

Imagine the possibilities

POSTMIDYEAR

A

S

H

P

14 FEBRUARY
2024

Organiza:



Con la colaboración de:





Innovación y tecnología

Organiza:



Emilio Monte Boquet

Con la colaboración de:

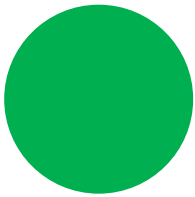


Sesiones revisadas (a algunas fui, a otras no)

- Artificial Intelligence (AI) and Machine Learning: New Horizons in the Development of Drug and Biological Products
- Putting Data to Work: Deploying Key Performance Indicators to Optimize Operations and Automation
- Implementation of Mobile Medication Tracking Technology for Controlled Substance Chain of Custody
- Innovations in Drug Information Practice and Research 2023
 - ✓ A Comparison of Drug Information Question Responses Answered by a DIC and ChatGPT
 - ✓ Accuracy and Utility of ChatGPT for Addressing Drug Information Questions in an Academic DIC
- 2023 Health Technology and Patient Safety Hazards: Are You Playing at the TOP of Your Game?
- Predictive Modeling to Advance Practice
- Protecting Our Patients During a Cyberattack: Prospective Planning for Extended Downtime
- Development and Implementation of a Drug Interaction Alert for a Multi- Site Anticoagulation Service
- Development and Implementation of a Technology-Assisted Final Product Verification (TAFPV) at a Community Teaching Hospital
- Implementation of a Medication Alert Optimization Committee at a Large Health System
- It's a Small World After All: Diversion Prevention Software Challenges
- AI and Direct-to-Consumer Genetic Testing: The Good, the Bad, and the Ugly
- Expansion of Medication Tray Check Technology Across Multiple Sites within a Health System
- Informatics Pearls 2023: Gigabytes of Informatics
- Partnering with an Innovation Center to Implement Design Thinking Across the Health System

Sesiones revisadas (a algunas fui, a otras no)

- Artificial Intelligence (AI) and Machine Learning: New Horizons in the Development of Drug and Biological Products
- Putting Data to Work: Deploying Key Performance Indicators to Optimize Operations and Automation
- Implementation of Mobile Medication Tracking Technology for Controlled Substance Chain of Custody
- Innovations in Drug Information Practice and Research 2023
 - ✓ A Comparison of Drug Information Question Responses Answered by a DIC and ChatGPT
 - ✓ Accuracy and Utility of ChatGPT for Addressing Drug Information Questions in an Academic DIC
- 2023 Health Technology and Patient Safety Hazards: Are You Playing at the TOP of Your Game?
- Predictive Modeling to Advance Practice
- Protecting Our Patients During a Cyberattack: Prospective Planning for Extended Downtime
- Development and Implementation of a Drug Interaction Alert for a Multi- Site Anticoagulation Service
- Development and Implementation of a Technology-Assisted Final Product Verification (TAFPV) at a Community Teaching Hospital
- Implementation of a Medication Alert Optimization Committee at a Large Health System
- It's a Small World After All: Diversion Prevention Software Challenges
- AI and Direct-to-Consumer Genetic Testing: The Good, the Bad, and the Ugly
- Expansion of Medication Tray Check Technology Across Multiple Sites within a Health System
- Informatics Pearls 2023: Gigabytes of Informatics
- Partnering with an Innovation Center to Implement Design Thinking Across the Health System



Educational Sessions

Innovation



Innovations in Drug Information Practice and Research 2023

📅 Sunday, December 3, 2023 ⌚ 3:30 PM – 5:00 PM 📍 Location: ACC, Room 201b, Level 2

📝 CE Credits 1.50 contact hours

Planned in cooperation with the ASHP Section of Inpatient Care Practitioners

Activity #: 0204-0000-23-220-L99-P

Activity Type: Application-based

Target Audience: Pharmacist

Learning Objectives:

- Recommend new services and methods used by drug information specialists and centers.
- Identify ways to apply new drug information services and methods in their institutions.
- Evaluate the importance of these drug information services and methods in practice environments.

ashp MIDYEAR 2023

Applying Decision Hygiene to the P&T Process

Erin Maxwell, PharmD, BCPS
Lead Clinical Pharmacist, Medication Management and Optimization
UNC Health System

imagine
THE POSSIBILITIES

» #ASHP23

ashp MIDYEAR 2023

A Comparison of Drug Information Question Responses Answered by a Drug Information Center and ChatGPT

Genevieve Lynn (Ness) Engle, PharmD, BCMAS
Samantha Triplett, PharmD
Tosin Ajayi, 2024 PharmD/MBA Candidate

imagine
THE POSSIBILITIES

» #ASHP23

ashp MIDYEAR 2023

Accuracy and Utility of ChatGPT for Addressing Drug Information Questions in an Academic Drug Information Center

Darren Hein, PharmD
Director, Center for Drug Information & Evidence-Based Practice
Associate Professor, Pharmacy Practice
School of Pharmacy and Health Professions, Creighton University

imagine
THE POSSIBILITIES

» #ASHP23

ashp MIDYEAR 2023

Improving financial review in formulary assessments and monitoring

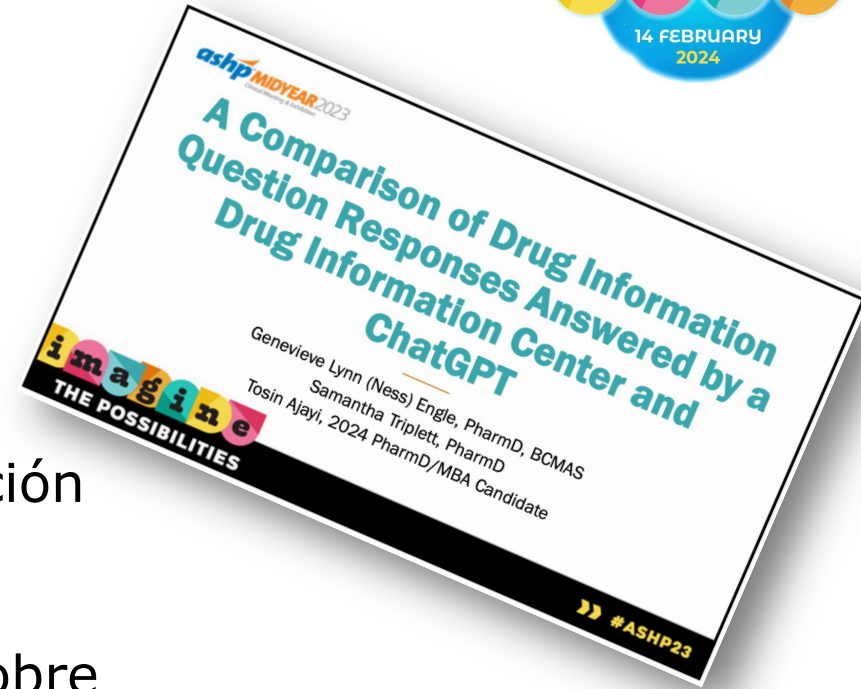
Indrani Kar, PharmD, DPLA
University Hospitals Health System
Cleveland, Ohio

imagine
THE POSSIBILITIES

» #ASHP23

Nos contaron...

- ¿Sustituirá Chat GPT al FH especializado en información de medicamentos?
- Estudio para comparar las respuestas a preguntas sobre información de medicamentos dadas por ChatGPT con las de farmacéuticos especializados en información sobre medicamentos del CIM de la Christy Houston Fundacion



Me quedo con...

Drug Information Questions Assessed

- 10 questions completed in 2022-2023

Drug/Drug Interactions	• Is there a drug interaction between tamoxifen and Benadryl® (diphenhydramine) or Unisom® (doxylamine)?
Dosage/Administration	• What is the conversion of 5 mg bisoprolol to immediate-release metoprolol (Lopressor®)?
Adverse Effect	• Can Paxlovid® cause electrolyte disturbances? • Can antihypertensive medications cause hair loss? • Are there any formulations of duloxetine that can cause less abdominal cramping?
Therapeutics	• Are there natural product alternatives for amphetamine? • Can ketamine be used for treatment-resistant depression?
Compatibility and Stability	• Are diphenhydramine hydrochloride (Benadryl®) single dose vials stable and sterile when used for multiple doses?
Availability	• Are there alternatives for eflornithine (Vaniqa®) 13.9% cream?
Pharmacology	• What are the metabolites of codeine and hydrocodone? Can hydrocodone be substituted for codeine in pediatric and lactating patients?



THE POSSIBILITIES



ChatGPT Data Collection

- 4 pharmacists participated in data collection

May 2, 2023

- 3 pharmacists created new ChatGPT accounts
- Each pharmacist submitted the same question to ChatGPT at the same time
- The pharmacists opened new chat boxes and submitted the same question again
- This process was completed for all 10 drug information questions
- Each pharmacist had 2 responses for each question
- 60 responses total were collected



May 4, 2023

- 1 additional pharmacist opened his own ChatGPT account
- The pharmacist submitted 1 question to ChatGPT
- The pharmacist opened a new chat box and submitted the same question again
- This process was completed for all 10 drug information questions
- This pharmacist had 2 responses for each question
- 20 responses total were collected
- 4 additional responses were included due to ChatGPT timing out during data collection

Analysis of Responses

Phase 1

- 1 pharmacist assessed all 84 responses for:
 - Accuracy of ChatGPT responses compared to the DIC responses
 - Discrepancies and common/uncommon themes between responses from ChatGPT



Phase 2

- Out of the 60 ChatGPT responses from the first 3 data collection pharmacists, 10 responses were selected to be graded by random number generator
- Using a pre-determined rubric, 3 blinded reviewers assessed each response

Rubric

- Developed through consulting the literature and with the expertise of an additional drug information pharmacist
 - Question Type
 - Complexity
 - Background
 - References mentioned
 - References identified
 - Clarity and conciseness
 - Misleading information
 - Response
 - Recommendation provided
 - Language/readability

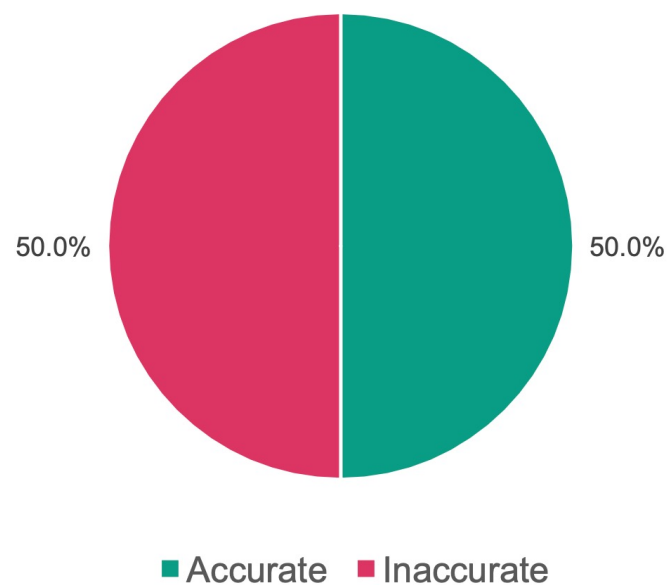
A Comparison of Drug Information Question Responses Answered by a DIC and ChatGPT

Blinded Question Response Assessment		Question Number: _____
Question Type: <ul style="list-style-type: none"> <input type="checkbox"/> Adverse Effect <input type="checkbox"/> Availability <input type="checkbox"/> Compatibility/Stability <input type="checkbox"/> Dosage Administration <input type="checkbox"/> Drug-Drug Interaction <input type="checkbox"/> Pharmacology <input type="checkbox"/> Therapeutics 	Complexity: <ul style="list-style-type: none"> <input type="checkbox"/> Simple – does not meet complex definition. <input type="checkbox"/> Complex – requires critical thinking/interpretation, professional judgement, and evaluation of primary literature. 	

		Yes	No	Comment
1.	Background	Contains relevant situational background	Does not include relevant situational background	Could include patient, disease or drug specific factors
2.	References Mentioned	Mentions use of references to support information; if so, which of the following were used (select all): <ul style="list-style-type: none"> <input type="checkbox"/> Tertiary (T) <input type="checkbox"/> Primary (P) <input type="checkbox"/> Unable to tell (U) 	Does not mention references	May include: package insert, FDA website, major compendia, AHFS, and subject specific textbooks, original articles
3.	References Identified	References are specific enough to be found	References are not specific enough to be found	References presented in a way to be tracked / checked
4.	Clarity and Conciseness	Response is logical in the progression of information and flow of ideas as well as concise	Response is not logical in the progression of information and flow of ideas nor concise	A clear and concise response does not require clarification and no extraneous information is provided
5.	Misleading Information	Absence of unclear or misleading information	Includes misleading or unclear information	Information is included that may be misleading
6.	Response	Formulates a response that answers the question	Does not formulate a response that answers the question	Information is presented that answers the question
7.	Recommendation Provided	A clear recommendation is provided based on the information included in the response	A recommendation is not included	A recommendation beyond seek advice of a health care provider is provided that logically deduced based on provided information
8.	Language / Readability	Response is well written and free from grammatical errors	Response is well written with some grammatical errors	A well written response is readable and understandable
Totals:				

Overall Results

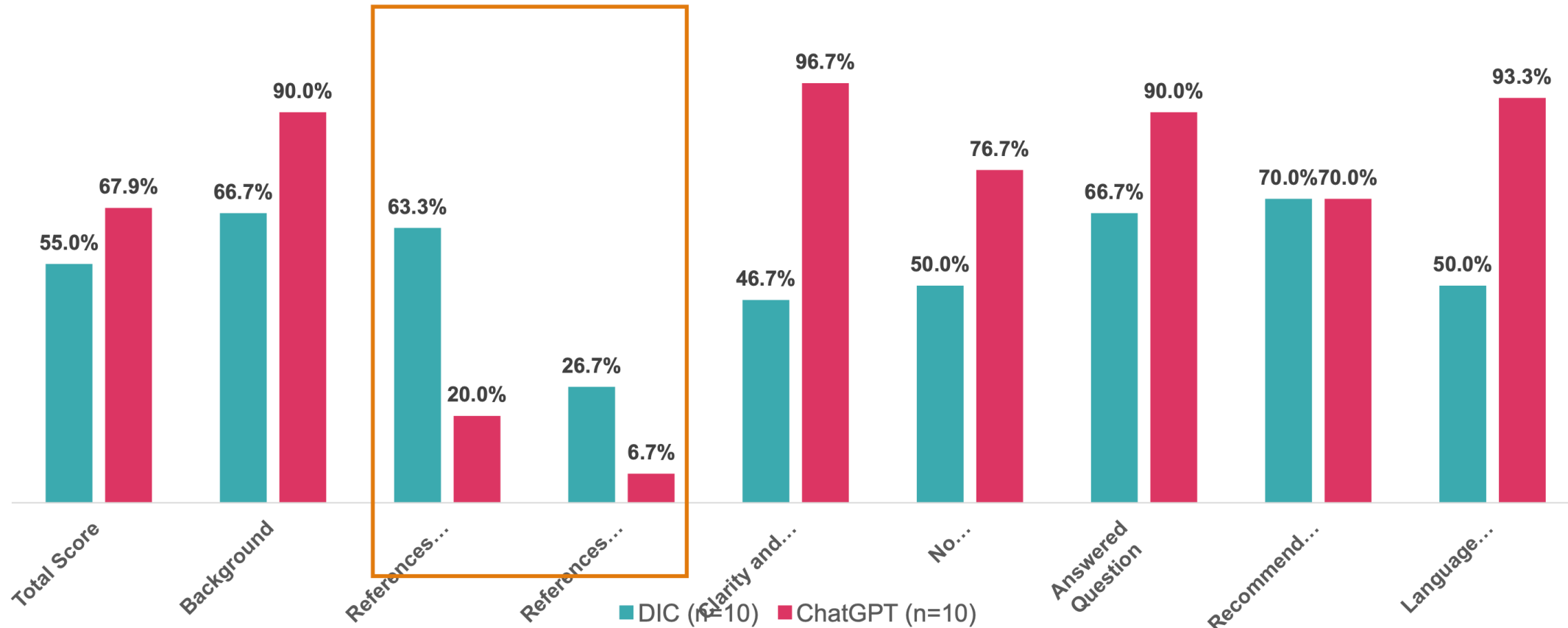
ChatGPT Overall Response Accuracy (n=84)



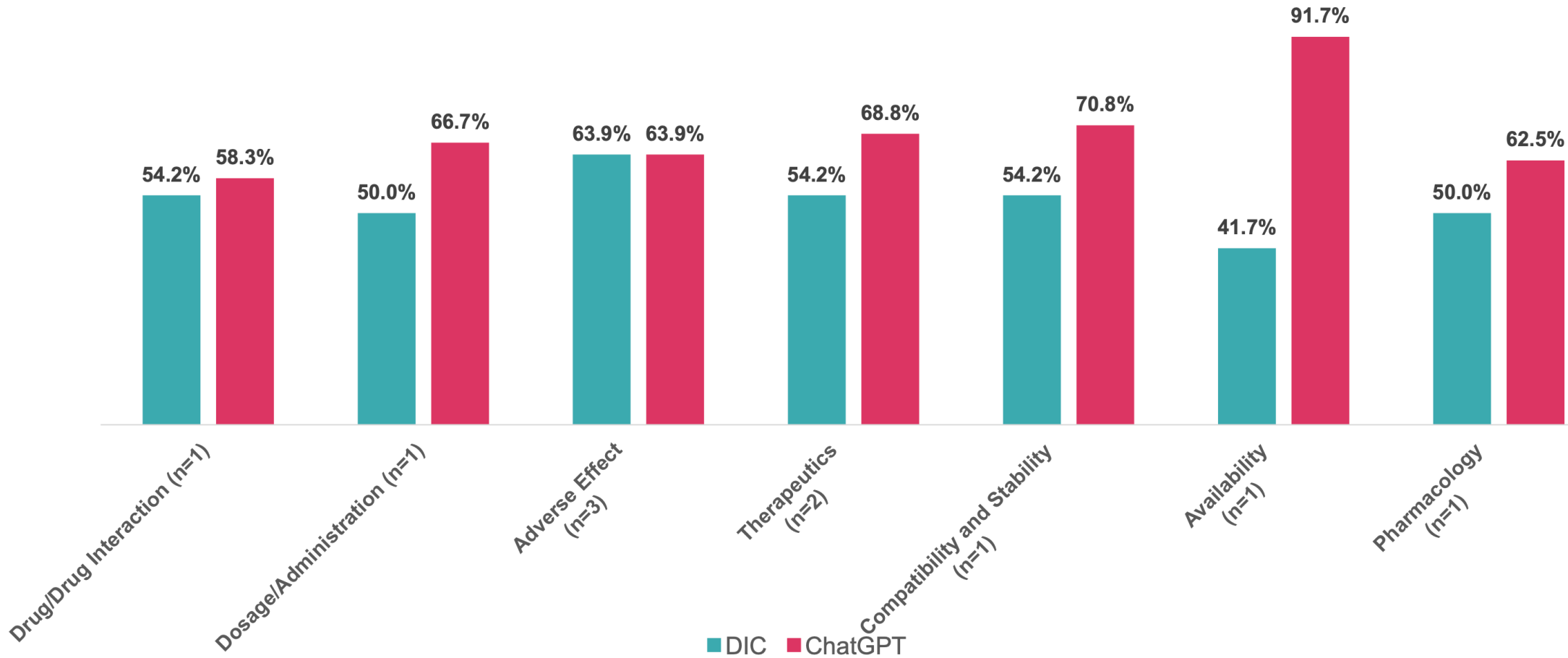
Overall ChatGPT Observations:

- Responses varied across data collectors
- Responses were written for patients
 - Most included a sentence about contacting their healthcare provider
- Works Cited Section not included

Graded Results by Rubric Category



Graded Results by Question Type



Key Takeaways

- 1 ChatGPT overall accuracy was 50%
- 2 ChatGPT scored higher on the rubric scoring compared to the DIC responses (67.9% versus 55%).
- 3 ChatGPT limitations including inconsistent results, lack of references, and using only open access resources.
- 4 Drug Information Pharmacists will not be replaced with ChatGPT.

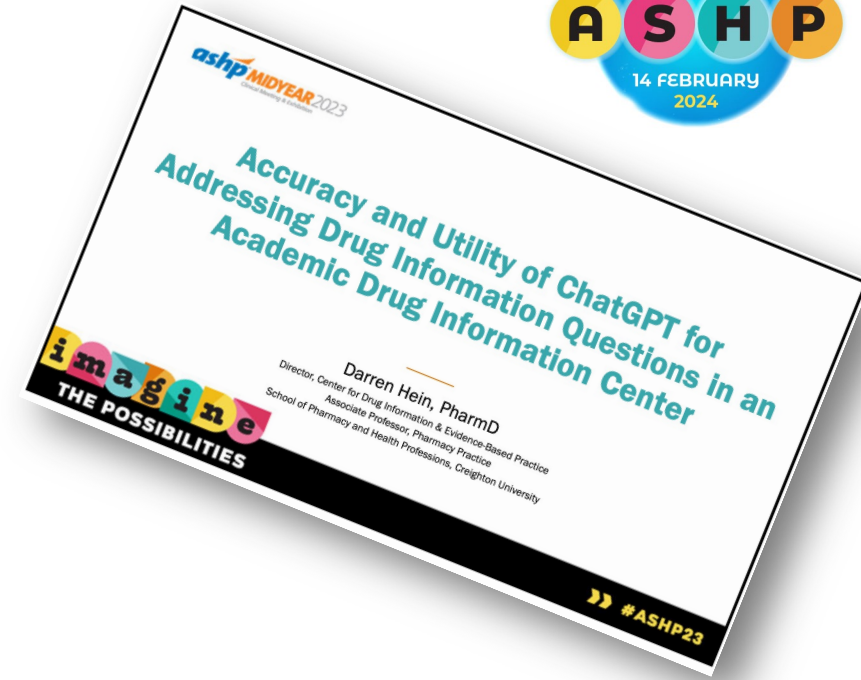
Imagine the possibilities

THE POSSIBILITIES



Nos contaron...

- Revisar la precisión de ChatGPT para responder preguntas sobre información de medicamentos de bajo y alto nivel de complejidad
- Cuáles son las limitaciones de ChatGPT para responder preguntas sobre información de medicamentos



Me quedo con...

DI Service and ChatGPT

Low level questions

- Basic drug data
 - Require less analysis/clinical judgement
- Typically require use of prescribing information and DI handbooks (e.g., ClinPharm, Lexi, Micromedex)

Mid level questions

- More complex (e.g., drug-supplement interactions, compounding, pregnancy/lactation, extended stability)
- Require more analysis/clinical judgement
- Typically require use of specialty resources

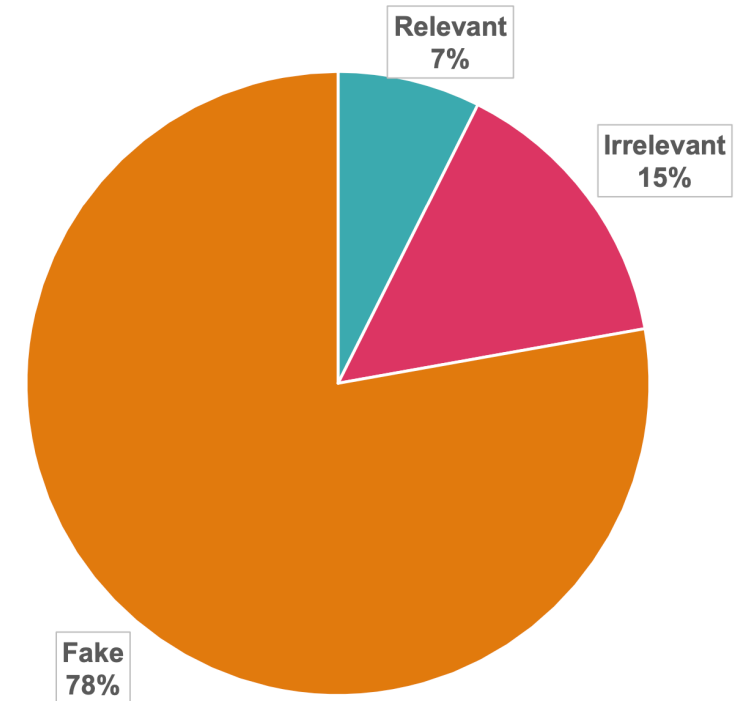
High level questions

- Complex therapeutic questions
 - Require even more analysis/clinical judgement
- Typically require use of clinical research and clinical practice guidelines

ChatGPT and High-Level DI Questions

- More specifically – High-level DI questions with a *lack of published evidence*
- First experience with ChatGPT (story)
 - Confirmation of our findings?
 - Evidence we missed?
 - Grey literature?
- Pilot project (April/May 2023)

- Citations provided:
 - 27 total
 - 2.7 per question





Can you provide the citations of the studies you just described?

Sure, here are the citations for the studies I mentioned:



1. Letang E, Chaignat CL, Ngwakum PA, et al. Efficacy and safety of intermittent preventive treatment with sulfadoxine-pyrimethamine for malaria in African infants: a pooled analysis of six randomised, placebo-controlled trials. *Lancet*. 2009;374(9700):1533-1542. doi:10.1016/S0140-6736(09)61258-7
2. Morlat P, Roussillon C, Henard S, et al. Effect of discontinuing primary prophylaxis against toxoplasmic encephalitis in HIV-infected patients. *AIDS*. 2013;27(9):1443-1450. doi:10.1097/QAD.0b013e328360a255
3. Hafner R, Bethel J, Power M, Taffet R, Johnson D, Sension M. Effect of temporary discontinuation of pyrimethamine in patients with *Toxoplasma* encephalitis. *J Acquir Immune Defic Syndr*. 1993;6(3):280-284. PMID: 8433075
4. Lortholary O, Chéron M, Dromer F, et al. AIDS-related *Toxoplasma* encephalitis and prophylaxis with cotrimoxazole (TMP-SMX) compared with dapsone-pyrimethamine (DP) plus leucovorin (LCV). *Ann Intern Med*. 1993;119(9):882-888. doi:10.7326/0003-4819-119-9-199311010-00005

I hope this helps!

Citations, PMIDs, and DOIs confirmed to either not exist or relate to an unrelated article.

But wait...

- August 2023 – prompted ChatGPT to answer same questions
- No longer provided citations (relevant, irrelevant, or fake)
- All answers included:
 - Note related to last knowledge update
 - Deference to healthcare provider or other medical sources

As of my last knowledge update in September 2021, pyrimethamine is an antiparasitic medication often used in combination with sulfadiazine for the treatment of toxoplasmosis, a disease caused by the parasite *Toxoplasma gondii*. The standard treatment approach for toxoplasmosis involves a combination of medications to effectively target the parasite and control the infection.

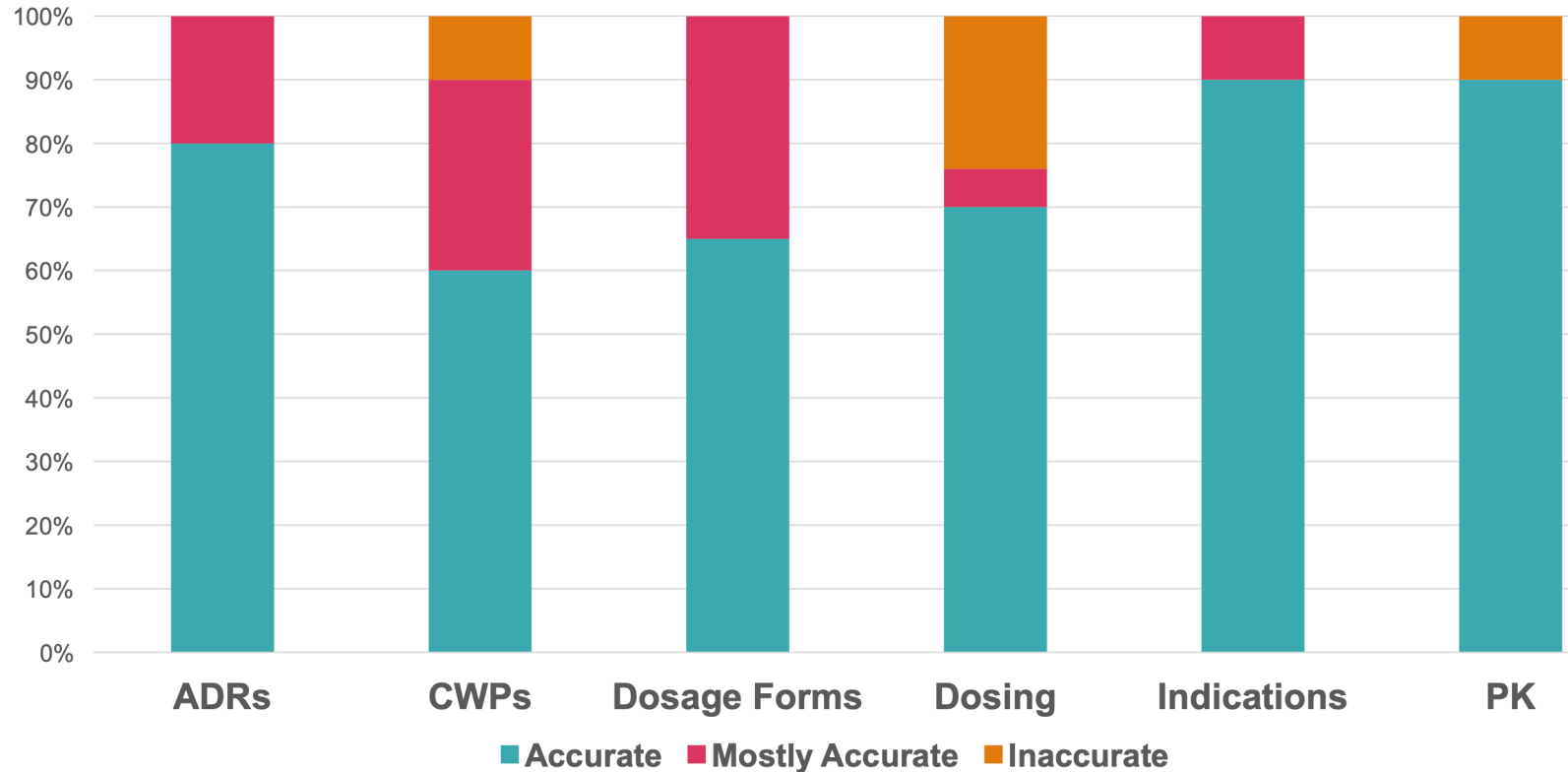
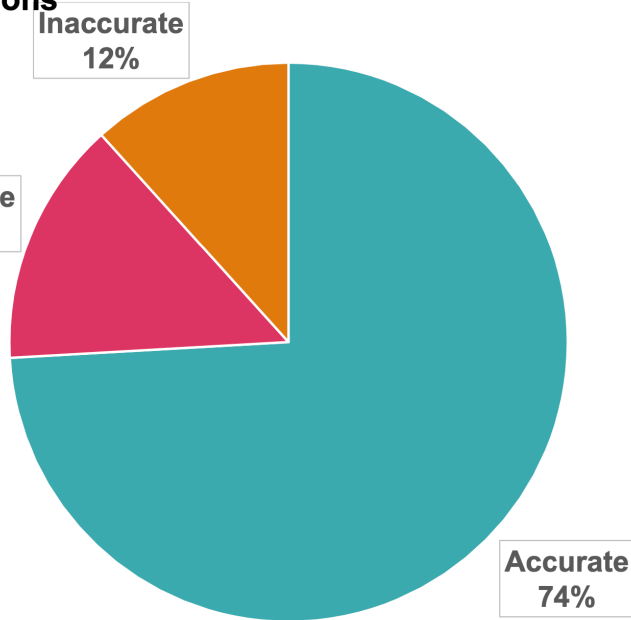
A drug holiday, which involves temporarily stopping a medication, is not a common practice in the treatment of toxoplasmosis. The goal of treating toxoplasmosis is to eliminate the parasite and prevent its replication, as the infection can have serious consequences, especially in individuals with compromised immune systems.

If you're considering any changes to your treatment regimen, including the idea of a drug holiday, it's crucial to discuss this with your healthcare provider, preferably an infectious disease specialist. They can assess your specific medical situation, the severity of the infection, your immune status, and any potential risks associated with interrupting treatment.

Please note that my information might not be up-to-date with the latest medical guidelines or research developments. For the most current and accurate information, consult with a qualified healthcare professional or refer to reputable medical sources.

ChatGPT and Low-Level DI Questions

Accuracy of ChatGPT – Low-Level DI Questions



Key Takeaways




1. Concerns related to fake studies cited by ChatGPT may have been resolved.
2. ChatGPT may be able to accurately address most low-level DI questions; however, cross-referencing still required.
3. ChatGPT may be a source for site-specific ideas and inspiration, but more reliable resources should be used when answering DI questions.





Educational Sessions

Protecting Our Patients During a Cyberattack: Prospective Planning for Extended Downtime

 Monday, December 4, 2023  4:00 PM – 5:00 PM  Location: ACC, Room 304b, Level 3

 CE Credits 1.00 contact hours

Activity #: 0204-0000-23-248-L04-P

Activity #: 0204-0000-23-248-L04-T

Activity Type: Knowledge-based

Target Audience: Pharmacist, Pharmacy Technician

Learning Objectives:

- Describe the critical pharmacy functions that require contingency planning should an extended downtime occur.
- Identify the key stakeholders for extended downtime planning.
- Discuss the components needed for continued downtime readiness.

Nos contaron...

- Describir las funciones críticas del SFH que requieren planificación de contingencia en caso de que ocurra un tiempo de inactividad prolongado por un ciberataque
- Identificar los principales agentes implicados en la planificación de un tiempo de inactividad prolongado
- Discutir los componentes necesarios para mantener al SFH preparado para un periodo de tiempo de inactividad continuado

Me quedo con...



El peligro es real

Introduction – How big is the threat?

- HHS states that healthcare breaches have doubled in 3 years. In addition, the average ransom demand has increased as well as the average downtime (18 days in 2020 to 22 days in 2021).
- JAMA stated that attacks on healthcare organizations are “increasing in frequency and sophistication; disruptions to care during ransomware attacks may threaten patient safety and outcomes.” (1)

1. JAMA Health Forum. 2022;3(12):e224873. doi:10.1001/jamahealthforum.2022.4873

Why are cyberattacks different?

- Downtime procedures in place are inadequate preparation for a cyber attack
- Typical down time preparation assumptions:
 - Designed for a single system being down at a time
 - Designed for relatively short durations of time

Why are cyberattacks different?

- A cyberattack can potentially take down everything on your server(s)
- A cyberattack may take multiple weeks to fully recover



Debemos ponernos en el peor escenario

Planning Assumptions

- All servers would be impacted for all locations
- Nothing digital would function
 - EHR, phones, email, ADMs
- Basic physical plant processes would be operational
 - Electricity, AC, air handling, etc.
- Initial focus was to ensure inpatient care could proceed
- Critical planning assumption – how much lead time will you have to activate your back up plan?

Imagine the possibilities

THE POSSIBILITIES



Resources

Policies, Procedures

- Key document identification
- How to access

Documents

- Policies
- Protocols
- Drug information reference
- Compounding reference
- Downtime forms

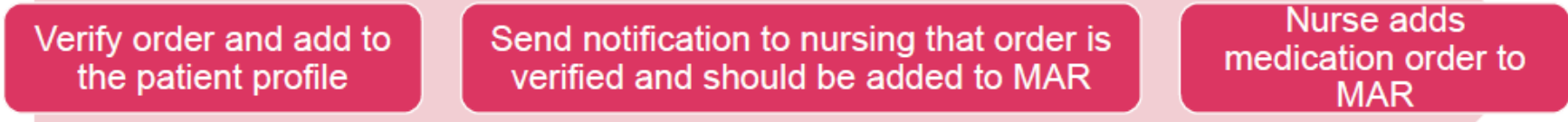
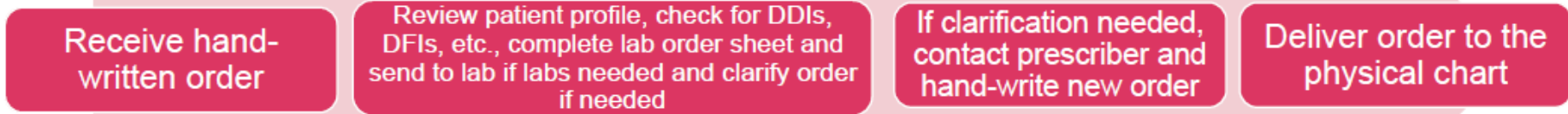
Resources

Downtime Forms

- Internal facing
 - Patient profile
 - Documentation requirements
 - Compounding documentation
- External facing
 - Order sets
 - Progress notes

Annual Document Reviews and Updates

Workflow: Current State v Downtime State



THE POSSIBILITIES

THE POSSIBILITIES



Hay que estar preparados por si sucede el ciberataque

Next steps – Putting Concepts into Practice

- Challenges
 - Ensure solutions work for the front line staff
 - It is impossible to fully stress test your solutions on the scale that would be existing in an actual event
 - Front line teams are the ones that need to be able to manage the new practices
 - Since the procedures will be significantly different, it is imperative that ongoing exposure and rehearsal be implemented

Imagine the possibilities

THE POSSIBILITIES



Hay que estar preparados por si sucede el ciberataque

Putting Concepts into Practice (continued)

- Solutions
 - Ensure frontline 'champions' are identified
 - Have frontline teams review and utilize the proposed solutions
 - Keep team engaged with routine reminders and practice
 - Consider monthly exercises of a small, manageable degree

Imagine the possibilities




THE POSSIBILITIES



Educational Sessions

Opioid-Associated Education

It's a Small World After All: Diversion Prevention Software Challenges

 Tuesday, December 5, 2023  2:00 PM – 3:30 PM  Location: ACC, Room 304b, Level 3

 CE Credits 1.50 contact hours

Activity #: 0204-0000-23-283-L04-P

Activity Type: Knowledge-based

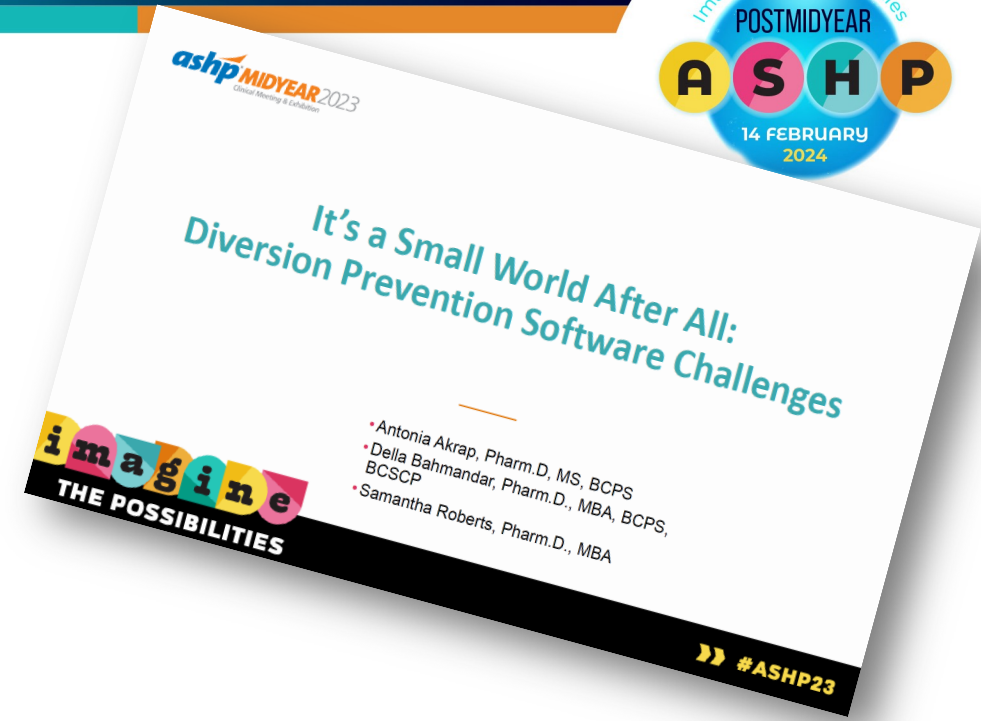
Target Audience: Pharmacist

Learning Objectives:

- Summarize the scope of the problem of drug diversion and the need for artificial intelligence software.
- Discuss limitations with available diversion prevention software.
- Describe strategies to maximize individual analytics tools.
- Discuss critical stakeholder engagement and involvement when addressing drug diversion.

Nos contaron...

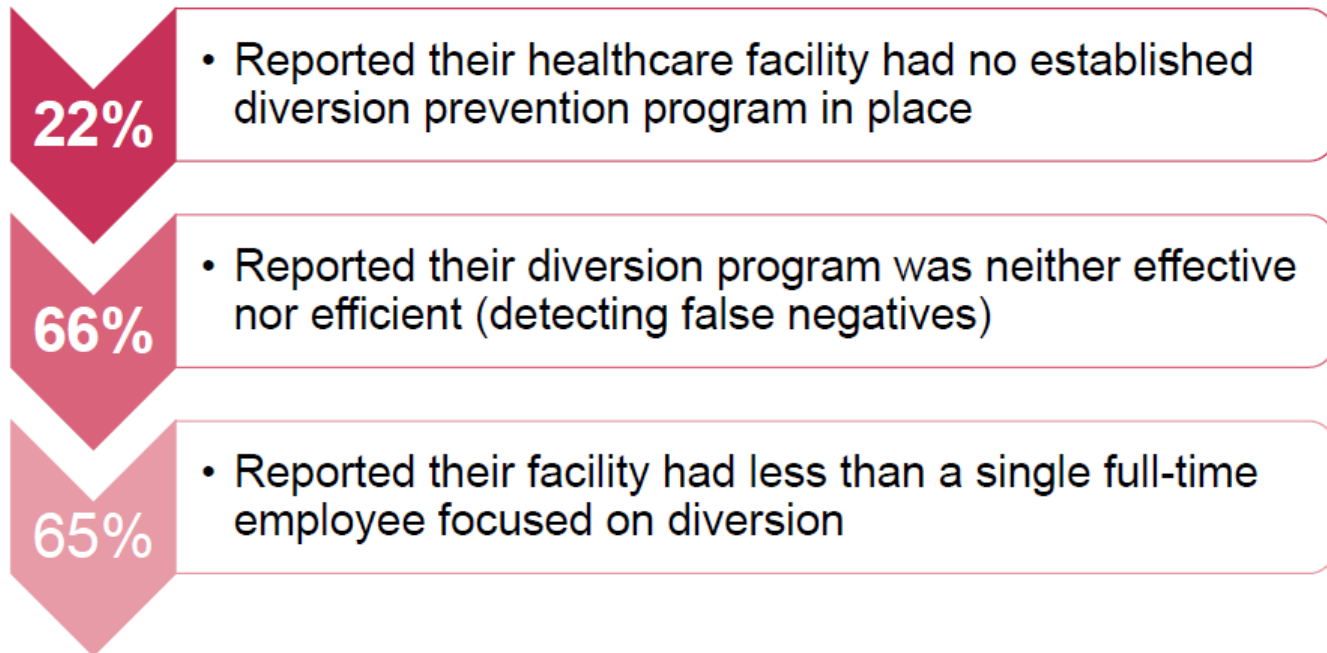
- Resumir el alcance del problema de la desviación de medicamentos y la necesidad de software de IA
- Discutir las limitaciones del software de prevención de desviaciones disponible
- Describir estrategias para maximizar las herramientas de análisis individual
- Discutir la implicación y participación de los interesados clave al abordar la desviación de medicamentos



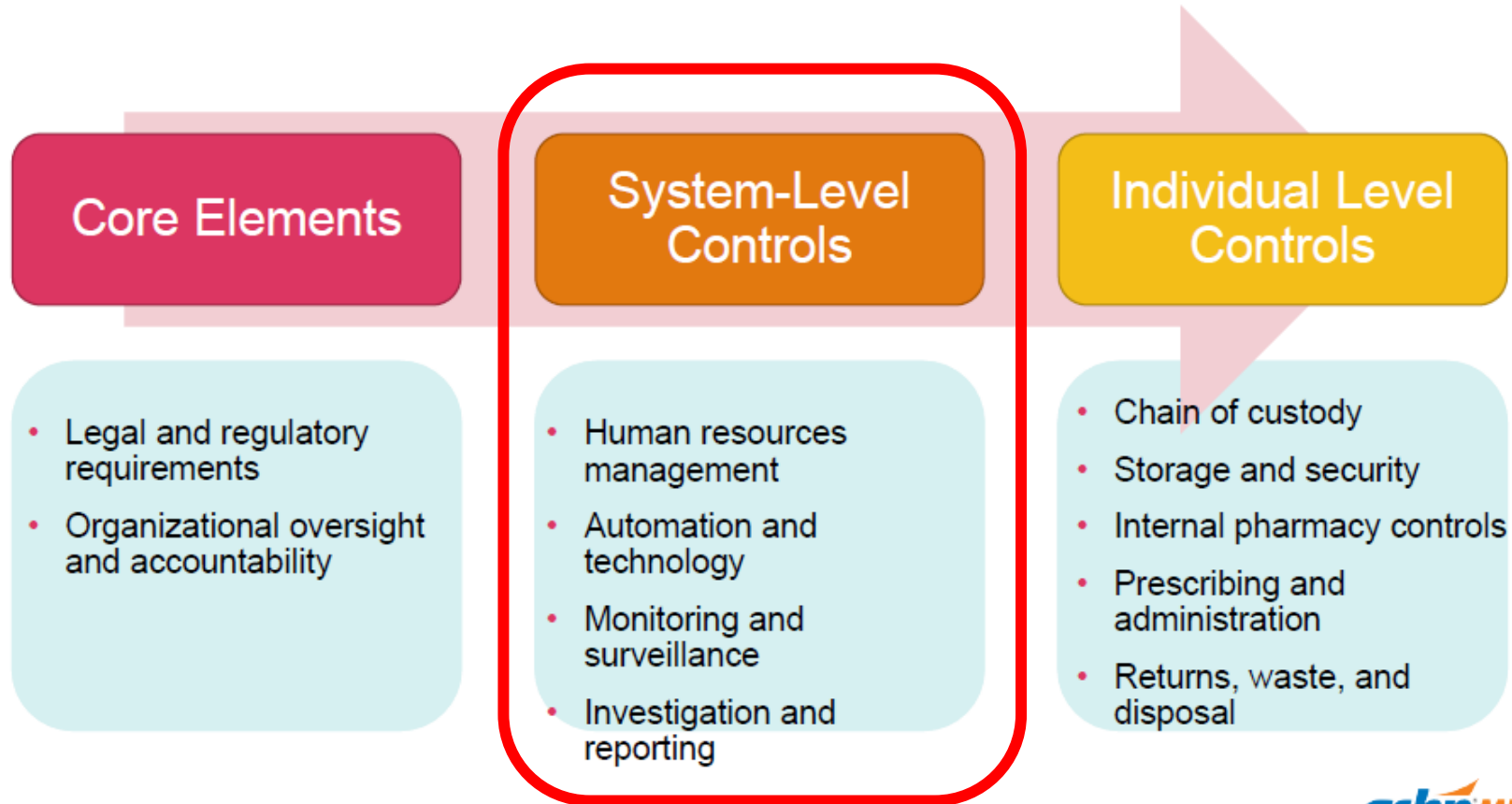
Me quedo con...

- An estimated 10% - 15% of healthcare workers abuse controlled substances, matching abuse rates within the US population
- The estimated cost of diversion to public and private insurers is approximately 70 billion
- A 2017 survey revealed 65% of surveyed institutions stated a majority of diversion goes undetected

Importance of Surveillance



Elements of a Surveillance Program

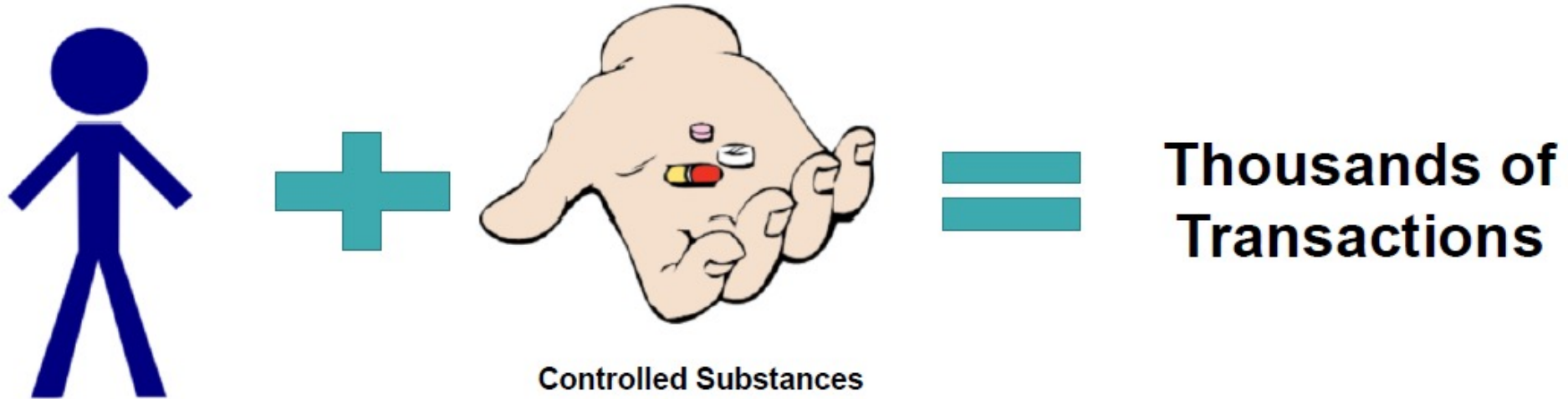


THE POSSIBILITIES

THE POSSIBILITIES



The Dilemma



THE POSSIBILITIES

THE POSSIBILITIES





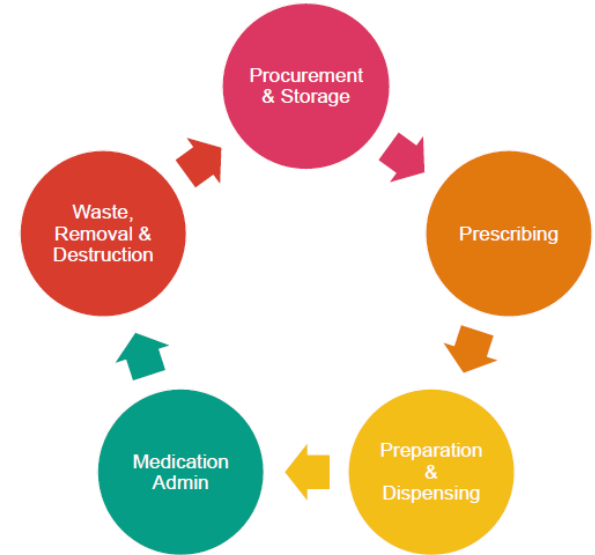
Drug Diversion Monitoring Software

- Limited resources for manual audits
- Artificial Intelligence (AI) automates tasks that would otherwise have to be manually performed
- Integrates data from automatic dispensing cabinets (ADCs) with data from electronic medical records (EMRs)
- Identify at-risk behavior individuals, highlighting providers whose behaviors are statistically abnormal from their peer group



Key takeaways

- Un programa de prevención de desviaciones debe abordar los puntos de riesgo comunes en el proceso de uso de medicamentos para proporcionar a las instituciones una visión completa del uso de sustancias controladas
- Para maximizar el software de análisis de prevención de desviaciones, es necesario entender los detalles y funcionamientos del software
- Es imprescindible involucrar a los interesados clave al implementar análisis de desviaciones y utilizar indicadores clave de rendimiento (KPIs) relevantes para promover la mejora continua de calidad del proceso



KPI	Description
% of transactions reviewed	% of ADC transactions determined to be appropriate
% of users reviewed	% of monitored total workforce using CS
# of cases reviewed	Number of alerts reviewed to rule in/out with human judgement
Diversion incidents detected per year	# of true diversion events detected
Workflow improvement opportunities per year	Poor practice, non-diversion, events detected
False positive rate	% of investigations yielding false positives
Time spent per case	Time spent (in hours) from event detection to final disposition
Time to detection	Amount of time elapsing between an event and it being detected
Time to resolution	Amount of time elapsing between reporting on an event and it being resolved

Educational Sessions

Innovation

Digital and Telehealth

Spotlights on Science

AI and Direct-to-Consumer Genetic Testing: The Good, the Bad, and the Ugly

📅 Wednesday, December 6, 2023 ⌚ 10:00 AM – 11:00 AM 📍 Location: ACC, Ballroom A, Level 3

📝 CE Credits 1.00 contact hours

Activity #: 0204-0000-23-328-L04-P

Activity #: 0204-0000-23-328-L04-T

Activity Type: Knowledge-based

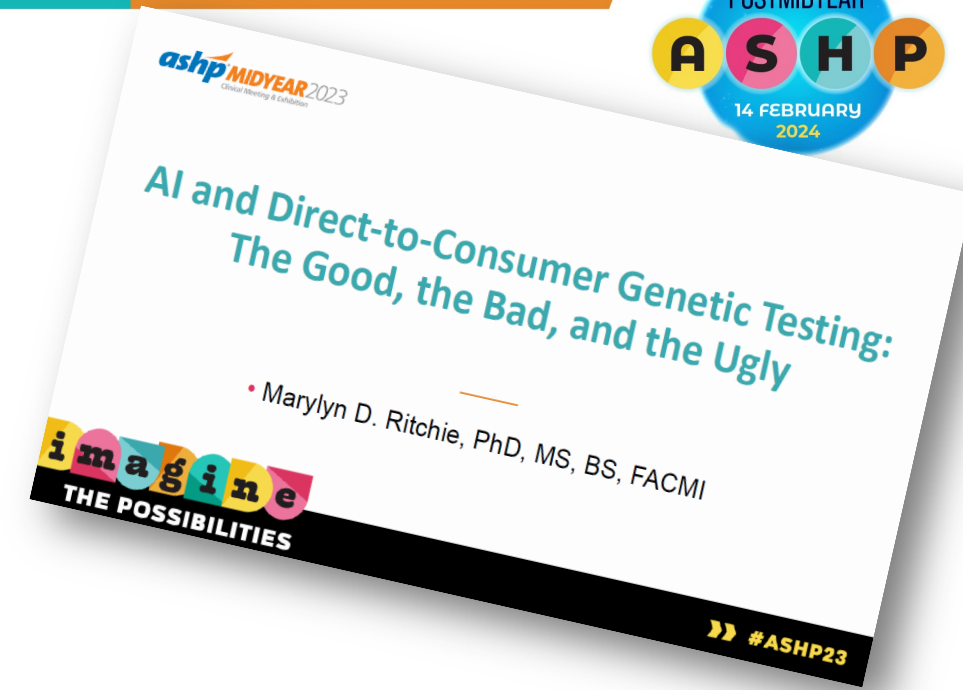
Target Audience: Pharmacist, Pharmacy Technician

Learning Objectives:

- Describe the elements of generative artificial intelligence (AI) (e.g., ChatGPT).
- Discuss available direct-to-consumer genetic testing options.
- List pharmacy-related results available from direct-to-consumer genetic testing.
- Identify the risks of using AI to make decisions about your healthcare.

Nos contaron...

- Describir los elementos de la IA (por ejemplo, ChatGPT)
- Discutir las opciones de pruebas genéticas directas al consumidor disponibles
- Revisar los resultados relacionados con las farmacias disponibles de las pruebas genéticas directas al consumidor
- Identificar los riesgos de usar la IA para tomar decisiones sobre la atención sanitaria



Me quedo con...

La IA generativa ya está en el mundo de la salud

Generative AI in the news

ChatGPT is poised to upend medical information. For better and worse.



Karen Weintraub
USA TODAY

Published 7:00 a.m. ET Feb. 26, 2023 | Updated 12:05 p.m. ET March 16, 2023

health Life, But Better Fitness Food Sleep Mindfulness Relationships

ChatGPT may have better bedside manner than some doctors, but it lacks some expertise

By Deidre McPhillips, CNN
Published 11:03 AM EDT, Fri April 28, 2023

HEALTH INC.

'Dr. Google' meets its match in Dr. ChatGPT

September 16, 2023 · 5:01 AM ET

By Andrew Leonard

FROM **KFF** Health News



La IA generativa ya está en el mundo de la salud

Generative AI Application Landscape



© Van Truong, 2023



A work in progress



THE POSSIBILITIES

Pero, ¿nos da ChatGPT buenos consejos de salud?

ChatGPT Gives False and Even Dangerous Health Advice

My questions were answered with myths, misconceptions and dangerous falsehoods



Robert Roy Britt · Follow

Published in The Generator · 8 min read · May 8



1.3K



36



<https://medium.com/the-generator/>

- What is normal human body temperature
- Treatments for chronic pain – opioids and surgery
- Number of steps to walk per day
- Is alcohol good for me
- How much water should I drink per day
- Other stories:
 - ER and chest pain
 - Fake diseases

Imagine the possibilities

THE POSSIBILITIES



Hay riesgos

LLMs and Health care



Epic, Microsoft partner to use generative AI for better EHRs

Integrating the cloud-based models into daily workflows will "increase productivity for many of our providers," says one CIO, "allowing them to focus on the clinical duties that truly require their attention."

By [Nathan Eddy](#) | April 18, 2023 | 12:45 PM



Microsoft and Epic are teaming up to harness the power of generative artificial intelligence to improve the accuracy and efficiency of electronic health records.

- Be careful these tools with patient data
- The systems store and potentially shares all data entered into the system
- HIPAA violation
- Epic and Microsoft are partnering to create clinical workflows using LLMs

THE POSSIBILITIES

Pero nos puede ayudar... y mucho



Re-imagining Healthcare Provider Documentation

Kevin B. Johnson, MD, MS

David L. Cohen University Professor of Pediatrics,
Informatics, Computer and Information Science,
Bioengineering and Science Communication

Vice President, Clinical informatics, UPHS

The Problem: Modern Day Clinic Visits Dissatisfy Everyone!



Burnout, in medical literature, is defined by increased emotional exhaustion, a more distant approach to the job and a declining sense of personal accomplishment. Charles Pox Arbogast/Associated Press

DRAWING BY AG, AGE 7, COPYRIGHT THOMAS G. MURPHY MD 2011

Toll E. The Cost of Technology. *JAMA*. 2012;307(23):2497–2498. doi:10.1001/jama.2012.4946

Slides courtesy of Dr. Kevin Johnson

THE POSSIBILITIES

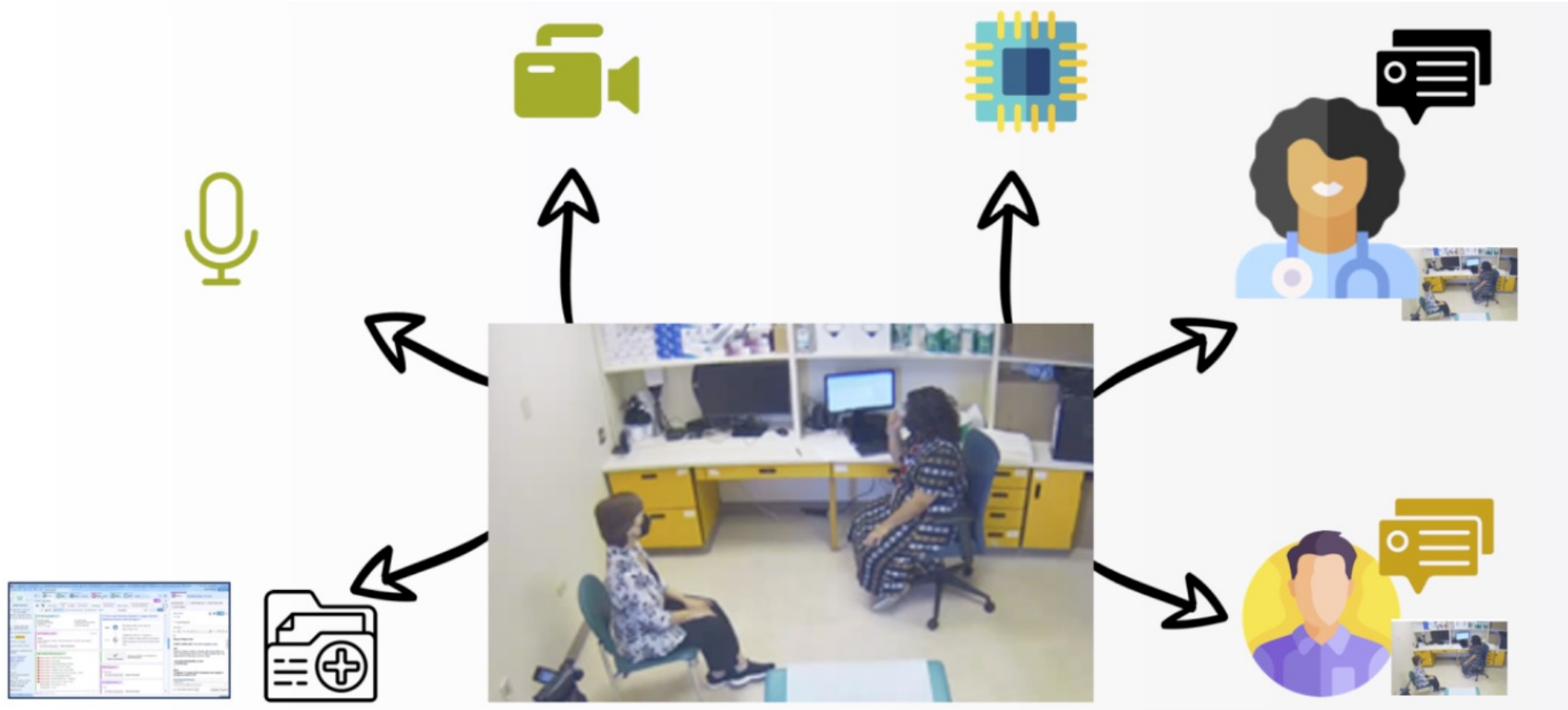
THE POSSIBILITIES



REDUCE Project Description

- **What if, instead of spending more time documenting a clinical encounter than we spend engaged with the patient, health care providers could rely on AI technology to summarize a clinical encounter qualitatively, quantitatively and equitably?**
- **Approach:** Leverage advances in AI perception and language understanding to re-envision medical documentation and real-time clinical support.

Aim 1: Observer's Multi-modal Data Sources



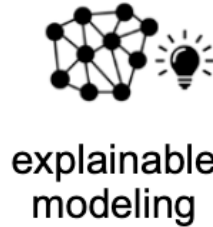
THE POSSIBILITIES

Enabling Technologies for AI-enabled Documentation

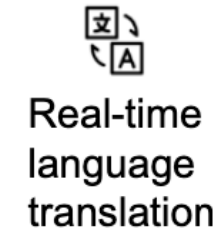
Perception



Machine Learning



Language



- Gait Length
- Word finding
- Understanding
- Affect
- Image capture
- Follow up

These advances have not been translated into anything that revolutionizes clinical care!

THE POSSIBILITIES

THE POSSIBILITIES






Educational Sessions

Integrated Informatics Institute

Digital and Telehealth

Innovation

Artificial Intelligence (AI) and Machine Learning: New Horizons in the Development of Drug and Biological Products

 Sunday, December 3, 2023  2:30 PM – 3:30 PM  Location: ACC, Room 204b, Level 2

 CE Credits 1.00 contact hours



Activity #: 0204-0000-23-215-L04-P

Activity #: 0204-0000-23-215-L04-T

Activity Type: Knowledge-based

Target Audience: Pharmacist, Pharmacy Technician

Learning Objectives:

- Discuss human-led governance, accountability, and transparency in responsible AI use for drug development.
- Describe assessment of quality, reliability, and representativeness of data.
- Summarize model development, performance, monitoring, and validation of responsible technology use.

Nos contaron...

- Utilidad de la IA en el desarrollo de fármacos
- Regulación de la IA en el desarrollo de fármacos
- Solicitudes de registro de fármacos en los que se ha utilizado IA/ML en su desarrollo
- Retos del uso de IA/ML en el desarrollo de fármacos
- Principios de buenas prácticas



Me quedo con...

AI in drug development – challenges

- AI or ML approach can only ever be as good as the underlying data:
 - Scarcity of high-quality, large-scale, and fit-for-purpose datasets for development and testing
 - Identification and mitigation of bias in datasets
 - poor generalization due to dataset shift, to overfitting to confounders
- Opacity of some algorithms
- Ensuring transparency to users
- Providing oversight/governance for adaptive algorithm
- Data privacy and security, and ethical use
- Need for regulatory clarity in certain areas

CDRH's Good Machine Learning Practice for Medical Device Development: Guiding Principles






- 1 Multi-Disciplinary Expertise Is Leveraged Throughout the Total Product Life Cycle
- 2 Good Software Engineering and Security Practices Are Implemented
- 3 Clinical Study Participants and Data Sets Are Representative of the Intended Patient Population
- 4 Training Data Sets Are Independent of Test Sets
- 5 Selected Reference Datasets Are Based Upon Best Available Methods
- 6 Model Design Is Tailored to the Available Data and Reflects the Intended Use of the Device
- 7 Focus Is Placed on the Performance of the Human-AI Team
- 8 Testing Demonstrates Device Performance During Clinically Relevant Conditions
- 9 Users Are Provided Clear, Essential Information
- 10 Deployed Models Are Monitored for Performance and Re-training Risks Are Managed

Educational Sessions

Integrated Informatics Institute

Putting Data to Work: Deploying Key Performance Indicators to Optimize Operations and Automation

 Sunday, December 3, 2023  1:00 PM – 2:00 PM  Location: ACC, Room 204b, Level 2

 CE Credits 1.00 contact hours



Activity #: 0204-0000-23-214-L04-P

Activity #: 0204-0000-23-214-L04-T

Activity Type: Knowledge-based

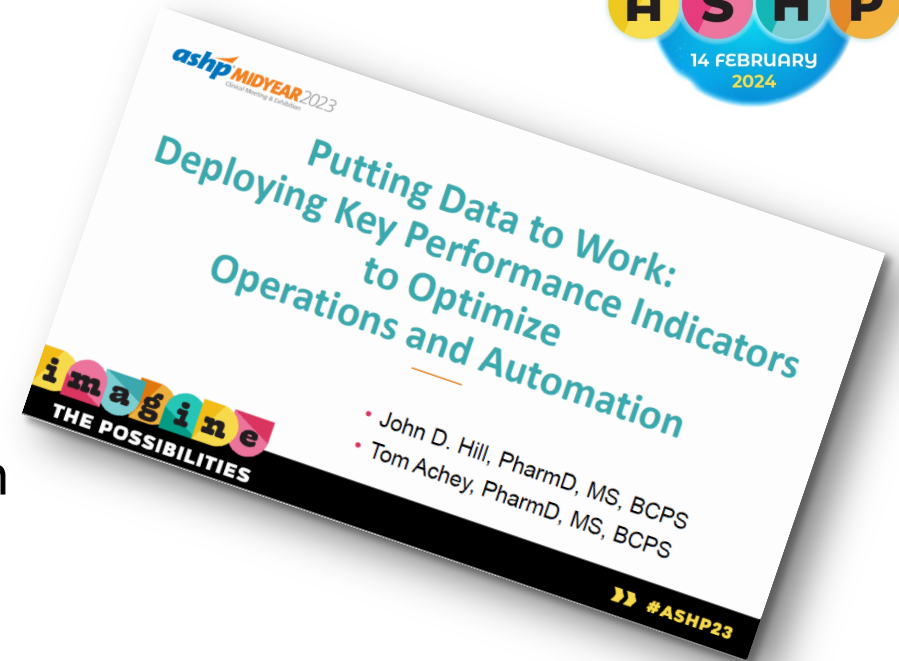
Target Audience: Pharmacist, Pharmacy Technician

Learning Objectives:

- Discuss best practice applications of data-driven decision-making in pharmacy operations.
- Describe success factors for the implementation of data-driven displays of performance metrics to optimize pharmacy operations and automation.
- Identify future applications of dashboards and evidence-based operations.

Nos contaron...

- Utilización de la toma de decisiones data-driven en las actividades de los SF
- Los factores de éxito para implementar la toma de decisiones data-driven
- Desarrollo de un dashboard



Me quedo con...

Four Types of Analytics

Type of Analytics	Questions Answered
Descriptive	What happened?
Diagnostic	Why did it happen?
Predictive	What will happen?
Prescriptive	What should happen?

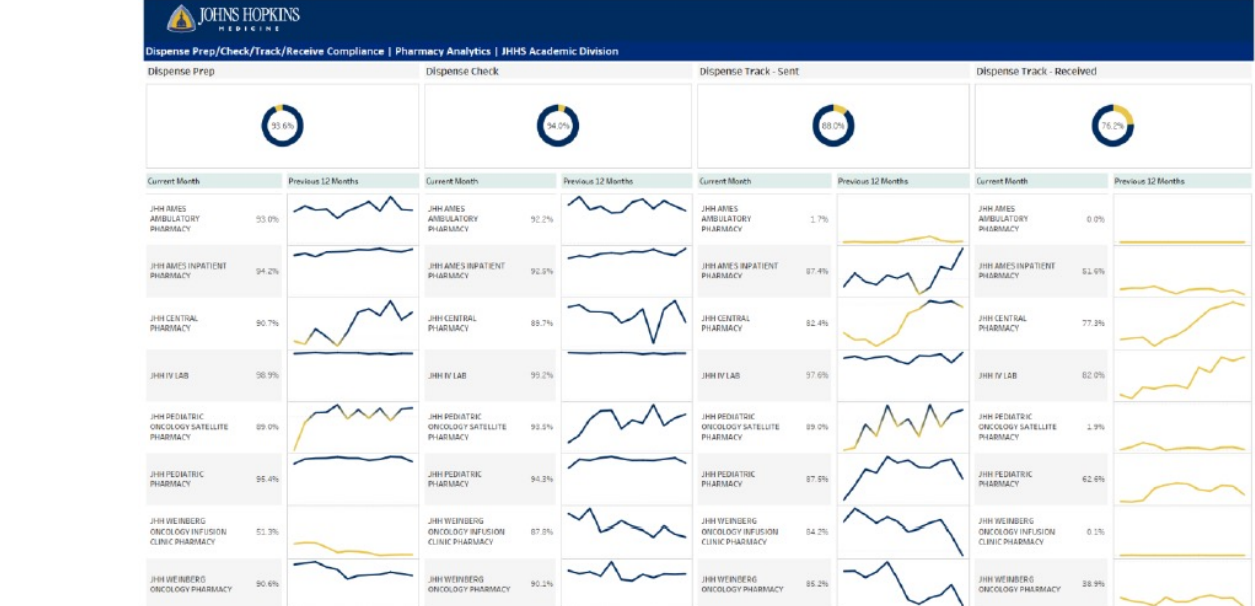
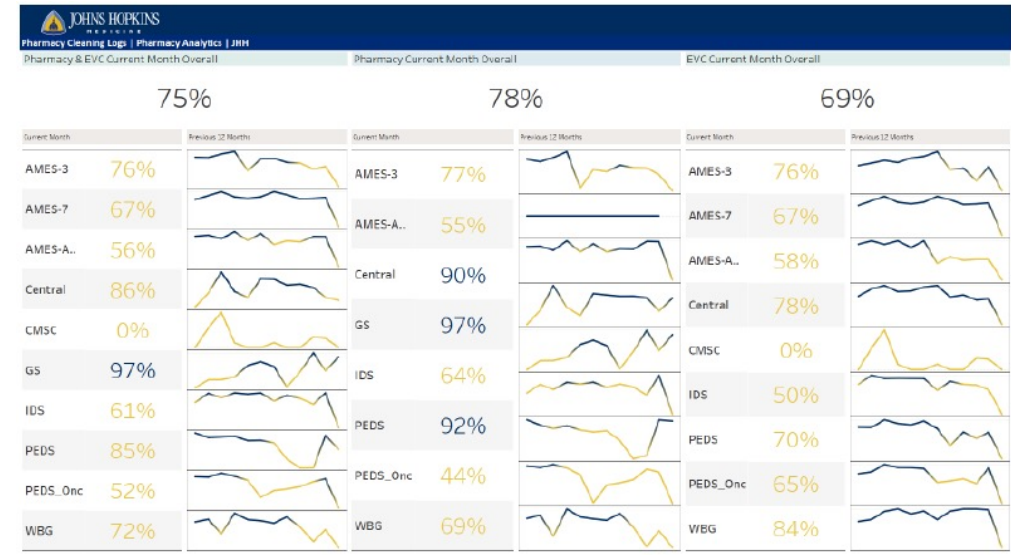
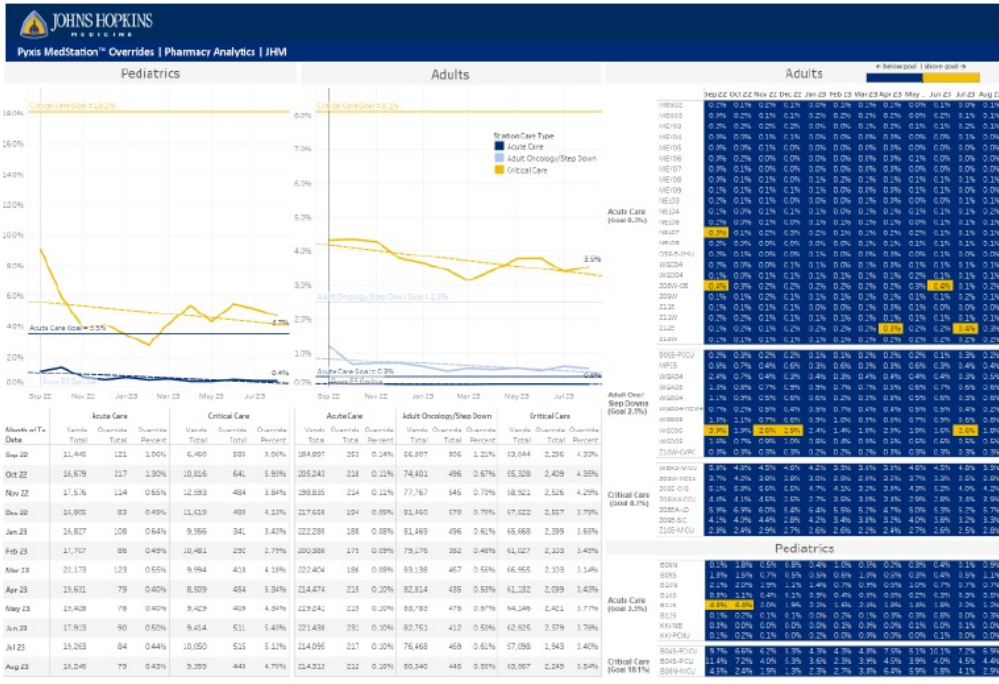
Pharmacy operations almost exclusively reliant on **descriptive** analytics

We've seen that use of data analytics in health care can improve quality and lower costs



Applications for data-driven decisions

- **Medication inventory management**
 - Demand forecasting
 - Vendor performance analysis
- **Patient safety**
 - Medication error prevention
 - Drug-drug interaction alerts
- **Workflow optimization**
 - Resource allocation
 - Process improvement
- **Medication cost control**
 - Cost analysis
 - Formulary management
- **Patient outcomes**
 - Clinical data integration
 - Medication adherence
- **Regulatory compliance**
 - Reporting
- **Patient-specific medication management**
 - Personalized treatment plans
 - Pharmacogenomics
- **Quality assurance and continuous improvement**
 - **Key performance indicators**
 - Root cause analysis



Success Factors

- Clear objectives and goals
- Cross-functional collaboration
- Data quality and integration
- User-friendly interfaces
- Real-time data updates
- Customization
- Training and education
- Change management
- Performance benchmarking
- Data security and compliance
- Continuous monitoring and improvement
- Feedback loop
- Scalability and flexibility
- Leadership support
- Return on investment analysis

Imagine the possibilities

THE POSSIBILITIES



Key Takeaways




- **SHARE DATA TO DRIVE PERFORMANCE AND ACCOUNTABILITY**
 - *Provide data to staff to promote operational and automation process improvements*
- **FOCUS ON MEASURING WHAT MATTERS MOST**
 - *Collect and share meaningful metrics in a relevant format using available resources*
- **SHARE DATA REGARDLESS OF FORMAT**
 - *Focus on sharing data with staff regardless of the medium/tools available*



Educational Sessions

Integrated Informatics Institute

(Management Case Study) Implementation of Mobile Medication Tracking Technology for Controlled Substance Chain of Custody

 Sunday, December 3, 2023  1:15 PM – 1:45 PM  Location: ACC, Room 213b, Level 2

 CE Credits 0.50 contact hours



Activity #: 0204-0000-23-364-L04-P

Activity #: 0204-0000-23-364-L04-T

Activity Type: Knowledge-based

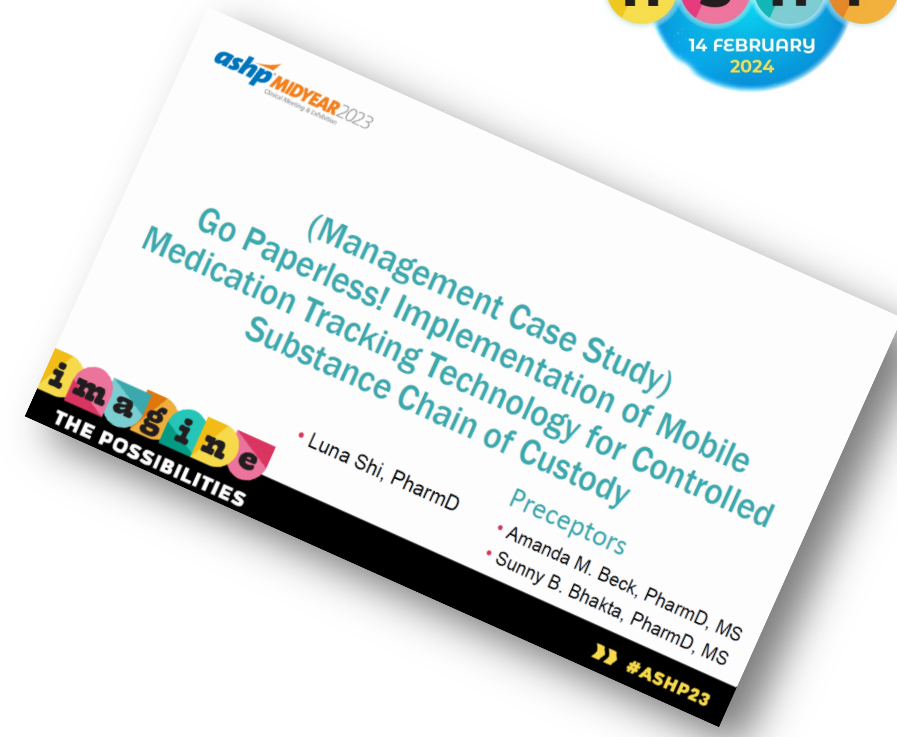
Target Audience: Pharmacist, Pharmacy Technician

Learning Objectives:

- Summarize the limitations of conventional paper-based medication tracking systems for controlled substance diversion prevention.
- Describe the implementation process of a mobile medication tracking technology in a hospital inpatient pharmacy.

Nos contaron...

- Las limitaciones de los sistemas convencionales de seguimiento de medicamentos basados en papel para la prevención de la desviación de sustancias controladas
- Cómo implementar tecnología que nos permita una mejor trazabilidad



Me quedo con...

Previous Controlled Substance Tracking Form

Complete this form for each premium medication. The Pharmacy Department will not be able to send the premium medication(s) without it.

Premium Medication Tracking Form

Patient's Full Name: _____ Unit: _____
 Date/Time: _____ Room: _____
 Requested by: _____

PHARMACY

Pharmacy Tech: _____
 Checking Pharmacist: _____
 Date/Time checked: _____

Medication Dose: _____
 (or affix label)

IV Solution: _____

Scheduled Administration Date/Time: _____

NURSE OR PROVIDER ONLY

Received by:
 Print Name: _____
 Signature: _____
 Nursing Unit & time received: _____

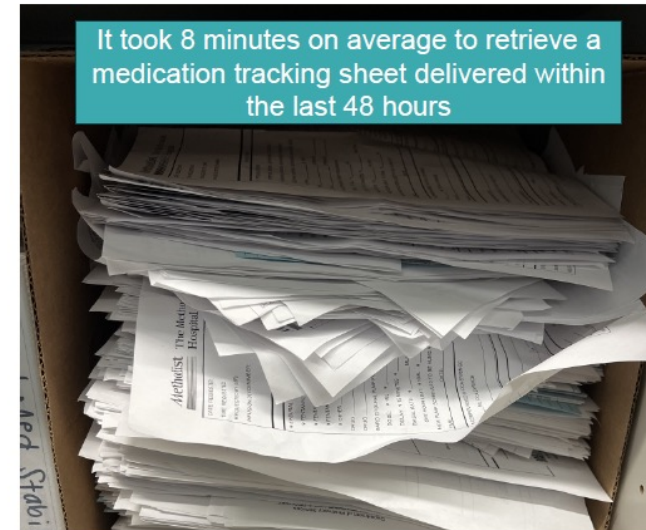
COURIER

Print name: _____
 Signature: _____
 Date/Time left pharmacy: _____

Form is for the following medications:

Albumin IV mixes	Conivaptan	Octreotide (missing IV mixes)
α 1-proteinase inhibitors	Daptomycin (Cubicin)	Pamidronate
Alprostadil IV (not inhalation)	Darbepoetin (Aranesp)	Palivizumab (Synagis)
Alteplase	Ecullzumab (Soliris)	Pegfilgrastim (Neulasta)
Aminocaproic acid	Epogen	Plerixafor
Amphotericin B Lipids	Ferumoxytol	Rifampin IV
Amphotericin B Oral Solution	Filgrastim (Neupogen)	Romiplostim (Nplate)
Anidulafungin	Ibutilide (Corvert)	Sirolimus oral solution
Argatroban	Imiglucerase (Cerezyme)	Sterile Talc
Atgam	Infliximab (Remicade)	Synercid
Baclofen	Itraconazole Oral Solution	Tacrolimus IV or missing oral solution
Basiliximab (Simulect) *Use Globulin from	Linezolid Oral Suspension	Temsirrolimus (Tortisel)
Bevacizumab (Avastin)	Muromonab (OKT-3)	Trastuzumab (Herceptin)
Bivalirudin (Angiomax)	Mycophenolate (Cellcept) IV	Voriconazole Oral Suspension or missing IV
Botulinum Toxin	Nesiritide (Natrecor)	Ziconotide (Prialt)
Cetuximab (Erbixx)	Nicardipine (missing doses)	Other: _____

- Houston Methodist Hospital previously used a paper tracking system for controlled substance delivery
- Challenges with paper-based system
 - Difficulty in auditing
 - Missing time stamps/IDs
 - Sustainability
- Gaps in transparency and accountability of controlled substance dispense process



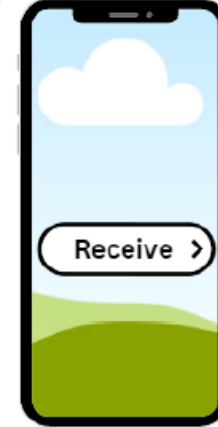
Mobile Device Tracking Technology

- Barcode-enabled mobile medication scanning device integrated with electronic health record (EHR)
- Enables nursing to receive medication on mobile devices and on desktops in the EHR
- Nursing can review medication tracking history

Step 1: Log In



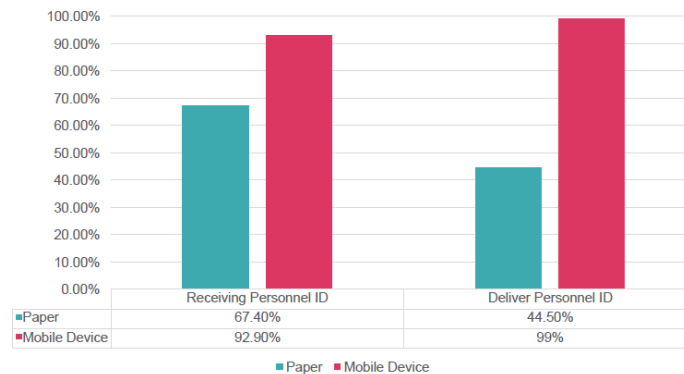
Step 2: Receiving Queu



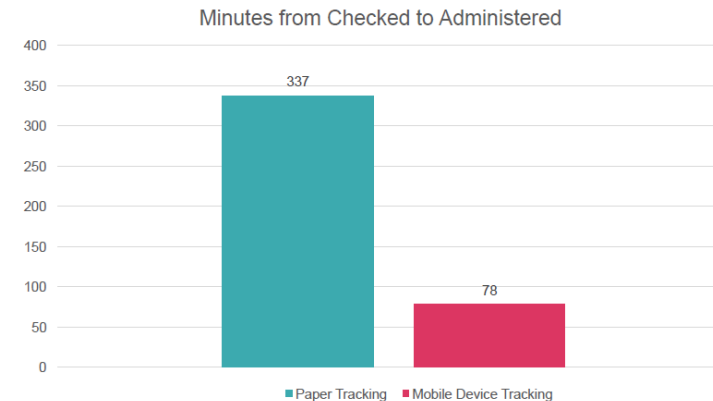
Step 3: Scan and Log out



Results - Identification Capture Rate



Results - Delivery Time



Educational Sessions

Integrated Informatics Institute

Predictive Modeling to Advance Practice

Monday, December 4, 2023 2:00 PM – 3:30 PM Location: ACC, Room 304b, Level 3

CE Credits 1.50 contact hours



Planned in cooperation with the ASHP Section of Informatics and Technology

Activity #: 0204-0000-23-234-L04-P

Activity Type: Application-based

Target Audience: Pharmacist, Certified Pharmacy Executive Leader

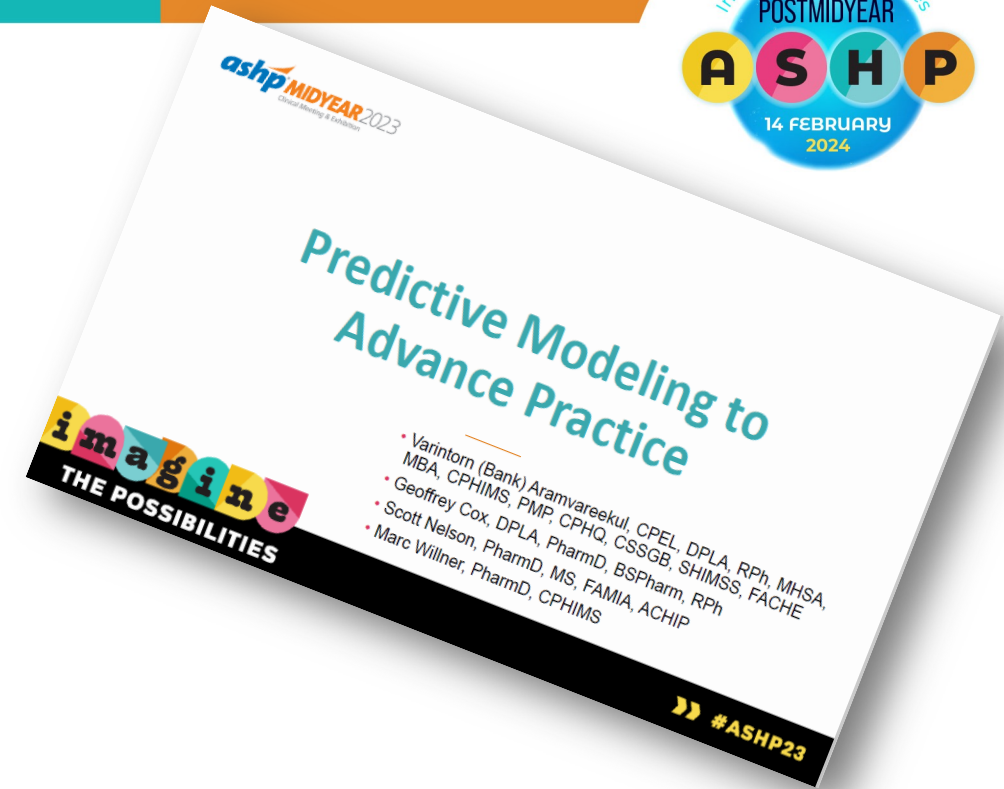
This activity qualifies for live CPELSM recertification credit.

Learning Objectives:

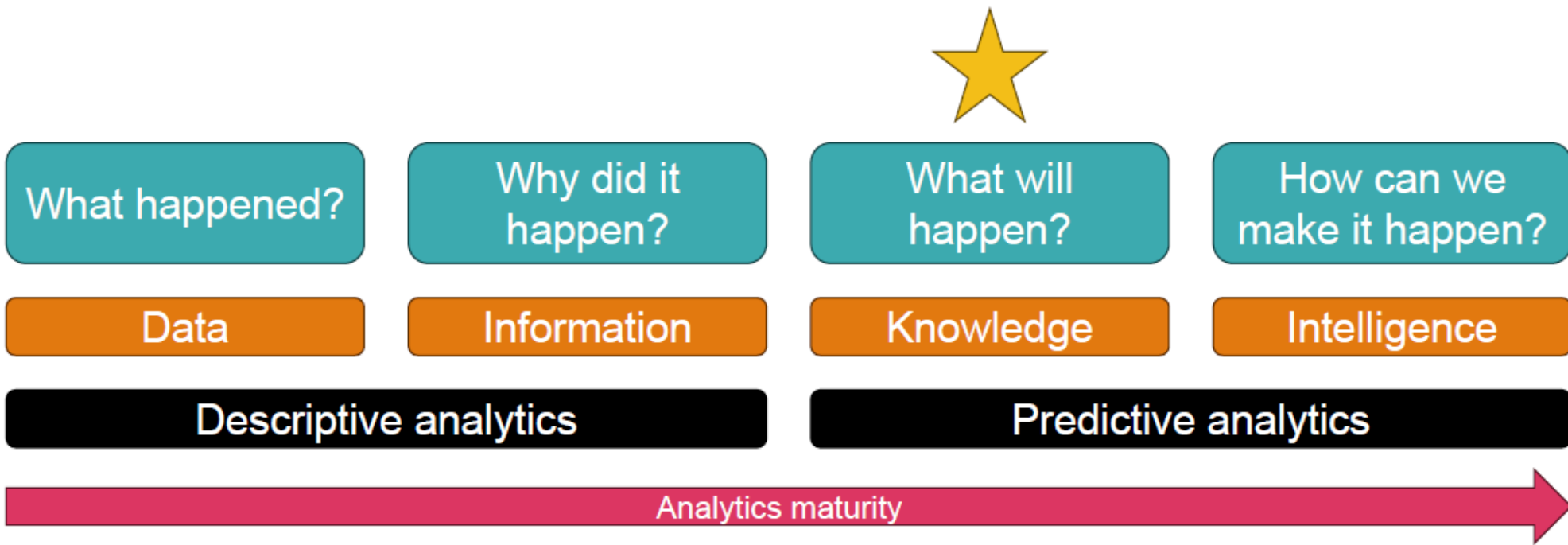
- State examples of where predictive modeling and analytics have been used in other industries.
- Describe opportunities in health-system pharmacies where predictive modeling may be applied.
- Identify clinical scenarios where predictive modeling may be used.
- Summarize ways to use predictive modeling to proactively handle drug and supply shortages.

Nos contaron...

- La importancia y utilidad de los modelos predictivos
- Tipos de modelos y la importancia de su validación
- El uso de la analítica predictiva en otros entornos (medio ambiente, finanzas, educación, recursos humanos, logística...)
- Modelos predictivos en FH
 - Predicción y gestión de desabastecimientos
 - Escenarios clínicos
 - ✓ Riesgo de reingreso a los 30 días
 - ✓ Riesgo de hipoglucemia
 - ✓ Riesgo de gonorrea/clamidia



Me quedo con...



THE POSSIBILITIES




- Hay múltiples maneras de evaluar el rendimiento de un modelo, pero no miden la utilidad clínica ni la factibilidad de implementación
 - Al predecir el futuro, lo más probable es que te equivoques, pero puede ayudarte a prepararte
 - El rendimiento de un modelo disminuye con el tiempo
- Utilizando datos internos de compras, existencias y faltas de medicamentos, utilizando modelos predictivos, se puede revisar e identificar medicamentos con alto riesgo de desabastecimiento
 - Esta información nos ayuda a plantear una estrategia a corto o largo plazo
- No todos los modelos predictivos pueden sustituir a la práctica clínica
 - Es necesario obtener retroalimentación de los usuarios finales cuando se usan modelos predictivos en escenarios clínicos de la vida real

Educational Sessions

Integrated Informatics Institute

(Management Case Study) Development and Implementation of a Drug Interaction Alert for a Multi-Site Anticoagulation Service

 Tuesday, December 5, 2023  3:30 PM – 4:00 PM  Location: ACC North, Room 254, 200 Level

 CE Credits 0.50 contact hours



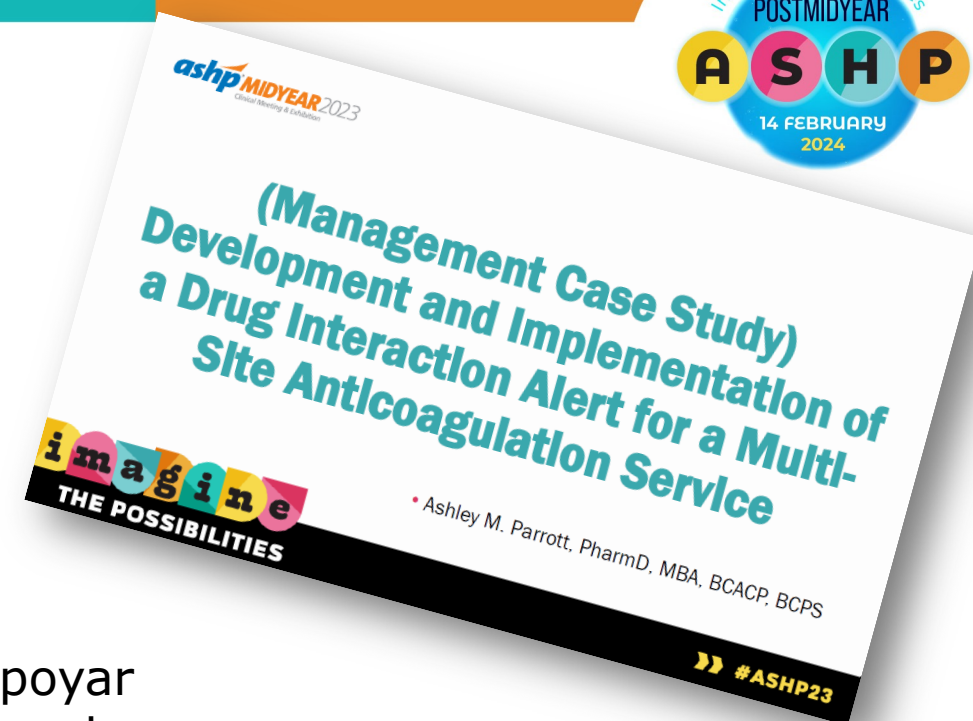
Activity #: 0204-0000-23-379-L04-P

Activity Type: Knowledge-based

Target Audience: Pharmacist

Nos contaron...

- Qué es un sistema de soporte a la decisión clínica (CDS)
- Identificar oportunidades para aprovechar los CDS para apoyar los servicios de gestión de la anticoagulación en un sistema de salud del noreste de Indiana y noroeste de Ohio



Me quedo con...

What is Clinical Decision Support (CDS)?

"...provides clinicians, staff, patients or other individuals with knowledge and person-specific information, intelligently filtered or presented at appropriate times, to enhance health and health care."

– The Office of the National Coordinator for Health Information Technology (ONC)

"...provides timely information, usually at the point of care, to help inform decisions about a patient's care."

– Agency for Healthcare Research and Quality (AHRQ)

<https://www.healthit.gov/topic/safety/clinical-decision-support>
<https://www.ahrq.gov/cpl/about/otherwebsites/clinical-decision-support/index.html>

ashp MIDYEAR 2023
Clinical Meeting & Exhibition

THE POSSIBILITIES

Examples of CDS

General Examples

- Automatic alerts to providers
- Automatic reminders to patients
- Embedded clinical guidelines & other evidence-based references
- Evidence-driven order sets
- Customizable data reports
- Documentation templates

Examples Applied to Anticoagulation

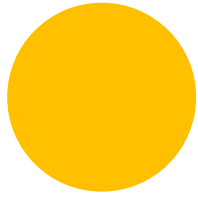
- Order sets or integrated clinical guidelines with evidence-based indications and dosing of anticoagulants
- Point-of-care dosing algorithms
- Patient-specific alerts to support prospective management
 - Perioperative
 - Drug-drug interactions
 - Change in lab values necessitating dosage adjustment

<https://www.healthit.gov/topic/safety/clinical-decision-support>

ashp MIDYEAR 2023
Clinical Meeting & Exhibition

THE POSSIBILITIES

- Los CDS pueden ayudar a mejorar los resultados en los pacientes, reducir costes, mejorar la eficiencia y mejorar la experiencia del paciente
- Es necesario algún nivel de colaboración con los equipos de Sistemas de Información
- Se requiere mantener refinamiento, revisión y actualizaciones después de la implementación para que los CDS sean útiles y basados en la evidencia



Educational Sessions

(Management Case Study) Implementation of a Medication Alert Optimization Committee at a Large Health System

 Tuesday, December 5, 2023  10:15 AM – 10:45 AM  Location: ACC North, Room 254, 200 Level

 CE Credits 0.50 contact hours

Activity #: 0204-0000-23-376-L04-P

Activity Type: Knowledge-based

Target Audience: Pharmacist

Nos contaron...

- Fatiga de alertas en los sistemas de prescripción electrónica asistida
- Es necesario poner en marcha un comité multidisciplinar dedicado a revisar las alertas relacionadas con la medicación en los sistemas de prescripción electrónica asistida

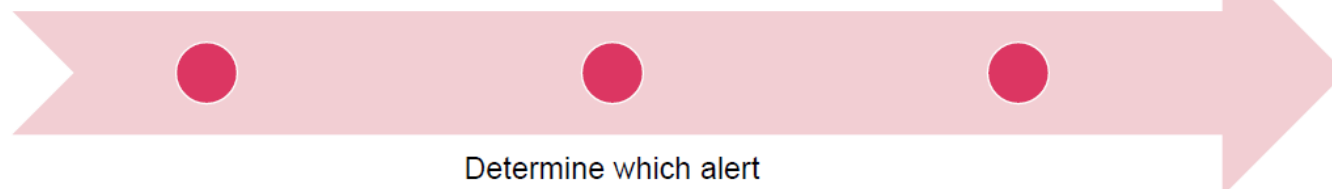


Me quedo con...

Review by alert type

- Drug-drug interactions
- Drug-disease precautions
- Dose range checking
- Duplicate therapy warnings
- Customized medication alerts (developed standard criteria)

Recommendations presented to the system CDS committee for final approval and subsequent build into the new EHR



Determine which alert severity types would display and to whom

Results

Drug-drug interactions

- Fire active alerts for severity of severe or contraindicated (prescribers and pharmacists)
- ~4,300 alerts
- 50% decrease from legacy EHR

Duplicate therapy

- Prescribers – high alert medications (14 classes)
- Pharmacists – all duplicate therapy alerts

Drug-disease precautions

- CPS review → ~300 modifications to reduce nuisance alerts
- Prescribers – contraindicated
- Pharmacists – severe and contraindicated

Dose-range checking

- Pediatric CPS customization
- Limited adult customization




Conclusion

- Successful, systematic review of medication alerts prior to EHR go-live
- ~50% reduction in drug-drug interaction alerts
 - Potential for decreased risk of alert fatigue and nuisance alerts
- Future directions: ongoing alert monitoring and data review for continuous alert optimization

Educational Sessions

Integrated Informatics Institute

(Management Case Study) Expansion of Medication Tray Check Technology Across Multiple Sites Within a Health System

 Wednesday, December 6, 2023  8:00 AM – 8:30 AM  Location: ACC North, Room 254, 200 Level

 CE Credits 0.50 contact hours



Activity #: 0204-0000-23-381-L04-P

Activity #: 0204-0000-23-381-L04-T

Activity Type: Knowledge-based

Target Audience: Pharmacist, Pharmacy Technician

Nos contaron...

- Cómo la tecnología nos puede ayudar a tener siempre a punto y en buenas condiciones (composición, cantidades, caducidades) las bandejas de los carros de parada

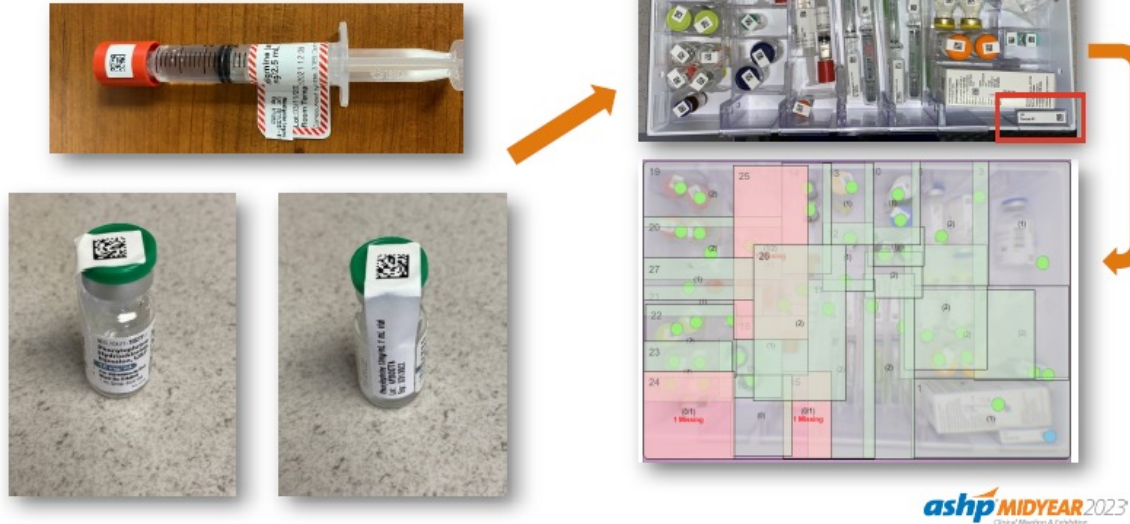


Code Blue!



Me quedo con...

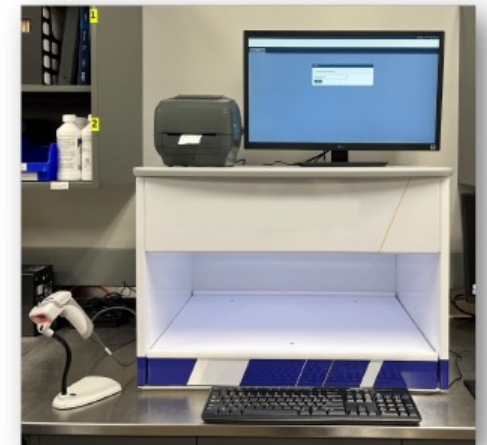
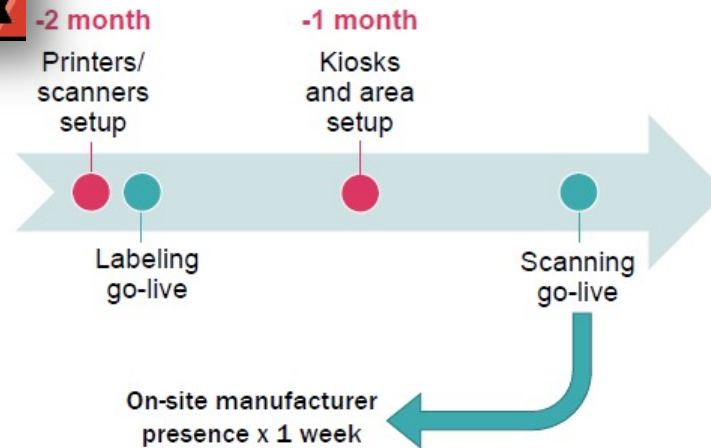
What is TCT?



THE POSSIBILITIES

- Se reduce el tiempo de FH
- Se reduce el tiempo de técnico
- Se asegura la exactitud de las bandejas de medicación

Hardware Installation






THE POSSIBILITIES

Educational Sessions

Innovation

(Management Case Study) Partnering with an Innovation Center to Implement Design Thinking Across the Health System

 Wednesday, December 6, 2023  8:45 AM – 9:15 AM  Location: ACC North, Room 254, 200 Level

 CE Credits 0.50 contact hours

Activity #: 0204-0000-23-382-L04-P

Activity #: 0204-0000-23-382-L04-T

Activity Type: Knowledge-based

Target Audience: Pharmacist, Pharmacy Technician

Nos contaron...

- Identificar cómo las etapas del desing thinking fomentan la innovación en la atención al paciente
- Describir cómo se puede aprovechar la colaboración entre los sistemas sanitarios y los centros de innovación para catalizar la soluciones innovadoras entre los líderes farmacéuticos



Me quedo con...

The Need for Innovation

Few pharmacy leaders are equipped with the knowledge and skills to foster innovation in healthcare.

Quality improvement isn't enough.


- Often reactive in nature
- Focuses often on safety in the healthcare setting
- Fosters *efficient* problem-solving rather than *creative* problem-solving

Design thinking is an approach to creative problem-solving that is applicable to healthcare, easy to understand, and replicable.



Stages of the Design Thinking Process




Empathiz


Goal
Understand people

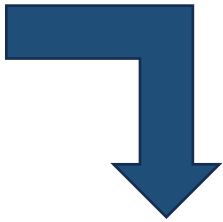
How
Engage
Observe
Immerse




Define


Goal
Understand the problem

How
Unpack the data
Examine the needs
Generate insights





Ideate


Goal
Generate a large quantity of ideas

How
Brainstorm individually and collectively
Categorize ideas



Prototyp


Test


Goal
Develop a prototype that can be tested

How
Create a minimal viable product to test
Envision using storyboards

Key Takeaways

Design thinking is a useful approach for fostering innovation within healthcare settings.

Working closely with academic and innovation partners can catalyze training opportunities for pharmacy leaders.

Continuing education credit augmented the benefit of the event.

Imagine the possibilities

THE POSSIBILITIES



¡Pero mereció mucho la pena!



¡GRACIAS!