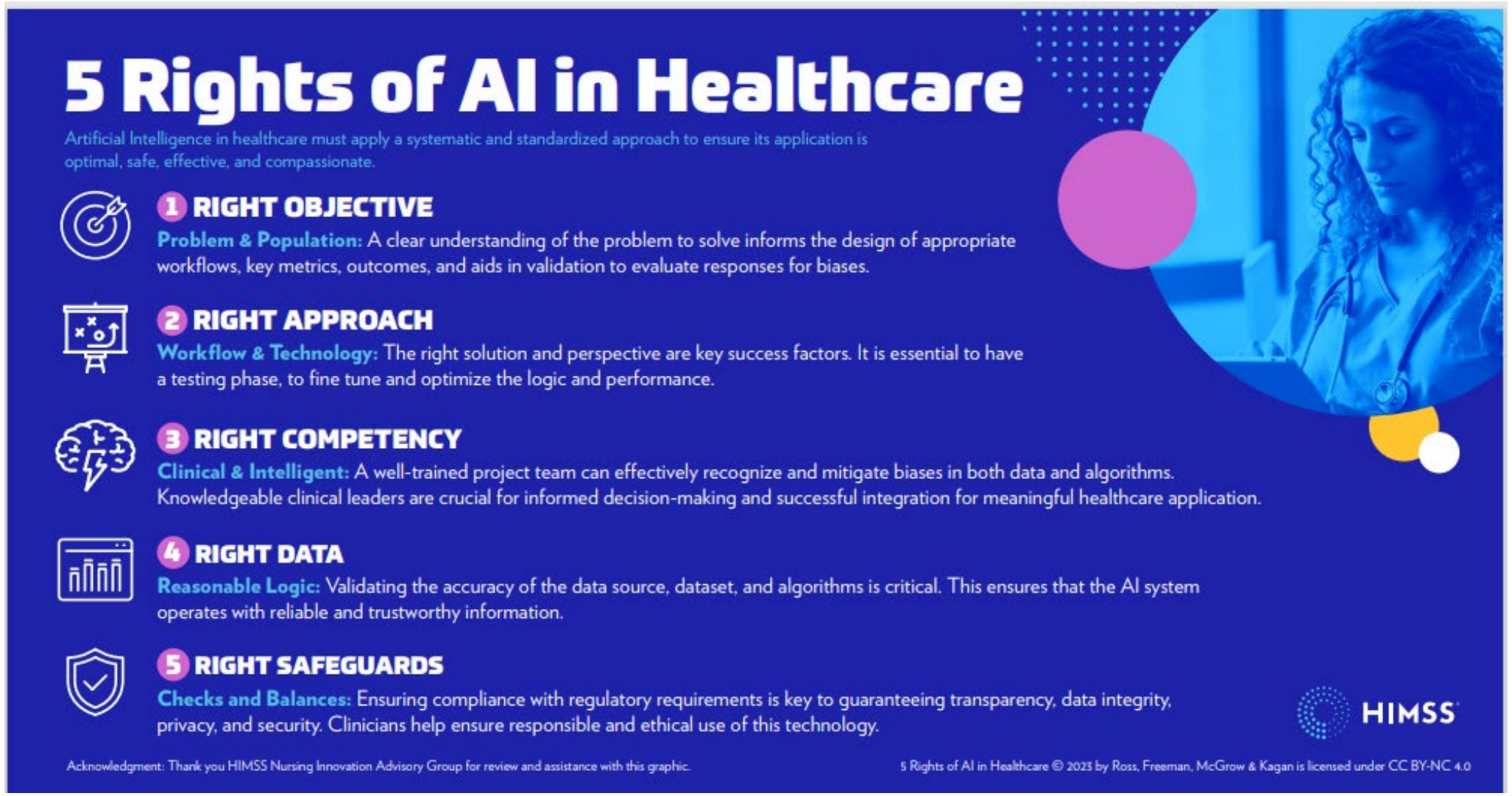
Medical Imaging/ Diagnostics	Patient Care	Drug Discovery & Development
Precision Medicine/ Health	Surgical Robotics	Patient Experience
Clinician Experience	Operational Efficiency	Decision Support
Supply Chain	Cybersecurity Surveillance	Revenue Cycle Management

Today’s focus:

AI’s role in:

- Revolutionizing Diagnostics and Treatment
- Enhancing Patient Care and Outcomes
- Improving Clinician Experience
- Transforming Personalized Medicine and Precision Healthcare
- Advancing Surgical Capabilities

How to Begin


5 Rights of AI in Healthcare
Artificial Intelligence in healthcare must apply a systematic and standardized approach to ensure its application is optimal, safe, effective, and compassionate.
1 RIGHT OBJECTIVE
Problem & Population: A clear understanding of the problem to solve informs the design of appropriate workflows, key metrics, outcomes, and aids in validation to evaluate responses for biases.
2 RIGHT APPROACH
Workflow & Technology: The right solution and perspective are key success factors. It is essential to have a testing phase, to fine tune and optimize the logic and performance.
3 RIGHT COMPETENCY
Clinical & Intelligent: A well-trained project team can effectively recognize and mitigate biases in both data and algorithms. Knowledgeable clinical leaders are crucial for informed decision-making and successful integration for meaningful healthcare application.
4 RIGHT DATA
Reasonable Logic: Validating the accuracy of the data source, dataset, and algorithms is critical. This ensures that the AI system operates with reliable and trustworthy information.
5 RIGHT SAFEGUARDS
Checks and Balances: Ensuring compliance with regulatory requirements is key to guaranteeing transparency, data integrity, privacy, and security. Clinicians help ensure responsible and ethical use of this technology.
HIMSS
Acknowledgment: Thank you HIMSS Nursing Innovation Advisory Group for review and assistance with this graphic.
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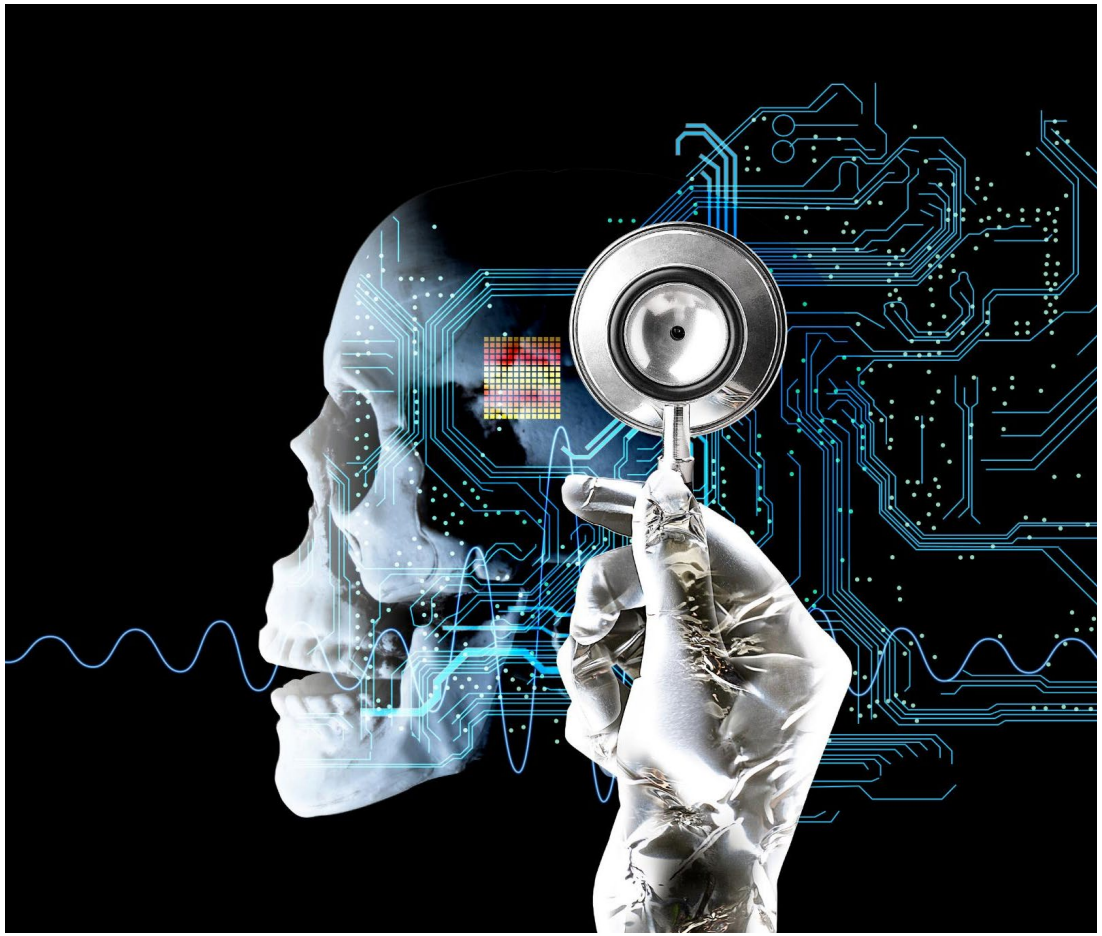
Revolutionizing Diagnostics and Treatment



AI in Medical Diagnosis

AI is transforming the way providers diagnose and treat patients, enabling faster and more accurate diagnoses and personalized treatment plans.

Medical Image Analysis

AI is helping providers analyze medical images, such as X-rays and MRIs, to identify abnormalities and diagnose diseases with greater accuracy and speed.

Clinical Imaging Artificial Intelligence

IN PRODUCTION

3D Breast Tomosynthesis

- AI for breast cancer detection in 3D mammography
- Enhances early detection & reduces false positives
- Improves reading efficiency

Body Fat Measurement

- Homegrown AI for body fat analysis from CT chest, abdomen, and pelvis imaging
- Detects conditions such as fatty liver disease
- Won the CIO Award for innovation in clinical AI when paired with the CIAI pipeline

Stroke Detection

- AI for real-time stroke diagnosis via CT/MRI
- Provides perfusion maps for neurology, which speeds up treatment
- Improves patient outcomes in acute stroke care

Thyroid Ultrasound

- AI for thyroid cancer detection in ultrasound
- Assesses malignancy risk & reduces unnecessary biopsies
- Improves diagnostic accuracy

Lung Nodule Tracking

- Auto-generates impressions & customizes reports
- Streamlines reporting workflows

Clinical Imaging Artificial Intelligence

IN THE IMPLEMENTATION STAGE

PE Detection

- AI for pulmonary embolism detection
- Speeds up diagnosis & critical care decisions

General Impressions

- Auto-generates impressions & customizes reports
- Streamlines reporting workflows

Neurology

- Neuro read assistant
- Supports faster and more accurate neuroimaging diagnoses

Orchestrator Models:

Solution for Data Streamlining

- Organizes healthcare data
- Optimizes radiology workflows

Solution for Cancer Detection

- AI for early lung cancer detection
- Improves diagnosis & decision-making

Solution for Fracture Detection

- AI for identifying fractures in X-rays
- Reduces missed fractures

Solution for Analytics

- Provides insights from radiology data
- Enhances workflow efficiency

Enhancing Patient Care and Outcomes

- Real-time monitoring of patients
- Predictive Analytics

Real-time Monitoring

Real-time monitoring of patients

- Enables real-time monitoring of patients with sensors and wearable devices collecting data and transmitting it to doctors, leading to improved patient outcomes

Tracking vital signs

- Tracks vital signs of patients, providing real-time information about their health status and enabling early intervention before health complications become serious

Early detection of complications

- Detects early warning signs of complications before they become serious, leading to improved patient outcomes and reducing healthcare costs

Predictive Analytics

Predictive Models

- Predictive analytics in healthcare by analyzing patient data to identify patterns and predict health outcomes.

Examples

- Hospital admission or ED visit risk
- Risk of falls
- Palliative Care
- Sepsis
- Risk of unplanned admissions

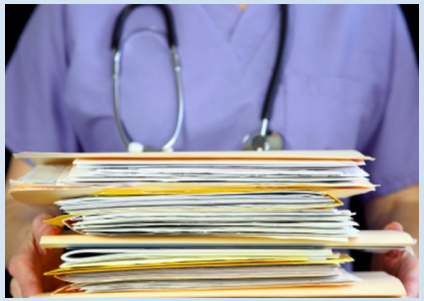
Improving Clinician Experience

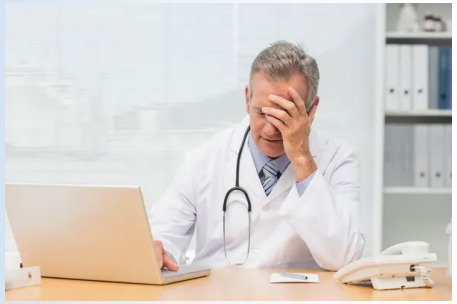
- **Ambient Digital Technology**
- **InBasket Responses**

AI Use Cases

Problem #1: Charting and documentation are burning out providers and diverting their focus during the patient encounter.

- Our providers are spending **~ 7.6 hours** on documentation weekly in pajama time (time outside scheduled hours).

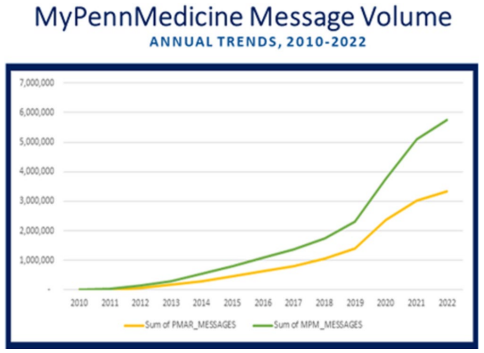




- To compensate, providers simultaneously try charting while talking with and examining their patients.

Problem #2: Continually responding to patient messages is becomingly increasingly difficult for providers to balance with other tasks and patient care.

- Penn Medicine receives **~ 6 million** in-basket messages from patients annually.



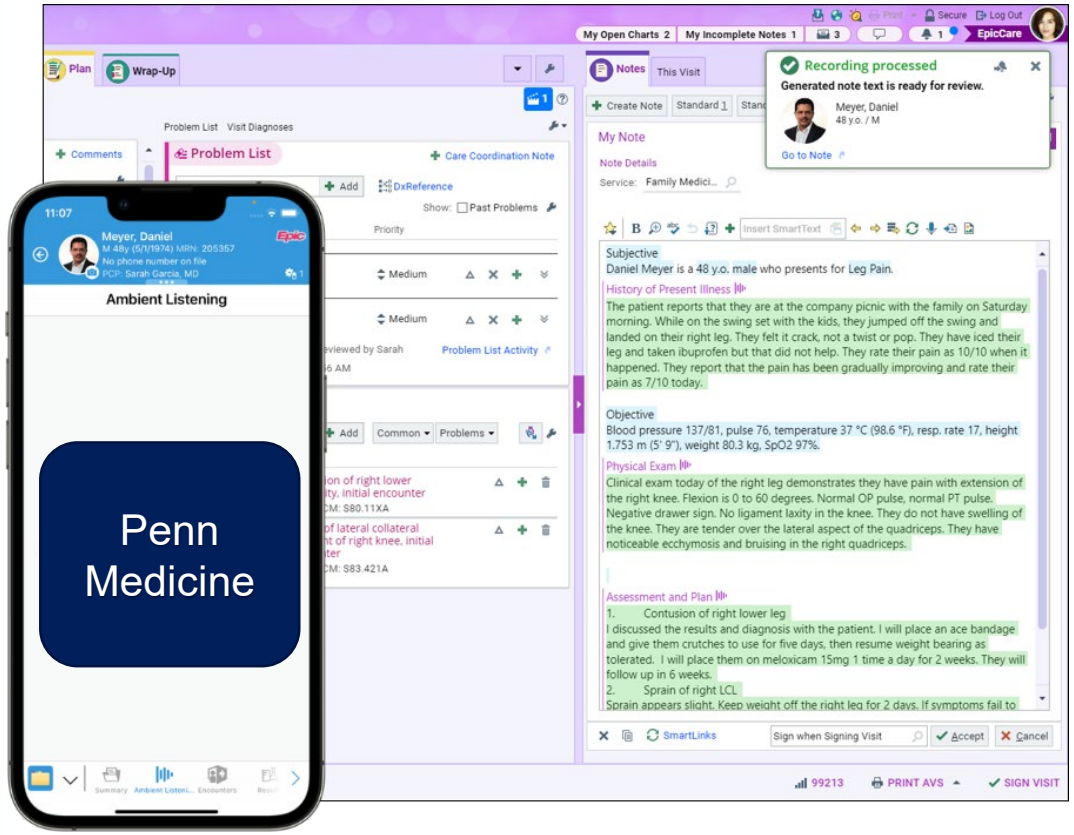
- Providers spend ~3.3 hours weekly reviewing and drafting responses while continuing to see and care for patients throughout the day.

Case Discussion – Ambient Digital Technology

Problem #1: Charting and documentation are burning out providers and diverting their focus during the patient encounter.

AI Solution: Ambient Digital Technology

- AI-powered scribe that automatically listens to, interprets, and documents the patient encounter in the exam room
- Hands-free technology allowing provider to focus fully on conversation with patients
- Wave 1- proof of concept (early adopters: not integrated)
- Wave 2- to begin early spring (integrated)



Lessons Learned:

1. Observation is a must
2. Reduced cognitive burden
3. Most helpful in documenting patient narrative; not as helpful for provider with templates
4. Future development for more chart functionality such as preparing and placing orders

Ambient Digital Technology Metrics- Wave 1 & 2

SIGNAL ANALYSIS SUMMARY

Metric	Post Impact	Statistically Significant Relationship with Solution Utilization
Time in Notes per Appt	**12% decrease** (approx. 1 min/appt)	**Yes**
Same Day Appt Closure	**5% increase**	No
Manual Keystrokes per Appt	**16% decrease** (approx. 70 characters/appt)	No
Pajama Time	No Change	Not Available

Metrics- Wave 1 and 2

PROVIDER SATISFACTION

Provider Wellness Cognitive Burden	Pre-Use	Post-Use	
Providers reporting documentation as an obstacle to achieving a better work-life balance	97.7%	20.5%	
Providers experiencing "mental overload" while interacting with patients and simultaneously keeping up with documentation	72.7%	13.6%	
Providers feeling able to manage their current patient volume	52.3%	65.9%	

Provider-Patient Engagement

75.0% ↓ Decrease in providers feeling distracted by documentation while talking with patients (pre 88.6% vs post 13.6%)

81.8% ↓ Decrease in providers reporting that documentation obstructs face-to-face conversation with patients (pre 88.6% vs post 6.8%)

Overview of New Features - Live September 2024

Transcripts-DAX Copilot now displays the transcript of the conversation.

Styling and formatting customizations- Edit and stylize your content based on many of your preferences.

Recording suggestion coach- Receive suggestions to enhance your documentation.

Referral letters- Transform clinical conversations into additional outputs such as referral letters.

After visit summaries- Transform clinical conversations into after visit summaries for patient instructions.

Summarize encounter- Receive concise summaries of clinical data on demand.

Summarize evidence- Get rich insights about diagnoses in the assessment and plan with referenced evidence from the transcript and draft note.

Feedback- How's this AI summary? Submit AI summary feedback to the vendor.

Ambient Digital Technology for Nurses

TRANSFORM NURSING

- Using AI-driven solution at the bedside to address nursing challenges
- Ambient Digital Technology has potential to streamline clinical workflows to greater efficiencies, increased nurse and patient satisfaction
- Opportunities in various settings:
  - Acute Care
  - Ambulatory
  - Home Health
  - Nurse Triage
  - Virtual Care
  - And beyond

Case Discussion – Augmented Response Technology (Art)

Problem #2: Continually responding to patient messages is becomingly increasingly difficult for providers to balance with other tasks and patient care.

AI Solution: ART with GPT models

- Automatically reads Inbasket patient messages, then generates draft response for the provider to send or edit

- **Lessons Learned:**

1. AI generated responses are more detailed and verbose.
    - Initial phase- used response 15.7% of the time
    - When prompts were used, it saved the provider 19 seconds
2. Understanding the meaning of early adopters
3. Iterative development process involves constant optimization to make AI generated messages increasingly better quality
4. Working with vendor before next phase - focus on category such as medication refills

Epic Augmented Response Technology (ART)

INBASKET MESSAGE EXAMPLE

Pioneering Feature

Generated Draft Reply

Hello Matt Mpm,

I noticed that ibuprofen is not listed in your current outpatient medication list. However, I understand that you need it for your pain management. Please call our office to discuss your prescription needs, and we can help you with the refill process.

If you have any other concerns or questions, feel free to reach out.

Thank you.

* This message was auto-generated and carefully reviewed and revised by *** to ensure accuracy."

Results

IN BASKET ART PILOT

~ 120,000

generated draft replies since Jun ’23

~ 35%

replies start with a draft *

- 25% frequently used
- 40% occasionally used
- ~ 35% rarely used

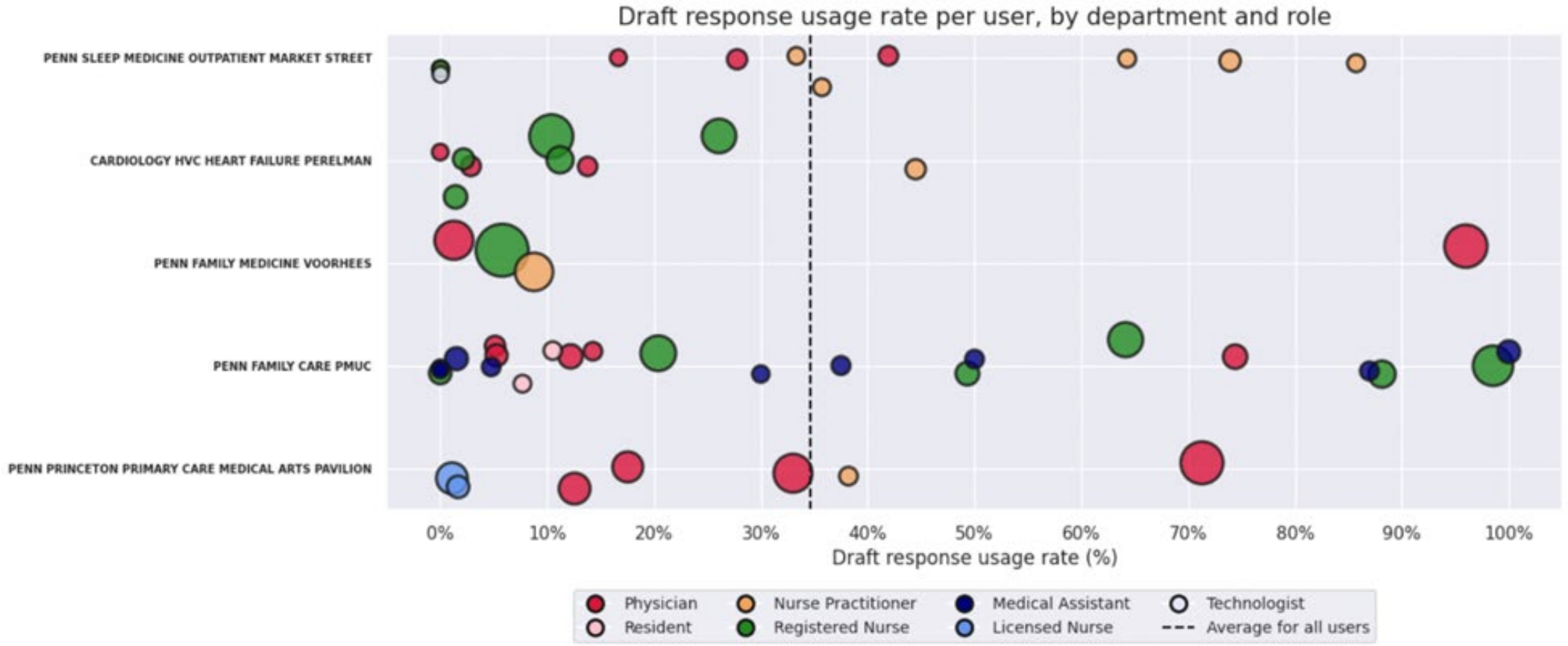
(nat’l ~ appr 7%)

95%

want to continue using, find it helpful, not burdensome, safe

Results

IN BASKET ART PILOT



Here is the usage rate per user, color-coded by role and sized by message volume. The data suggests that the ***usage rate is not solely an indicator of message quality*** but is in part dependent on individual workflows. Some users prefer starting with a draft, while others do not. Therefore, would not conclude that ~35% of messages are good enough to use based on this data.

InBasket Messages- Augmented Response Technology for Nurses

- Many health systems have implemented the augmented response technology for in-basket for clinicians
- Promising for certain workflows
- Review use by medical assistants
- Potential use case for nurses in practices.

Accelerating Drug Discovery and Development

Drug discovery

- Identifying new drug targets by analyzing vast amounts of data and uncovering new patterns and relationships that would be difficult for humans to detect

Drug efficacy and toxicity

- Predicting drug efficacy and toxicity by modeling the interaction between drugs and biological systems, enabling the identification of more effective and safer drugs

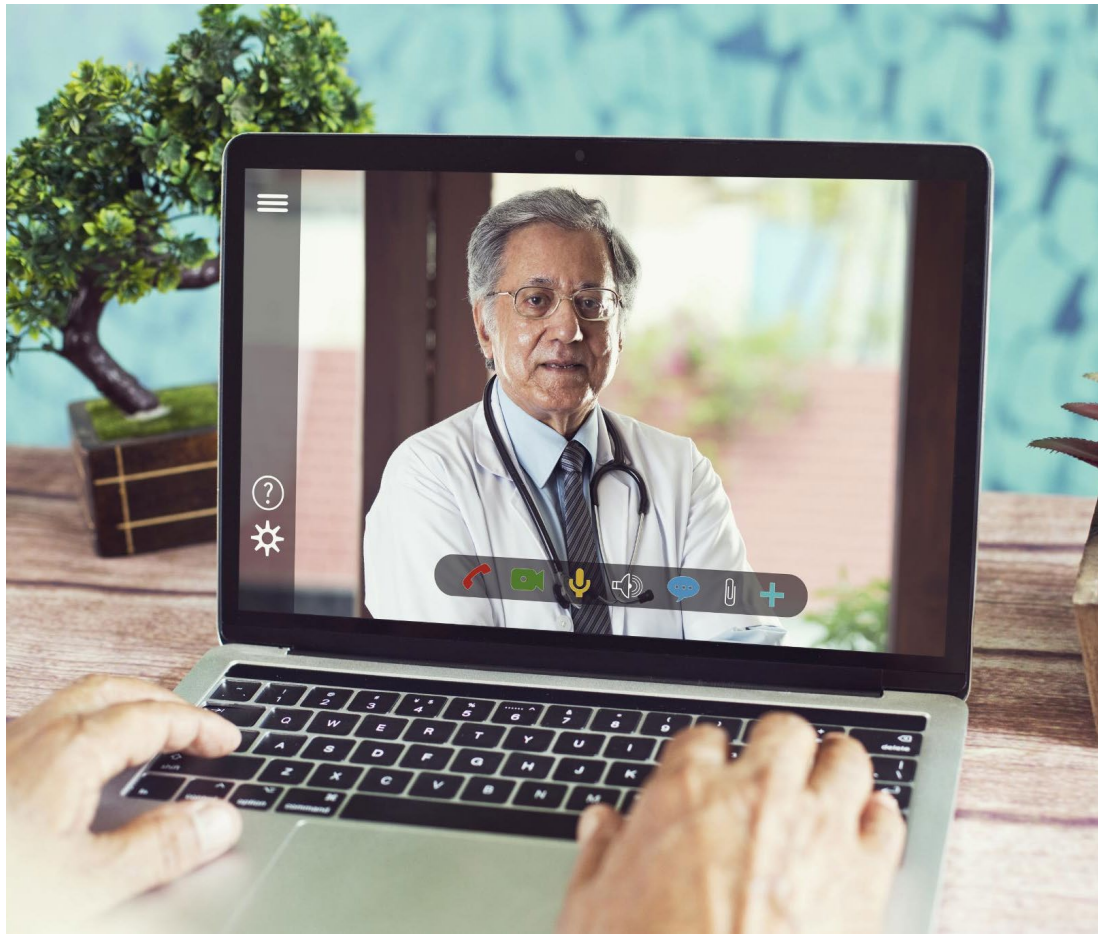
Clinical trials

- Optimizing clinical trials by identifying the most promising candidates for testing, reducing the time and resources required for drug development

Drug Target Identification

- Machine learning algorithms are enabling drug target identification by analyzing vast amounts of biological data to identify new potential targets.
- AI is speeding up the drug discovery process by enabling researchers to identify potential targets more quickly and accurately.

Transforming Personalized Medicine & Precision Healthcare



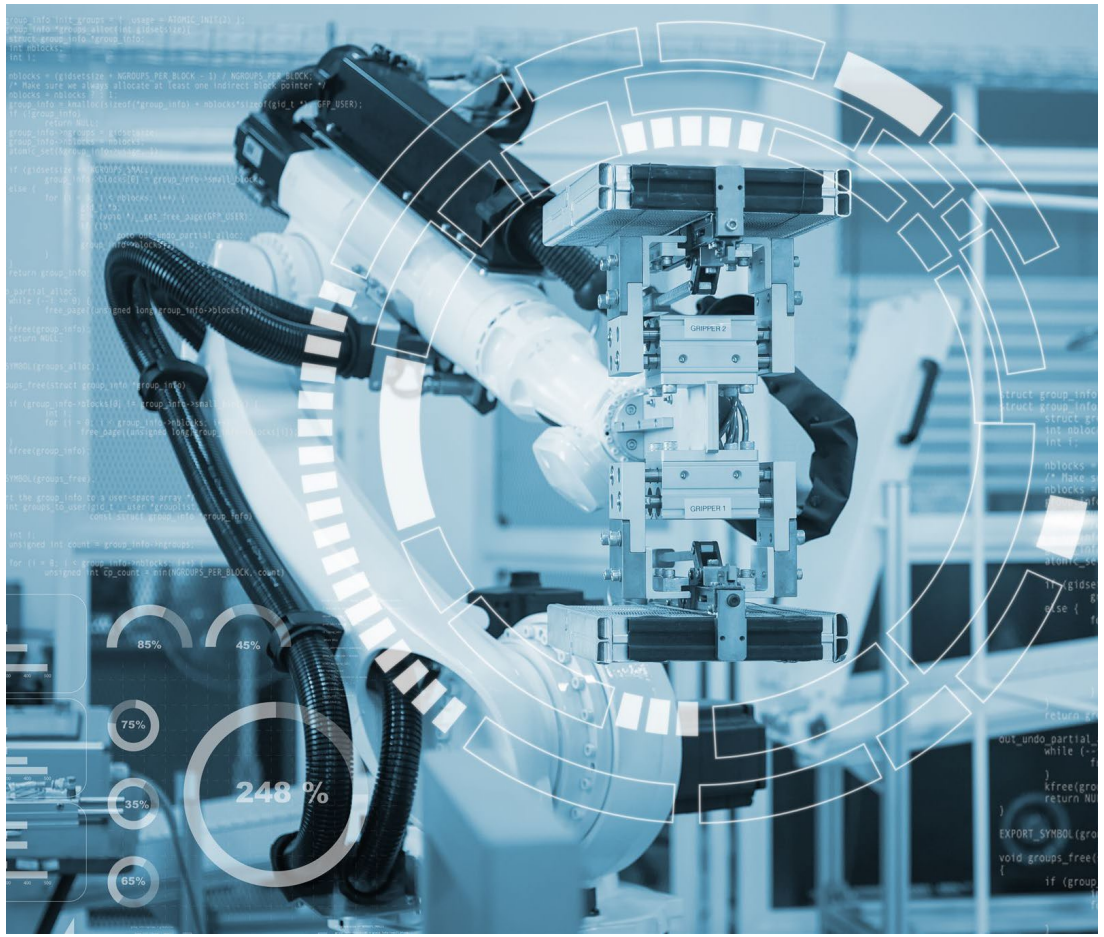
Personalized Medicine

- Revolutionizing healthcare by enabling personalized medicine and precision healthcare.
- Tailoring treatments to individual patients based on their unique genetic makeup, enabling doctors to create personalized treatment plans for patients.

Precision Healthcare

- Optimizing healthcare delivery by enabling precision healthcare.
- It uses data and advanced algorithms to predict outcomes and optimize treatments, reducing costs and improving patient outcomes.

Advancing Surgical Capabilities



AI-Powered Surgical Robotics

- Revolutionizing the field of surgical robotics, enabling surgeons to perform complex procedures with greater accuracy and precision

Guiding Surgical Robots

- Guiding surgical robots, providing real-time feedback to surgeons and improving patient outcomes

Benefits of AI in Healthcare

- Faster diagnoses
- Accelerated treatment
- Personalized care
- Better patient outcomes
- Enhanced patient experience
- Cost reduction
- Operational efficiency
- Improved clinical experience

The Bright Side of AI and Transformative Impact on Healthcare

Potential of AI in Healthcare

AI has the potential to transform healthcare by improving diagnostics, treatment methods, and patient care, leading to better health outcomes and higher patient satisfaction.

Balancing Investment and Safety

It is essential to balance time and resource investments in AI with safety and ethical standards to ensure that the technology is effective and provides value to patients.

The Right Reasons for AI

- Right Objective
- Right Approach
- Right Competency
- Right Data
- Right Safeguards

Involvement of Clinicians

Keep the Human in the Loop

The involvement of clinicians in decision-making regarding the use of AI in healthcare is critical to ensure that the technology is tailored to meet the needs of patients and healthcare professionals.

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