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Self-assessment Booklet

for

AMIA 2020 Virtual Clinical Informatics Conference – live meeting and enduring material

Both the virtual streaming live conference and the enduring material version of this activity are certified to offer CME and CNE credit. AMIA invited conference presenters to create multiple choice questions related to their sessions so that you may assess what you learned and so that you have a reference tool in the months ahead. Members of AMIA's Continuing Professional Development Subcommittee reviewed the questions and edited for clarity.

All attendees at the live AMIA 2020 Virtual Clinical Informatics Conference may use this booklet as a self-assessment tool and reference.

If you are participating in the enduring/asynchronous version of this activity, you should self-assess and score at least 75% before evaluating the activity and claiming your CME/CNE credit.

Part 1: Multiple Choice Questions associated with each CE-certified session

Part 2: Answers, explanations, and references

Use the pdf bookmark feature so you may quickly check answers after you have read the questions related to the session you are attending.

Part 1: Multiple Choice Questions Associated with Each CE-Certified Session

W01: Workshop - FHIR Starter: Building Your First SMART on FHIR App

Joshua Herigon, Colby Uptegraft

W01-1: You are working to make sharing of patient allergies easier and more transparent using Fast Healthcare Interoperability Resources (FHIR). Your methods for recording allergies specifically calls out food allergies as distinct from drug allergies. In looking at the "AllergyIntolerance" specification in FHIR Version 4, you note that in the base specification there is no distinct concept for delineating "food allergy" or "drug allergy" for the resource. Which of the following is the most appropriate to overcome this?

A. Extension
B. Implementation guide
C. SMART
D. The Argonaut Project

W01-2: When designing an app that will be used in health care settings, steps should be taken to maximize patient safety. Because drug names can have similar appearances, what is one step you can take to alert users to dissimilarities in order to enhance differentiation?

A. Camel casing
B. Tall man lettering
C. Using brand names instead of generic names
D. Title casing

W01-3: Health Level Seven International (HL7) created Fast Healthcare Interoperability Resources (FHIR) as a new healthcare data model and exchange standard. How is FHIR different from previous HL7 standards, including HL7 versions 2.x and 3.x?

A. FHIR uses modern web-based protocols
B. FHIR allows Extensible Markup Language (XML) for data representation
C. FHIR does not allow for any local customization
D. FHIR is truly vendor agnostic and does not require any implementation guides or profiles

W06: Workshop - Operational and Practical Aspects of Clinical Knowledge Management

Dominik Aronsky, Saverio Maviglia, Roberto Rocha

W06-1: What is a logical first step in starting a clinical knowledge management program within the iterative knowledge management framework?

A. Establish a knowledge asset lifecycle

B. Build standards-based interoperable knowledge assets

C. Centralize the process of creating knowledge assets

D. Create a catalog of existing knowledge assets including relationships with metadata

W06-2: What activities are least likely within the scope of a clinical knowledge management framework?

A. Integrate knowledge assets into clinical workflow

B. Build a sustainable knowledge asset framework with reusable components

C. Maintain the representation of knowledge assets

D. Provide knowledge lifecycle support

W06-3: Select the most likely role domain experts (or subject matter experts) fulfill within the context of a knowledge management lifecycle?

A. Review quality measures and propose new knowledge assets

B. Critique asset specifications and share expertise during knowledge engineering sessions

C. Author new knowledge assets using tools available within clinical knowledge management systems

D. Support end-user adoption of new knowledge assets

W06-4: According to Wright, what is the most common cause of CDS malfunctions?

A. Software and content upgrades

B. Database corruption

C. Human error

D. Inadequate testing prior to release

W08: Workshop - Organizational Issues and Informatics: Translating Theory into Practice - *Saira Haque, Kim Unertl*

W08-1: When implementing health information technology, why is it a good idea to consider organizational theory when developing an implementation plan?

A. Academics love theory

B. To help identify concepts that are relevant for informatics practice

C. It doesn't make a difference

D. To inform your organization as a whole

W08-2: What paradox led to the research that established Sociotechnical Systems Theory?

A. The Profit Paradox, that profits were elevated when new technology was implemented

B. The Happiness Paradox, that workers were happier when their work was going poorly

C. The Productivity Paradox, that despite improved equipment and better working conditions, productivity went down

D. The Despair Paradox, that the better technology got, the less happy workers became

W08-3: Everett Rogers identified four major elements in how innovations are adopted in groups, as part of his Diffusion of Innovations Theory. What were the four elements?

A. The Innovation, Communication Channels, Time, A Social System

B. The Bosses, The Workers, The Tools, The Organizers

C. Advertising, New Technology, Coordinators, End Users

D. Great Ideas, Software Developers, Sales Representatives, Time

W08-4: Why is the low point of the Change Curve Model sometimes referred to as the "Valley of Despair"?

A. People like to whine

B. People worry for no reason when productivity goes down

C. When productivity dips because of new technology, people have a hard time understanding how the technology might help them in the future

D. The implementation productivity dip does not actually exist, but is rather just a theoretical model that has been disproven by years of technology implementation

W09: Workshop - Machine Learning Basics for Informatics Professionals

Robert Hoyt

W09-1: Your hospital in NYC now has clinical data on 500 COVID-19 hospitalized patients. You are on a clinical research team that is developing a model to predict COVID-19 mortality (survived vs. died). Which machine learning method would you use?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

W09-2: You are on a bioinformatics team at a large healthcare system. The system now has a large genomic database integrated with EHR data, stored in an enterprise-level database. Your team is trying to determine if COVID-19 patients have any unusual genomic patterns. Which machine learning method would you use?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

W09-3: Your CEO is concerned about the length of stay for uninsured asthmatic patients at your hospital who are admitted from the emergency department. Your data science team has excellent ED data that includes cost data, clinical data, and demographic data. What machine learning method would you use to predict hospital length of stay?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

S01: Panel - Electronic Personal Protective Equipment (ePPE): A Strategy to Protect Emergency Department Providers During the Age of COVID-19

Michael Ward, Trent Rosenbloom, Daniel Savage, Ryan Ribeira, Patrice Callagy

S01-1: What central feature distinguishes electronic personal protective equipment (ePPE) from telemedicine?

A. The patient can see the provider outside the glass door

B. The patient and provider are in the same location

C. The provider is at home, but there are other providers to care for the patient

D. The use of non-encrypted software when performing an ePPE

S01-2: What overall group of billing codes would be most appropriate for an emergency medicine ePPE based evaluation/medical screening examination?

A. Traditional emergency medicine evaluation and management codes

B. Emergency medicine telemedicine evaluation and management codes

C. Outpatient clinic telemedicine evaluation and management codes

D. Initial hospital evaluation and management codes

S02: Presentation: Next Level Clinical Decision Support: Higher Expectations and Better Outcomes

Improving Clinical Decision Support for Lung Cancer Screening in an Electronic Health Record - *Nicholas Riley*

S02-1: A health care system wishes to improve its lung cancer screening rates. What is the most appropriate next step?

A. Implement CDS to determine lung cancer screening screening eligibility based on EHR data

B. Identify and address issues with the design and implementation of EHR tobacco smoking history collection

C. Address differences between Medicare Advantage programs in coverage of low-dose CT scans

D. Send reminder messages to patients meeting lung cancer screening eligibility criteria based on EHR data

HIV-ASSIST, a clinical decision support tool to guide ARV selection – *Manoj Maddali*

S02-2: What is multiple-criteria decision analysis (MCDA)?

A. A stochastic model to evaluate randomly changing systems

B. A quantitative framework to simultaneously evaluate all decision considerations and compare across multiple conflicting outcomes of interest

C. A type of machine learning technique to predict healthcare outcomes

D. Difference in cost between two possible interventions divided by the difference in their effect

S03: Presentation: Social Determinants and Health Assessment

The Synergistic Effects of Social Determinants of Health and Racial-Ethnicity on 30-day Readmission Disparities in an Inpatient Population - *Wan-Ting Su*

S03-1: This study applied multiple analytic methods to investigate how the combination of social determinants of health (SDH) and race-ethnicity impact disparities in 30-day readmission. Based on the identification of sub-groups of patients at the highest risk of readmission, these findings will be used to establish priorities for limited resources to reduce readmission.

Which of the following is most appropriate statement to describe the synergistic effects of SDH and race-ethnicity on readmission disparities from different perspectives using multivariate logistic regression analysis (MLRA) and latent class analysis (LCA)?

A. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients was significant, but insignificant for White and African American patients.

B. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that Hispanic patients had the largest effect of depression on readmission compared to White and African American patients.

C. LCA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients, White, and African American patients were all significant.

D. LCA - In the high-readmission group, the majority of patients were Hispanic patients and had the high proportions of nearly all SDH.

E. LCA - In the high-readmission group, the majority of patients were African American and there was only high proportions of depression.

S04: Panel - Development and Validation of an Efficient, Effective, and Satisfying EHR Based on Clinician-Centered Design

John R. Windle, Thomas A. Windle, Martina A. Clarke, James E. Tcheng

S04-1: The Panel emphasized the use of functional usability to optimize the electronic health record. Functional usability requires measuring & optimizing:

A. efficiency, effectiveness, satisfaction

B. design, planning, testing,

C. data flow, workflow, cognition

D. time, satisfaction, ergonomics

S04-2: The Panelists interviewed physicians and advanced practice providers to better understand the barriers, wants, and needs of clinicians. Clinician-centered design principles applied to EHR functionality will likely reduce clinician burn-out through which of the following mechanisms?

A. Additional revenue realization

B. Reduced clinician cognitive load

C. Better patient engagement

D. Increased note bloat

S05: Presentation: Enhancing the Patient Care Experience Through Telehealth

Patient data, outcomes and perspectives in a remote monitoring program: realizing a comprehensive digital medical home strategy – *Emily Webber*

Remote home monitoring was implemented as a digital adjunct to a comprehensive cardiac medical home in the program presented. The following were all components necessary in adopting the technology except:

A. Alignment with parent/guardian questions used in national benchmarks

B. Strong multi-disciplinary collaboration and clinical team in place

C. Consideration of revenue stream supported by remote monitoring and EMR documentation

D. Consistent use of tablet protection cases

Utilization of Telemedicine in Pediatric Rheumatologic Care - *Rajdeep Pooni*

S05-1: Pediatric subspecialty video visits may vary in many ways including exam, communication, and ancillary needs following the visit. Like adult patients, pediatric patients/subjects have identified which of the following themes when considering video visits for follow-up care:

A. Convenience, Communication, Comfort, Time savings)

B. Cost, Audio, Connection felt with primary care provider

C. Duration, Comfort with parent guardian, Background noise

S06: Presentation: Tackling Clinical Problems with Quality Improvement Approaches

The EQUIPPED Potentially Inappropriate Medication Dashboard (EPIMD): A Suitable Alternative to In-Person Academic Detailing? – *Zachary Burningham*

S06-1: A primary care provider wishes to identify patients in his/her panel at risk for psychiatric hospitalization. This provider does not have access to a care manager with the needed bandwidth to identify patients at risk. Fortunately, a Psychiatric Hospitalization Risk Assessment Dashboard exists, which identifies patients in a PCP's panel with a high probability of a psychiatric admission in the next 90 days. Which of the following Psychiatric Hospitalization Risk Assessment Dashboard components are most important to ensuring the PCP is effective at reducing the risk of a psychiatric admission amongst their patient panel?

A. In addition to displaying a patient's risk of a psychiatric admission over the next 90 days, the dashboard also provides detailed information on patient demographics.

B. The dashboard contains functionality that allows for the exportation of data and visuals to excel, pdf, and other commonly used formats.

C. The underlying data that supports this dashboard are updated nightly so that the end user can access the dashboard at any time to determine whether they are having a meaningful impact on risk reduction.

D. The backend data structure that supports this dashboard has been optimized to ensure load times when drilling down on different views are less than 1 second in duration.

Tackling Problematic Problem Lists: A Quality Improvement Approach – *Jennifer Lee*

S06-2: Quality improvement involves doing small tests of change. Which of the following is the correct order for executing a test of change?

A. Plan, Act, Study, Do

B. Do, Study, Act, Plan

C. Plan, Do, Study, Act

D. Plan, Study, Act, Do

S07: Panel - Technology and Person-generated Health Data to Enhance Shared Decision Making: The Current State and Future Opportunities

Katherine K. Kim, Patricia D. Franklin, Sarah M. Greene, Margo Edmunds

S07-1: Several models exist for large-scale culture change in health care delivery that seek to improve experience, quality and engagement. Among these models are the Chronic Care Model (a systems model that explains both the delivery of chronic care and self-management), Patient-Centered Medical Home (a healthcare delivery model that centralizes and streamlines care into a "home"), and Open Notes (a movement to make clinical notes in the electronic health record available to the patient). Central to these models is a focus on data-enabled shared decision making and the clinician-patient interface. Data include both clinical and person-generated health data which can provide a comprehensive view of a person's health and wellbeing. Despite the promise, wide-spread improvement in outcomes related to healthcare experience, quality and engagement have not yet materialized.

What is a common attribute across all three models mentioned?

A. Recognition of the importance of self-management

B. Use of electronic health data to create productive interactions between clinicians and patients and across different types of encounters

C. Leadership expressing explicit support for shared decision-making

D. Widespread adoption of "open" medical records

S07-2: One definition of person-generated health data (PGHD) is health-related data created, recorded, gathered, or inferred by or from individuals or their designees to help address a health concern. One distinction of PGHD from clinical data is the fact that it is generated by the individual rather than the healthcare delivery setting. PGHD in shared decision making can be collected or shared using a variety of technologies including web-based portals, personal health records, wearable devices, smartphone applications, and sensors. Which of the following is the best example of PGHD?

A. Lab test results available to a patient in a web portal

B. Alerts sent to a phone from a door webcam for the purpose of home security

C. Patient consent form for treatment

D. Symptoms reported via a smartphone application

S08: Presentation: Informatics Solutions to Improve Patient Safety and Quality

Hidden Harm: Clinical Informatics and Health Policy Dimensions of a Prescription Monitoring Program Safety Event – A Clinical Case Report - *Joel Betesh*

S08-1: An attending physician searches the Drug monitoring program on an inpatient through his EHR and sees 20 controlled prescriptions filled on a patient over the last two years. He directs his resident to write a prescription for a narcotic for the patient to take at home. Later that day when the patient is being discharged the resident does her own search and only sees two controlled substance prescriptions written over the past two years. The resident is puzzled by the discrepancy between her search results and the attending's search results. The course of action with the broadest impact and the most likely to get to the root cause of the problem would be to:

A. Assume that the longer list seen by the attending is the more accurate one.

B. Question the patient about how many controlled substance prescriptions he had filled in the past 2 years.

C. Call the patient's pharmacy to see what controlled prescriptions they have on record for the patient.

D. File a Safety report with the hospital to investigate and see whether this problem might be affecting other patients as well.

Big Data Analytics and Visualization Break QI Silos and Empower Precision Targeting of Interdisciplinary QI: The INFECTALYTICS Project – *Allen Bryan*

S08-2: A practitioner has observed a quality improvement gap in the titration of heparin in anticoagulated patients. The current system permits lag at peak chemistry testing volume as the laboratory prioritizes STAT orders and critical values. Practitioners have responded by marking all routine coagulation panels as STAT, which is impacting other patient's timely results while still not fully alleviating the problem with lag in resulting coagulation values.

The practitioner wishes to set up a multidisciplinary virtuous cycle model using holistic Big Data analysis of the patient population's test histories. What is the FIRST step in setting up the virtuous cycle?

A. Evaluate the feasibility of possible interventions to alleviate the lag problem

B. Assess the administrative and financial impact of addressing the lag problem

C. Define the quality gap in a measurable, structured manner and identify influencing factors

D. Recruit subject matter experts from lab staff, providers, and data support personnel

S08-3: Your quality improvement data team has identified a number of linkages between various factors causing a quality gap. These factors include a wide variety of sources, ranging from timestamps of collection and report views, to patient demographics, to provider service lines and rounding workflow models. The team is considering proposed visualizations to best convey the results for practitioners. One panel member complains that visualizations are difficult to read and asks why good old bar charts and scatter plots are not being used. What is the best response to her query?

A. Timelines are a better visualization because time is the most important factor to consider

B. Visualizations work best when they reflect the types of data being presented

C. Choosing the wrong visualization can confuse practitioners

D. There are too many variables to use scatter plots

S09: Ignite-style Talks 1 - Igniting Strategies to Tackle Burnout

Echoes of Overload: Sensing Clinician Adaptation to Time Pressure – *Dana Womack*

S09-1: A hospital wishes to analyze workplace data to support collaborative human-machine workplace monitoring and early recognition of supply-demand imbalance at the bedside. Which of the following common workplace activities has least time delay between the actual event and data production about that event?

A. Documentation of patient assessment

B. Documentation of intake and output

C. Record of a communication event such as a phone call

D. Documentation of a missed meal break

The Effects of a Problem Oriented View on Clinician Workflow - *Michael Semanik*

S09-2: A problem oriented view allows for:

A. A clinician to see all the information relevant to managing a problem in a single location

B. An administrator to see the number of patients with a specific problem

C. A business analyst to organize their work by problem

D. A nurse to prioritize the patient list by number of problems

Inbasket Diet Plan: - Strategy to Reduce the Weight of the EHR Inbasket – *Nitu Kashyap*

S09-3: The CMIO of a large organization is assigned to develop action items related to decreasing EMR "pajama time" for clinicians practicing within the organization. In addition to eliciting feedback from frontline clinicians, which of the following would be most appropriate next step?

A. Propose a scribe program for all clinicians

B. Propose switching from desktops to tablet devices for EMR access during patient visits

C. Review trend data on time spent and type of activities in EMR outside of business hours

D. Review specialty notes to assess document length and use of copy/paste function.

S09-4: An Informatics physician is tasked with 'fixing' the EHR inbasket burden at her organization. To understand the problem, she meets with several colleagues who had expressed concerns. Reports and trend data suggests that there is opportunity to improve incoming volume of inbasket messages. In deploying a strategy for improving provider experience with the inbaket, which of the following is the most appropriate outcome measure to track?

A. Incoming inbasket message volume

B. Number of inbasket message folders

C. Number of providers who delegate inbasket to a team member(s)

D. Time spent in inbasket

The Practice Experience Program (PEP)– Helping physicians finish faster - *Scott MacDonald*

S09-5: Although perhaps not causal, burnout is associated with EHR use, and efforts to improve facility and efficiency with this tool should improve physicians' experience and ability, and may lead to decreased burnout symptomatology. A combination of group learning and tailored one-one-one sessions has been demonstrated to improve:

A. Higher distribution of billing codes

B. Patient satisfaction with their care

C. Physician satisfaction with informatics tools

D. Burnout rate

S09-6: Data on gender identity and sexual orientation is needed in the EHR in order to identify and reduce disparities, as well as to provide appropriate and patient centered care. Once any technical barriers are overcome, and structured data fields and their downstream dependencies have been assessed and mitigated, various change management and psychosocial issues come to the fore.

These can be uncomfortable questions for some clinicians to ask, and for some patients to answer. Which of the below is most important to surmount barriers and successfully capture this information?

A. Feedback from patients on how they would prefer to be asked

B. Physician training on importance and approaches to 'how to ask'

C. Engagement from leadership as to 'why to ask'

D. Workflows for office staff to routinely capture this information

S10: Panel - Unleashing the Potential of the EHR

- *Amy Chaumeton, Chris Clune, Rod Tarrago*

S10-1: Among hospital-based physicians, what percentage of the EHR user experience is attributable to the EHR vendor?

A. 12%

B. 40%

C. 22%

D. 67%

S10-2: Organizations have very little control over the EHR user experience and should rely upon the vendor to handle this matter in most cases.

A. True
B. False

S10-3: What three areas can organizations focus their attention and efforts on to improve EHR user experience?

A. Workflow Efficiency, User Mastery and Governance

B. User Mastery, Shared Ownership and Personalization

C. Code Upgrades, User Mastery and Training

D. Clinical Leadership, Support and Personalization

S11: Presentation: Beyond Desktop: Mobile and Messaging Innovations to Drive Care

Developing a Sustainable Secure Messaging Platform – *Matthew Cain*

S11-1: A healthcare facility has decided to investigate secure messaging platforms to replace the current paging system. Each system has its pros and cons. Which of the following is a key benefit of transitioning to secure messaging?

A. Secure messaging will be much easier to use for younger and older physicians alike. Therefore, education and policy changes will be minimal.
B. Individuals have often abused the paging system whereas secure messaging naturally curbs inappropriate messaging.
C. Secure messaging platforms are typically HIPAA compliant; pagers traditionally are not.
D. Secure messaging is highly adaptable; therefore, services should not have to alter their workflow significantly.

EHR-Integrated Core Competency Reporting - A story from the cath lab – *Emeka Anyanwu*

S11-2: A hospital's procedure service is looking to keep track of the procedures that residents and fellows do while on the procedure rotation. They have asked the hospital's EHR team to help them implement automated structured reports based on their procedure reports in the EHR. What is a potential disadvantage to implementing educational experience reporting based on the clinical record?

A. Trainees spend less time per case documenting their involvement
B. Changes to clinical documentation structure can result in changes educational reporting
C. Educational reporting data is warehoused using the same resources as clinical data
D. Less exposure of personal health information

S12: Presentation: Higher, Further, Faster! Continuous Improvement in Clinical Informatics Processes

Quantifying discharge medication reconciliation accuracy at scale – a semi-automated, multi-institution, retrospective review - *Keith Morse*

S12-1: Which of the following is **NOT** a commonly used method to identify medication reconciliation errors that occur during a hospitalization?

A. A system of tracking self-reported medication errors.
B. A pharmacist reviews medications with the patient prior to discharge.
C. A nurse reviews medications with the patient prior to discharge
D. A FHIR-based app on the patient's smartphone stores a list of the patient's home medications and automatically compares it to the reconciled medications.

Accelerating Change - Agility in governance and build drive faster, cleaner optimization - *Amy Miller*

S12-2: The ACE methodology at Partners was a success as demonstrated by which of the following?

A. It ensured that all sites had a voice in all decision making

B. It enables successful build even with new / inexperienced or weak analysts

C. It reduces the "cost" of the team by not requiring any involvement of physicians

D. It delivered more changes and more impactful changes

S13: Panel - So You Want to be a Clinical Informatician?

– *Noellee Clarke, Paul Fu, Natalie Pageler, Shama Patel, Thomas Payne, Emily Webber*

S13-1: Which of the following statements is **false** about clinical informaticians?

A. The practice pathway eligibility is planned through 2022.

B. Board-certified clinical informaticians also hold a primary clinical board certification.

C. All clinical informaticians take a specific set of data science classes in medical school.

D. Clinical informaticians had an evolving set of responsibilities.

S13-2: Many clinical informaticians will see their careers adapt to the changing needs of health care systems. Being a clinical content expertise is helpful in driving specific work; however, clinical informaticians are required to understand clinical workflows in all venues. Which of the following were most instrumental to success in leading clinical informatics success:

A. Knowledge of video conferencing applications

B. Ability to embrace continuous learning and organizational change

C. Building an app

D. How to add a printer

S14: Presentation: CDS and Physician Diagnostic and Treatment Efficiency

Implementing Age-Specific CDS Promotes Adherence to Duration Guidelines for Acute Otitis Media in the Pediatric ED - *Jonathan Beus*

S14-1: As a clinical informaticist, you have been asked to help develop clinical decision support for appropriate antibiotic prescribing for acute otitis media (inner ear infection) in children. The appropriate duration of therapy according to the best available evidence varies by patient age. Of the following, which is most likely to be acceptable to the user and provide optimal care to the patient?

A. Provide a one-time education session for providers and post guidelines to an internally accessible website. Leave the default durations for antibiotics blank/empty.

B. Implement an order set to dynamically present the age appropriate durations. The order set will be "suggested" based on chief complaints or visit diagnoses.

C. Create an interruptive alert that prevents completion of a prescription if the duration does not match the age appropriate recommendation.

D. In the "plan" section of the provider documentation template for ear complaints, include a drop-down list of age-based durations to remind the prescriber of the recommended duration.

S15: Presentation: Informatics and Public Health

Visualizing Opportunity Index Data using a Dashboard Application – *Naleef Fareed*

S15-1: How were the variables of the seven domains of the Ohio Opportunity Index reported in the Opportunity Index Dashboard?

A. Raw values

B. Logged values

C. Inverse values

D. Standard deviations

Using CQL to Compare CDC Opioid Prescribing Guidelines with Washington State Regulations
– *Maggie Dorr*

S15-2: A healthcare IT professional has created a program using HL7 standards that they think could be helpful for other facilities. Which is the most appropriate strategy to share the application?

A. Create a detailed Word document describing his process.

B. Develop an implementation guide.

C. Share his application in a marketplace/directory.

D. Write an email to his colleagues announcing his new application.

S16: Panel - The Emerging Role of the Electronic Health Record Patient Safety Officer

--Ethan D. Gershon, Jim Russell, Eva Karp, Gianna Zuccotti

S16-1: Healthcare IT is pervasive in clinical practice today and there are a number of moderating and mediating factors for how useful technology is in practice. It will require collaboration across government agencies, healthcare organizations, and health informatics companies to ensure patient safety is kept as a key focus and measurement of effective and safe use of health informatics. Which of the following is the most important process for a HealthIT company to follow to ensure that the software supports a clinician's practice and patient care safety in the design and use of clinical software?

A. HealthIT companies have experienced engineers developing software for healthcare systems to support clinical practice.

B. HealthIT companies have significant involvement of clinical experts, human factors experts, and healthcare providers throughout the development implementation and post-implementation processes to ensure the design and application of technologies in health care are safe, supports clinical practice, and safe patient care.

C. Failure Mode and Effect Analysis (FMEA) is a required process throughout the development process to identify potential process failures before they occur, intending to eliminate them or minimize the risk associated with them.

D. HeatlhIT companies should have automated testing tools for regression testing to ensure the products meet the intended design and enhancements do not introduce errors.

S17: Presentations - Considerations for Utilizing Consumer Focused Technologies

One PROMIS™ at a Time: Implementation of Depression and Anxiety PROMIS™ Domains as a Standard of Care for Adolescents Undergoing Anterior Cruciate Ligament Reconstruction. – *Lia McNeely*

S17-1: A hospital department has implemented a single patient reported outcome questionnaire to a few cohorts of patients within their department. The PRO will be given to patients on an iPad at the time of the visit or prior to the visit through the Patient Portal. The PRO questionnaires are being manually attached by administrative staff to each appointment based on certain criteria. The implementation team trained the provider staff on how to locate the data in the EHR using a reporting tool, and they reviewed with the clinicians the scoring cutoffs for potential interventions. For the first 4 weeks after implementation of the PRO, 85% of patients were completing the questionnaire, but by 12 weeks after implementation the rate had fallen to 50%.

Which of the following answers best explains why this decrease occurred?

A. Most patients were not completing the PRO prior to the office visits, and the department did not have enough iPads to give out during office visits to meet the demand.

B. Providers found it difficult to find the reporting tool and stopped looking for the patient scores.

C. Administrative staff missed many appointments that met the criteria and did not attach questionnaires.

D. Patient's scores were never discussed with them at the office visits and when following up at the next visit many patients opted not to complete the questionnaire since they did not see the point.

S19: Presentation: Experiences with using Applied Clinical Informatics Tools

Speeding Access to Specialty Care with a SMART-on-FHIR Fax-to-Referrals Automation Tool – *Aaron Neinstein*

S19-1: A SMART on FHIR application was developed to enable inbound faxed referrals to be ingested as digital referral objects in the EHR. Which of these is an advantage to using SMART on FHIR for this application?

A. It allows a user to launch the application without a separate log-on and allows demographic data to be easily read out of the EHR into the application

B. It allowed an open source community of developers to contribute software code

C. It was SMART enough to read the data in the inbound faxes

D. SMART on FHIR ensured that the application would comply with privacy policies

S20: Presentations - Informatics and Chronic Conditions

Human-Centered Methods to Inform the Design of Information Technologies for Team-Based Depression Care – *Jina Suh*

S20-1: Human-centered design provides several methods for developing easy to use, accessible, and appealing user experiences. Two methods for early investigative phases we discussed in the presentation are semi-structured interview and contextual inquiry. Below are four benefits of using these methods. Which of the following benefits is a strength unique to contextual inquiry?

A. Enumerate challenges and needs of providers

B. Directly observe care processes and behaviors as they unfold which may be omitted from self-reports

C. Capture qualitative descriptions of care processes, workflows, and roles

D. Identify competing demands for provider attention and resources

Development and use of an advanced patient registry to support team based collaborative care of perinatal depression in community health centers – *Tess Grover*

S20-2: A collaborative care team at a local FQHC has recently started using a patient registry built into Epic to support their perinatal mental health program. As part of their regular weekly workflow, care managers at this FQHC use the registry to sort patients by when they last had a follow-up visit so that they can prioritize reaching out to those patients that have gone more than two weeks without an appointment. Which of the following required functions of an advanced patient registry does this illustrate?

A. Tracking clinical outcomes across a target population

B. Tracking patient engagement across a caseload

C. Prompting treatment-to-target

D. Facilitating efficient, systematic psychiatric caseload review

S22: Presentation: Cybersecurity and Deidentification

Getting in Front of Cybersecurity Frameworks with a Cyber Vulnerability Profile: Assessing Risk from a Different Perspective - *Gemini Majkowski*

S22-1: Data breaches continue to rise and pose significant risk to patient safety, financial loss, litigation, and loss of public trust in our healthcare system. Using the Cyber Vulnerability Profile Framework as a basis for examining U.S. hospitals with data breach and without data breach, which of the four dimensions of vulnerabilities are most likely associated with data breaches in U.S. hospitals?

A. Human Factor & Operational Processes

B. Technology & Human Factor

C. Technology & Organizational Factors

D. Organizational & Operational Processes

S23: Panel - The Critical Role of Clinical Informatics in Addressing the Global Threat of Antibiotic Resistance, Emerging Infectious Diseases, and Healthcare Acquired Infections - *Courtney Hebert, Nirav Shah, Juan D. Chaparro, Ari Robicsek, Keith F. Woeltje*

S23-1: Which of these was the main objection raised by clinical staff about an EHR-based alert notifying front-line providers that an individual lives at an address with another known COVID-19 case?

A. They were concerned that the alert would go off so often, it would cause alert fatigue

B. They were concerned that the alert would lead to workflow disruption during an already busy time

C. They were concerned that it would be challenging to explain to the patient why they are being isolated without a potential HIPAA violation

D. They were concerned that there was insufficient clinical benefit to this alert

S23-2: The COVID-19 pandemic has created challenges throughout the health care system. Which of the following is one reason why there is a need for changes in research informatics infrastructure, that is unique to this pandemic?

A. Because of the urgency and timing of a pandemic, multiple trials are being proposed simultaneously on a similar patient population

B. Because with limited information on treatment for COVID-19, there is a greater urgency to conduct observational research rather than prospective clinical trials

C. Because personal data on patients with COVID-19 is considered protected health information

D. Because there are unique regulatory requirements for diseases that differentially affect children and adults

S24: Presentation: Using Predictive Algorithms for Patient Outcomes

Machine Learning Predicts Catheter Salvage in Pediatric Central Line-Associated Bloodstream Infection – *Lorne Walker*

S24-1: You wish to use your local EMR data to build a model to predict outcomes in CLABSI catheter salvage attempts. While applying this approach to your local patient population, which of the following is true?

A. CLABSI are rare, so EHR-based datasets are necessary to gather adequate sample size to train a predictive model.

B. A predictive model for CLABSI outcome could provide the optimal management strategy for most individuals.

C. Estimates of the likelihood of infection recurrence or catheter loss could augment provider decision making.

D. An EHR-based CLABSI predictive model could reliably predict outcomes in individuals who routinely have their catheters removed immediately.

A Novel Artificial Intelligence Algorithm of Synthetic Sampling for Boosting Accurate Prediction of Infrequent Health Outcomes – *Gang Fang*

S24-2: A prediction model is being built and trained to predict the clinical event of major bleeding among patients taking anticoagulants as prevention management for thromboembolic events. The study cohort has 21,000 patients and 3% of them experienced a major bleeding event while 97% did not. Which of the following is most likely?

A. The 3% major bleeding event rate is called imbalanced data, which may cause low AUC (ROC) problem in the machine-learning prediction model

B. The 3% major bleeding event rate is called imbalanced data, which may cause low specificity problem in the machine-learning prediction model

C. The 3% major bleeding event rate is called imbalanced data, which may cause low sensitivity problem in the machine-learning prediction model

S24-3: Methods to address imbalanced data problem in machine-learning prediction for clinical health outcome data with both numeric and categorical features (predictors) may include:

A. Random over-sampling of original samples

B. Over-sampling using synthetic samples

C. Use AUC as a model performance measure

D. A and B

Prediction of Unplanned Readmission in Infants with Single Ventricle Disease - *Christine Allen*

S24-4: WT is a 3-month-old with hypoplastic left heart syndrome (HLHS) that is home during the interstage period between the first two surgeries for single ventricle heart disease. He is on aspirin and furosemide. He eats all his feeds by mouth. His parents monitor his oxygen saturations, heart rates, weight gain, and video daily. They then enter that data into a mobile health application to transfer to their home monitoring team.

While reviewing the mobile application data, the healthcare team notes that WT has had weight loss for 3 days, high oxygen saturations over the goal of 85%, and harder breathing on his video. In addition, a predictive model calculates WT at a high risk for readmission, a status which has changed from a lower risk for readmission in the previous week. Which of the following best explains these observations?

A. He is having expected clinical changes with his cardiac anatomy.

B. His symptoms indicate possible viral respiratory illness.

C. His symptoms indicate a need for possible cardiac catheterization intervention due to aortic arch obstruction.

D. His symptoms indicate likely pulmonary blood flow obstruction.

S25: Presentation: Innovative Methods in EHR Optimization

Using Computational Ethnography to Measure Changes in Workflow after Implementing Clinical Decision Support – *Jeritt Thayer*

S25-1: A hospital has gone live with a new clinical decision support tool. To ensure it is impacting clinical workflow as expected, system administrators must do which of the following:

A. Trust that developers of the tool knew what they were doing.

B. Use computational ethnography techniques in conjunction with traditional data collection methods on an ongoing basis.

C. Use only computation ethnography techniques.

D. Send out a single survey to a small sample of clinicians who use the tool.

S27: Presentation: Tracking Serious Conditions

Aortic Aneurysm: Informatics Driven Detection, Risk Stratification and Treatment – *Victor Garcia*

S27-1: You are a clinical informatician working at a large hospital. You built an algorithm that predicts whether a patient's abdominal pain is due to a vasculitis. Experimenting on historical data, your algorithm predicts vasculitis with a sensitivity of 60% and a precision of 70%. You are excited to put it to work right away with the added feature of automatically sending your algorithm's results as a message to providers.

With institutional approval, you run your algorithm on the electronic health data of patients currently admitted from the emergency department, and it identifies two patients that may have an unrecognized vasculitis. A few days later, you and your team review the cases, and there is no evidence that the clinicians are treating or working up the patients for vasculitis.

Which of the following is a flaw in your implementation up to this point?

A. Your algorithm was not ready for clinical use because the sensitivity was too low.

B. Your algorithm was not ready for clinical use because the precision was too low.

C. You have not worked with your stakeholders to identify how best to validate and integrate your model into current workflows.

D. Your system should have automatically ordered the appropriate follow-up tests to evaluate for the disease of interest.

Informing colorectal cancer screening in northern Canada using participatory simulation modeling - *Heather Smith*

S27-2: A rural health authority is looking to implement a colorectal cancer screening program in their region. What of the following is most likely to create a bottleneck in the screening process?

A. Media promotion

B. Identifying eligible individuals

C. Delivering fecal stool tests

D. Providing colonoscopy

S28: Presentations - No Pain No Gain: Initiatives Around Improved Opioid Management

A Workflow-Oriented Approach to Clinical Decision Support for Effective Pain and Opioid Management – *Upendra Thaker*

S28-1: Which of the following statements best describes the 2016 CDC guidelines for responsible outpatient prescribing of opioid medications for chronic non-cancer pain?

A. Carefully evaluate the risks and benefits of opioid therapy and minimize risks by using the lowest effective doses as part of a multimodal analgesia strategy.

B. Rely on pharmacists to determine an effective pain management strategy for each patient

C. Never prescribe opioids, and only rely on non-pharmacologic and alternative therapies for pain control

D. Prescribe opioids as a first-line therapy for any reported pain, regardless of pain levels.

S30: Presentation: Using Models to Learn Differences in Populations

Beyond χ2. Finding significant differences in cohort studies despite wide ranging demographic diversity – *Gordon Lemmon*

S30-1: You have patient data that includes demographics and categorical clinical information (ICD diagnoses and procedure codes). What two statistical approaches can be combined in order to discover correlations between categorical variables, while accounting for confounding effects?

A. Logistic regression and Poisson distribution

B. Linear regression and Poisson binomial distribution

C. Logistic regression and Poisson binomial distribution

D. Linear regression and binomial distribution

Results from the first EHR DREAM Challenge: Patient Mortality Prediction – *Timothy Bergquist*

S30-2: A health care system has an EHR repository that follows a well-documented common data model and they wish to host a community challenge using a model to data approach. They choose a clinically relevant question and establish their benchmarks. Which of the following resources will be the most important for enabling challenge participants to successfully run models on the EHR data.

A. A document detailing the distributions of the EHR data.

B. A synthetic dataset that closely mimics the real EHR repository

C. A detailed FAQ hosted on a website

D. An example Docker image.

S31: Presentation: Pragmatic Human-centered Design

Requirements for Inpatient Hand-Off Software: Application of Design Thinking to the User-Centered Design Process – *Ryan Yarnall*

S31-1: A physician practice currently uses a software program and workflow for scheduling patient appointments that often causes scheduling errors and usually creates redundant work. They plan to design a more effective program for office staff. To design a tool that best meets the practice's needs, which of the following is the best first step in the design process?

A. A representative office staff member with informatics training creates a design based upon his experience.

B. A contracted developer presents three potential scheduling tools to select from that were designed in consultation with other developers working in different industries.

C. Leadership arranges a conference between a design team and physician champions to rank scheduling tool prototypes using a validated usability assessment.

D. A design team surveys physicians and office staff at the practice to understand what makes the current system ineffective and inefficient.

Addressing Preventative Care Gaps Using Robotic Process Automation at Bedside - *Joshua Lystra*

S31-2: Your health informatics team to would like to evaluate the use of Robotic Process Automation in care gap closure at bedside in a primary care clinic, which is the most likely LEAN system tool to implement to ensure your team performs real time analysis of root cause problems related to care gap closure?

A. Carry out a Gemba walk to observe team performance as care is provided or received.

B. Implement the “5S methodology” to reduce waste and standardize work.

C. Apply the principles of the "eight wastes" to help reduce care gap opportunities.

D. Participate in a Kaizen event.

S32: Panel - Threading the Needle: Protecting Vulnerable Adolescents’ Confidentiality in the EHR Without Information Blocking

Jennifer Lee, Jeffrey Hoffman, Chethan Sarabu, Natalie Pageler

S32-1: An important early step of natural language processing is preprocessing the free text. Which of the following describes the process of tokenization?

A. Removing punctuation

B. Dividing text into single words

C. Dividing text into bigrams (groups of 2 words, with occurring frequency)

D. Dividing text into trigrams (groups of 3 words, with occurring frequency)

S32-2: Confidentiality laws protecting adolescents vary by states. Adolescents are protected in most states by which of the following categories?

A. Mental health, Medication history, Reproductive health

B. Reproductive health, Mental health, Substance abuse

C. Oncology, Mental health, Substance abuse

D. Reproductive health, Oncology, Substance abuse

S33: Presentations: Organizational Considerations for Achieving Clinical Informatics Success

Encouraging Collaboration Between Applied and Academic Informatics Staff: The Case of the Vanderbilt Clinical Informatics Center – *Adam Wright*

S33-1: Which of the following resources has been demonstrated to be useful for connecting clinical informaticians with resources they need to do their job?

A. A community-edited knowledge base

B. Biostatistical consulting services

C. Facilitation of collaboration

D. Value sets

HIT Capability Maturity Model: Strengthening the HIT Ecosystem through Self-assessment – *Jennifer Shivers*

S33-2: Please select the best answer below. The ECCM maturity model and Toolkit promote a learning health system by

A. Creating a standardized evaluation system that allows comparing different health facilities HIT abilities.

B. Defining a recipe that can quickly be used to fill in any gaps in facility HIT system requirements.

C. Ensuring that HIT systems will all reach maturity in each domain.

D. Providing a model that allows a facility to self-assess and make a plan for continued improvement.

S34: Panel - From Burnout to Wellness: Investing in People to realize the Value of IT Investment

Lu de Souza, Susan Locke, Michael Ross, John Schultz

S34-1: A strong Net EHR Experience Score is correlated with lower burnout; the more satisfied providers in a certain organization are with their EHR, the less likely it is that many providers in that organization are experiencing burnout.

The single greatest predictor of user experience is:

A. EHR vendor software choice.

B. EHR vendor software version.

C. Percentage of operating budget spent on IT

D. Perceived EHR training quality.

S34-2: A well- functioning care team improves patient outcomes, reduces repetition and incongruities in care, and improves patient satisfaction. Patients who think their care team works well together tend to report better experiences and feel safer. Studies have shown that team-based care also reduces clinician burnout.

Investing in a high-quality team-based training program overcomes the following barriers to team based care:

A. Financial Barriers
B. Inefficient and outdated workflows in the era of the EHR
C. Lack of clearly defined roles for team members
D. Regulatory barriers

S34-3: Adoption is the continuous process of keeping software users informed and engaged, providing innovative ways for them to become proficient in new tasks quickly, measuring changes in critical outcomes, and striving to sustain that level of performance long-term. Adoption is not a snapshot at a single point in time; it is a motion picture. Which of the following practices is most important to develop an ongoing, long-term adoption model?

A. Enforce mandatory adoption education for all users
B. Evaluate and share analysis of provider clinical and operational metrics before, during, and after adoption classes
C. Offer multiple classes at a variety of times to engage different provider populations
D. Provide Easily Readable Handouts and course aides

S34-4: Known barriers to provider enrollment in a software adoption training curriculum include cost, staffing support, provider productivity, institutional change management, and organizational culture. Of the following factors, which aspect is MOST likely to improve these barriers.

A. a coexisting Train-the-trainer program
B. administrative support
C. leadership buy-in/protected provider time for classes
D. providing food and drink during classes

S35: Presentation: Making it Actionable

An Infrastructure for Value Set Creation and Maintenance Utilizing a Clinical Interface Terminology – *Eric Rose*

S35-1: Which of the following is one of the layers of the architecture presented for building value sets based on clinical interface terminology (CIT)?

A. A standardized quality metric definition expansion

B. A value set expansion with codes from standardized health vocabularies such as SNOMED CT

C. Computable value components (""Outcome Code Maps"")

D. Human-readable definitional components (name, scope, inclusion criteria, exclusion criteria)

Meaningful, Actionable Pharmacogenomic Patient Results – *Adam McDermaid*

S35-2: Pharmacogenomics provides a route to identify how a patient will respond to specific medications before they have been prescribed based on the patient's genetic code and can provide information as detailed as whether the patient would need a higher or lower dosage. This allows for a reduction in the "trial-and-error" method of prescribing medications. Pharmacogenomic testing provides the most benefit when it is done preemptively, with the results of the test being available at the time of the provider makes a prescription decision. MAPPeR is a recently developed method to aid in one critical step in pharmacogenomics. Of the following, what is the primary purpose of the MAPPeR tool?

A. Define new medications with pharmacogenomic significance

B. Identify patients that are most likely to benefit from pharmacogenomic testing

C. Identify possible adverse outcomes from a medication prescription

D. Performing analysis on genotype data to determine which medication is correctly prescribed

PheNominal: phenotype annotation at the point-of-care using an EHR-embedded web application – *Bimal Desai*

S35-3: Which of the following is an appropriate ontology for the annotation of phenotype attributes?

A. Human Phenotype Ontology (HPO)

B. Online Mendelian Inheritance in Man (OMIM)

C. International Statistical Classification of Diseases and Related Health Problems, 10th Edition (ICD-10)

D. Logical Observation Identifiers Names and Codes (LOINC)

S35-4: Phenotypic annotations are best described using which FHIR resources?

A. BodyStructure or DiagnosticReport

B. Patient or CodeSystem

C. ClinicalImpression or DetectedIssue

D. Condition or Observation

S36: Ignite-style Talks 2 - Igniting Excellence, Efficiency and Ease of Use

A learning health network of one: how medical trainees can use the electronic health record for clinical feedback – *Samuel Yang*

S36-1: Which of the options below allow for compliant access of the EMR for clinical feedback for medical trainees?

A. The trainee should have a clinical relationship with the patient.

B. The trainee should have a clinical question that is answered by the patient's clinical course.

C. The trainee should not access a patient's chart after the question is answered.

D. The trainee should maintain a list of patients within the EMR.

E. All of the above.

Feasibility and acceptance of mobile point-of-care self testing: a case study on the flu@home mobile app – *Victoria Lyon*

S36-2: In order to implement home-testing for flu into healthcare systems, we need to understand the patient and provider perspectives. All of the following perspectives were shared in the presentation EXCEPT:

A. Patients have demonstrated that they are motivated to adopt home-testing

B. Providers have demonstrated that they see value in home-testing

C. The majority of patients are willing to act upon a flu-positive self-test result by managing their illness and protecting others

D. The majority of providers are willing to prescribe antivirals to patients who receive a flu-positive self-test result

Ready or not, Real-time is needed – *Dana Womack*

S36-3: A hospital-based nursing work system experiences a rapid sequence of new patient admissions, followed shortly thereafter by a staff person falling ill and going home early, and a blood-transfusion reaction which required immediate action, in addition to regularly scheduled care tasks for patients on the unit. This places this system at risk for which common pattern of failure in complex adaptive systems?

A. Decompensating due to exhausting the capacity to adapt as disturbances or challenges cascade

B. Getting stuck in outdated behaviors: Circumstances change but the system remains stuck in previously adaptive strategies

C. Over-valuating rare or exceptional patterns during system training

D. Working at cross-purposes: Behavior that is locally adaptive, but globally maladaptive

The 80's Called; They Want Their Pagers Back – *Ryan Jelinek*

S36-4: Which of the following is a risk associated with the use of alphanumeric or analog pagers?

A. Blocking of messages from non-authenticated sources

B. Encryption/decryption errors

C. Insecure transmission of protected health information

D. Geolocation errors

Where Did the Time Go: A Multivariate Analysis of Epic's Signal Data at an 8-Hospital Healthcare Organization – *Christopher Kelly*

S36-5: At MultiCare Health System, which EMR activity accounts for the second most amount of time providers spend in the EMR per appointment, but is associated with the greatest variability?

A. Clinical / Chart Review

B. InBasket / Messaging

C. Notes / Clinical Documentation

D. Orders

S37: Panel - Celebrating the International Year of the Nurse and the Midwife: A *Look at Nursing in JAMIA*

Moore Slight, Ruth Masterson Creber

S37-1: There have been calls for more standardized research when conducting time and motion studies to investigate clinical work. Zheng et al., developed a checklist: The Suggested Time and Motion Procedures (STAMP) that aims to help researchers produce more compatible and comparable results. What feature do Time and Motion studies most commonly fail to report in their studies, based on the review by Zheng et al.?

A. Details about the empirical setting e.g., the institution type

B. Details about the human observer e.g., the training they received

C. Details about data recording e.g., how multi-tasking was handled

D. Details about the research design e.g., study duration

S37-2: A large international survey was conducted that explored nurse satisfaction with the current state of functionality in EHRs. What level of the Stratified View of Health Information Technology usability evaluation (SV-HIT) did the majority of themes align to?

A. Education Issues

B. Environment Issues

C. User-task issues

D. System Issues

S38: Presentation: Social Connections for CMIOs

Regional Meeting of CMIOs of Competing Health Systems - In Unity There is Strength, - Or, if you want to go fast, go alone; if you want to go far, go together – *Joel Betesh*

S38-1: Acme Health system is located in a medium size metropolitan area and has been using an EHR from Vendor CIPE for over 15 years. Over the past 2 years 4 other local health systems have converted their ambulatory and inpatient EHRs to CIPE. These 5 health systems are located within a 12-mile radius and are in competition with each other for market share. Acme Health systems best next step is to:

A. Answer EHR related questions from other health systems but not reach out with proactive advice

B. Benefit from having the most mature version of CIPE in the area.

C. Ignore requests for collaboration on EHR issues from other local health systems.

D. Set up a regional collaboration of the 5 local health systems to work together to solve mutual EHR related issues.

Social Media for the Physician IT Leader: How to Leverage Online Tools to Facilitate Change Management, Professional Development, and Physician Engagement – *Craig Joseph*

S38-2: A new physician is considering becoming more active on social media in order to increase patient referrals and be seen by her peers as an expert. Best practice includes:

A. Create ad hominem attacks against colleagues with whom she disagrees.

B. Maintain separate personal and professional social media accounts.

C. Re-post a message that makes derogatory statements about protesters who don't follow COVID-19 CDC recommendations.

D. Tag all of her colleagues in all of her posts.

S38-3: A physician is presenting at a national conference about new research she has just published. She is concerned that prominently placing her Twitter handle and relevant hashtags in the presentation would be unprofessional. Your advice to her would be:

A. Avoid self-promotion at all costs and include only your institutional email address

B. It is acceptable to use your professional Twitter handle and relevant hashtags as this has been shown to be an effective way to broaden the audience for scientific research

C. Only use the approved conference templates which likely has no social media references

D. Some participants at the conference may not be on social media, so referencing your Twitter account will not help in any way

S40: Presentation: Utilization Readmission Risk and Adherence

Impact of risk stratification and referral to social services on subsequent emergency and hospital utilization – *Joshua Vest*

S40-1: Which of the following situations suggests that a stepped-wedge design is an appropriate approach to evaluating a new technology in a multi-clinic health care organization?

A. When end users practice at multiple different clinics on a regular basis (i.e. staff cross over).

B. When patient-level randomization is ethical and feasible.

C. When the health care organization is more comfortable with a phased-in approach.

D. When the study duration is very short.

Relationship between adherence to daily home telehealth use and cardiology clinic visit in Veterans with heart failure – *Jenice Guzman*

S40-2: Which of the following is the greatest challenge when promoting the use of home telehealth (also known as remote patient monitoring) for heart failure monitoring and management to health care leadership and program funders?

A. Decreased funding support for heart failure telemonitoring.

B. Lack of large-scale, randomized trials that show consistent positive outcomes.

C. Limited number of telemonitoring technologies to choose from.

D. Poor implementation guidance for specific patient populations.

S41: Presentations: FHIR: Application from the Lab to the Globe

FHIR-based Laboratory Order Interoperability between OpenMRS and OpenELIS in Haiti - *Piotr Mankowski*

S41-1: A healthcare system in a Low and Middle Income Country (LMIC) is planning to develop laboratory order communication between EMRs used at the point-of-care clinics and Laboratory Information Management Systems. This implementation faces challenges similar to those in many LMICs, including limited IT resources and support, unstable funding and developer time, and inconsistent network connectivity. Leadership wants to use lessons learned from previous efforts and considers the recommendations made in the referenced article titled “Implementing medical information systems in developing countries, what works and what doesn’t.”

Of the below recommendations based on FHIR, which one will have the greatest utility?

A. Support and training of local developers

B. Off-site backup of clinical data

C. Definition of a core clinical dataset

D. Use of existent, scalable systems instead of reinventing the wheel

S43: Presentation: Linking Data and CDS to the Point of Care

Real World Data and Research Common Data Elements: A Case Study in HIV – *Vojtech Huser*

S43-1: Which of the below is a data dictionary standard for clinical research study ?

A. Fast Healthcare Interoperability Resource (FHIR)

B. Research Electronic Data Capture (REDCap)

C. Clinical Data Interchange Standards Consortium (CDISC)

D. Logical Observation Identifiers Names and Codes (LOINC)

Implementing a Clinical Decision Support Service to Deliver Recommendations Using a Clinical Decision Support Hook - *Rebecca Shaw*

S43-2: MayoExpertRecommendations is an application that provides recommendations for patient care in an outpatient setting. The generation of these recommendations is triggered by the entry of the patient's blood pressure into the EHR. According to the HL7 Clinical Decision Support Specification, this trigger is known as a Clinical Decision Support _____

A. Service

B. Hook

C. Client

D. Card

S44: Presentation: Expanding Mobile Health Applications to a Wider Patient Audience

Supporting the Future Interoperability of a Game-Based Symptom Reporting App for Children – *Lauri Linder*

S44-1: Mapping clinical terms to standards-based terms included in databases such as SNOMED-CT and LOINC supports which type of interoperability with electronic health record systems?

A. Foundational

B. Structural

C. Semantic

D. Organizational

Health apps for everyone: developing inclusive user experience (UX) criteria – *Elaine Lum, Geronimo Jimenez*

S44-2: What inclusive features should developers incorporate into health apps?

A. Navigation

B. Language Comprehension

C. Motivation

D. Data Security

Spanish Translation of mHealth Technology – *Bonnie Gance-Cleveland*

S44-3: Describe the Beaton Process for translation and cultural adaptation of decision support technology that provides individualized patient education materials.

A. Translation, back translation, synthesis, testing with target audience

B. Translation, synthesis, back translation, synthesis, testing with target audience

C. 2 Translations, synthesis, 2 back translations, synthesis, testing with target audience

D. Translate and test with native target language speakers

S45: Presentation: Exemplars in Health Information Exchange and Interoperability

Delivering Value to the Veteran: - Advancing Informatics/ Data Infrastructure and Process Interoperability to Ensure a Single Standard Level of Care Across the VHA Enterprise during its 10-year EHR Modernization Effort – *David Massaro*

S45-1: A large, integrated health care system desires to implement the principles of high reliability organizations and learning health systems to improve the care it delivers. Baseline data reveals that care delivery processes and the electronic health record and other supporting infrastructure and tooling contain significant variation in their implementation across the enterprise, thereby resulting in clinical staff who inadvertently contribute to practice variation. As a result, the health care system experiences difficulty in measuring, monitoring and reporting enterprise-wide outcomes for select disease states.

Assuming that each of the following options are possible and necessary, which would be the most appropriate first step to support clinical standardization and integration within the healthcare organization?

A. Identify and conform to relevant standards

B. Establish clinical governance processes to identify and reconcile practice variation

C. Validate technical, process, and data interoperability efforts

D. Conduct robust training and orientation programs for staff

The in's and out's of Veteran Health Information Exchange (VHIE) – Veteran reactions to changing from Opt-in to Opt-out – *Eric Pan*

S45-2: A Health Information Exchange (HIE) is preparing press release, participant email announcements, and direct-to-patient communication campaigns to inform its participating organizations, partners, and patient population that it's changing from an "Opt-In" policy to an "Opt-out" policy. Which of the following best summarizes the key change and implications?

A. "Optionality of data standards" – the HIE is changing from allowing free text and non-standard terminologies and data formats to only accepting standardized data.

B. "Default legal position" – the HIE will no longer voluntarily submitting ("Opting in") to HIPAA privacy requirements since it's not a healthcare provider.

C. "Optionality of patient participation" – the HIE now consider patient participation mandatory and will no longer allow member organizations to offer the option of non-participation to their patients.

D. "Default consent" – the HIE will default to sharing all patient data while allowing individuals the option to disallow data sharing. The previous default was only sharing data on individuals who explicitly granted permission to share.

S46: Presentations: Using Data Visualization to Improve Patient Care

Visualizing patient-level risk factors from clinical risk prediction algorithms - *Nate Apathy*

S46-1: When providing clinicians with aggregated "risk" scores for any adverse health outcome, it is important to also present information about what aspect of a patient's risk?

A. How the patient's risk compares to the population risk.

B. The key factors driving the individual patient's risk, ideally limited to those that can be intervened upon.

C. Exact confidence intervals and point estimates of the patient's risk score and it's percentile in the population.

D. A color-coded scale to ensure easy interpretability by the clinician.

Identifying and Analyzing Inequity in Quality Care – *Mark Connolly*

S46-2: Your organization asks you to develop a report to look at hypertension management outcomes across your system. You have a Business Intelligence (BI) solution that allows filtering and interaction. Which of the below is important to ensure about your underlying data to keep an equitable lens in analysis?

A. That it is pre-aggregated, providing the quickest answer on your hypertension management for the whole organization.

B. That it is dis-aggregated by only patient MRN, allowing aggregation of performance to occur within your BI platform. If people want to look at performance by demographics they can take patient MRNs and check against your EHR.

C. That it is disaggregated by patient MRN with demographic information like gender, age, and race included in the underlying data. While aggregation will be possible in your final report, this would allow comparative analysis for various needs and populations to occur as needed.

D. Aggregate performance by patient demographics in the underlying data and display these in the final report.

S47: Presentation: Measuring and Governing Data Sharing

A Proposed Scorecard to Prioritize Successful Health Information Exchange Projects – *Kristina Garrels*

S47-1: There are still many barriers to achieving wide-spread system interoperability for health information exchange. Which of the following remains a barrier?

A. Exchanging health information of patients shared with a local health system has the lowest number of barriers to health information exchange.

B. User centered design helps overcome the largest barriers of health information exchange.

C. The National Academy of Medicine Report "Procuring Interoperability" provides a step by step plan for overcoming barriers to health information exchange.

D. Consent to exchange policy requirements can be a significant barrier to health information exchange.

S48: Presentation: Improving Processes with Data & Algorithms

Calculation and Utilization of a Risk-Adjusted Test Utilization Index for Process Improvement – *Mariah Ondeck*

S48-1: As per the many Choosing Wisely initiatives from various professional societies, a healthcare system is searching for a way to eliminate repetitive laboratory testing. Lab reduction can both benefit the patient and improve their experience and reduce costs for the hospital. Research has demonstrated that patient safety has not been compromised with reduced laboratory testing. Which method is most likely to find long-term success in this quality improvement goal?

A. Provide the cost of each lab ordered

B. Pop up prompts alerting the user of duplicate ordering

C. Use a multimodal system that provides timely feedback

D. 1x education on limiting laboratory use

S49: Presentation: Patient Centered Decision Support: A Critical Look

Systematic assessment of suicide prevention strategies in health apps - *Laura Martinengo*

S49-1: Suicide prevention comprises a multidimensional approach that includes the following strategies EXCEPT

A. Tracking of mood and suicidal thoughts

B. Completing a thought record form

C. Information and education

D. Access to emergency counseling

How good is the decision support provided by apps for self-management of blood glucose for type 2 diabetes? - *Elaine Lum*

S49-2: A general practitioner would like to advise patients under her care on suitable self-monitoring diabetes apps. She downloads several popular apps from the commercial marketplaces to test. Of the features commonly offered by diabetes apps, what would be the most critical to ensure appropriate, time sensitive, self-management of glycemia levels?

A. The app provides a comprehensive list of diabetes-appropriate food recipes

B. The app provides personalized physical activity programs

C. The app alerts the user if the blood glucose levels are outside the normal range

D. The app offers a forum where the user can contact other app users to discuss topics related to diabetes management

S50: Presentation: Inclusive & Family-focused Care

Maintaining Adolescent Confidentiality in the Age of Online Patient Portals - *James Xie*

S50-1: Providing adolescent healthcare can be fraught with inadvertent breaches of confidentiality even when providers and their respective clinics or hospital systems are mindful about maintaining confidentiality. Electronic health records and online patient portals represent a specific area in which confidentiality can be hard to maintain.

Which of the following poses the GREATEST risk to maintaining confidentiality?

A. Adolescent healthcare providers educating patients and families about how they can use patient portals.

B. Healthcare providers offering portal access and confidential messaging to adolescents aged 13 to 17.

C. Vendors of EHRs and patient portals already having incorporated privacy and confidentiality features into their products so it is unnecessary to pursue a custom configuration during implementation.

D. An EHR designed to designate problems, medications, visit notes, results, social and family history as confidential.

Developing a Matching Algorithm for Identifying Family Units – *Colby Uptegraft*

S50-2: The matching algorithm uses current and historical data points to identify potential family units. Which one of the following combinations is most likely to result in a match between two or more patients?

A. Identical phone numbers

B. Identical guarantor names

C. Identical addresses

D. Similar guarantor names and identical street addresses

Supporting LGBT+ healthcare through capture of structured data in the HER – *Scott MacDonald*

S50-3: Although perhaps not causal, burnout is associated with EHR use.Efforts to improve facility and efficiency with this tool should improve physicians' experience and may lead to decreased burnout symptomatology. A combination of group learning and tailored one-one-one sessions has been demonstrated to improve:

A. Higher distribution of billing codes

B. Patient satisfaction with their care

C. Physician satisfaction with informatics tools

D. Burnout rate

S50-4: Data on gender identity and sexual orientation is needed in the EHR in order to identify and reduce disparities, as well as to provide appropriate and patient centered care. Once any technical barriers are overcome, and structured data fields and their downstream dependencies have been assessed and mitigated, various change management and psychosocial issues come to the forefront.

These can be uncomfortable questions for some clinicians to ask, and for some patients to answer. Which of the below is most important to successfully capture this information?

A. Gain feedback from patients on how they would prefer to be asked

B. Improve physician training on importance and approaches to 'how to ask'

C. Elicit engagement from leadership as to 'why to ask'

D. Create workflows for office staff to routinely capture this information

Part 2: Answers, Explanations, and References

W01: Workshop - FHIR Starter: Building Your First SMART on FHIR App

Joshua Herigon, Colby Uptegraft

W01-1: You are working to make sharing of patient allergies easier and more transparent using Fast Healthcare Interoperability Resources (FHIR). Your methods for recording allergies specifically calls out food allergies as distinct from drug allergies. In looking at the "AllergyIntolerance" specification in FHIR Version 4, you note that in the base specification there is no distinct concept for delineating "food allergy" or "drug allergy" for the resource. Which of the following is the most appropriate to overcome this?

A. Extension

B. Implementation guide

C. SMART

D. The Argonaut Project

Answer: A. Extension

Explanation: Extensions (answer A) are used to allow for implementers to add additional requirements for a resource that are not included in the common requirements set forth in FHIR. By adding an extension to a resource, the implementer can tailor a given resource to their local context. In this example in the question, extensions allow for defining an extension to define whether an allergy is a "food allergy" or "drug allergy" in the "AllergyIntolerance" resource. Implementation guides (answer B) are collections of profiles and such profiles may contain extensions, but this is not the best answer. SMART and The Argonaut Project are not related to extensibility.

Reference: Health Level Seven International (HL7) Fast Healthcare Interoperability Resources (FHIR) Version 4. Extensibility. Available at: https://www.hl7.org/fhir/extensibility.html; accessed May 3, 2020.

W01-2: When designing an app that will be used in health care settings, steps should be taken to maximize patient safety. Because drug names can have similar appearances, what is one step you can take to alert users to dissimilarities in order to enhance differentiation?

A. Camel casing

B. Tall man lettering

C. Using brand names instead of generic names

D. Title casing

Answer: B. Tall man lettering

Explanation: Bolded tall man (uppercase) letters help draw attention to the dissimilarities in look-alike drug names (answer B). The Food and Drug Administration (FDA) and the Institute for Safe Medication Practices (ISMP) maintain lists of generic drug names that should be displayed using tall man lettering to help reduce confusion between similar looking drug names and enhance patient safety. Camel casing (answer A) refers to writing phrases without spaces but capitalizing each new word and is used for variable names in computer programming. Title casing (answer D) simply capitalizes each word in a phrase while maintaining spaces between words. Neither camel casing nor title casing are useful for distinguishing look-alike drug names. Using brand names instead of generic names (answer C) may help with similar looking drug names, but also cause additional confusion as there can be many different brand names for a drug and depend on country or jurisdiction.

Reference: Healthcare Information and Management Systems Society (HIMSS) Electronic Health Record Association (EHRA). Electronic Health Record Design Patterns for Patient Safety. Available at: https://www.ehra.org/sites/ehra.org/files/docs/ehra-design-patterns-for-safety.pdf; accessed May 3, 2020.

W01-3: Health Level Seven International (HL7) created Fast Healthcare Interoperability Resources (FHIR) as a new healthcare data model and exchange standard. How is FHIR different from previous HL7 standards, including HL7 versions 2.x and 3.x?

A. FHIR uses modern web-based protocols

B. FHIR allows Extensible Markup Language (XML) for data representation

C. FHIR does not allow for any local customization

D. FHIR is truly vendor agnostic and does not require any implementation guides or profiles

Answer: A. FHIR uses modern web-based protocols

Explanation: The correct answer is (a) FHIR uses modern web-based protocols. Unlike HL7 v2.x & v3.x, the FHIR application programming interface (API) uses hypertext transfer protocol- (HTTP-)based technology. Resources can be fetched (or pushed) using their own unique uniform resource locator (URL). FHIR and HL7 v2.X & v3.X use Extensible Markup Language (XML) while FHIR also allows several other data representations, including JavaScript Object Notation (JSON). FHIR allows local customization through extensions that are not part of the core definition of the resource. FHIR requires resource profiles and implementation guides to fit the unique requirements of different institutions and healthcare contexts. Like previous HL7 standards, local customization may be needed.

Reference: Health Level Seven International (HL7). Welcome to FHIR. Available at: https://www.hl7.org/fhir/, November 1, 2019; accessed May 3, 2020.

W06: Workshop - Operational and Practical Aspects of Clinical Knowledge Management

Dominik Aronsky, Saverio Maviglia, Roberto Rocha

W06-1: What is a logical first step in starting a clinical knowledge management program within the iterative knowledge management framework?

A. Establish a knowledge asset lifecycle

B. Build standards-based interoperable knowledge assets

C. Centralize the process of creating knowledge assets

D. Create a catalog of existing knowledge assets including relationships with metadata

Answer: D. Create a catalog of existing knowledge assets including relationships with metadata

Explanation: Although all answers are desirable goals for a knowledge management program, an assessment of all institutionally available knowledge assets is a pre-requisite in order to understand the breadth and depth of existing knowledge, to identify redundancies and gaps, and to evaluate optimal next steps for iterative improvement.

Reference: Clinical Decision Support - The Road to Broad Adoption. 2nd Edition. Edited by Robert A. Greenes, Academic Press ISBN 978-0-12-398476-0

W06-2: What activities are least likely within the scope of a clinical knowledge management framework?

A. Integrate knowledge assets into clinical workflow

B. Build a sustainable knowledge asset framework with reusable components

C. Maintain the representation of knowledge assets

D. Provide knowledge lifecycle support

Answer: A. Integrate knowledge assets into clinical workflow

Explanation: Knowledge management deals with the creation and maintenance of institution knowledge assets over their entire lifecycle, from creation through revision, to retirement. How knowledge assets are integrated into the clinical workflow often informs their design, but is typically not the focus of knowledge management, since the same asset would ideally be integrated into more than one workflow to maximize re-use. For example, a data classification expression ("adults with poorly controlled essential hypertension") might be a managed knowledge asset that is integrated into an order entry workflow (as a CDS alert), into a reporting workflow (as a quality measure), or into a population health workflow (as a disease registry).

Reference: Clinical Decision Support - The Road to Broad Adoption. 2nd Edition. Edited by Robert A. Greenes, Academic Press ISBN 978-0-12-398476-0

W06-3: Select the most likely role domain experts (or subject matter experts) fulfill within the context of a knowledge management lifecycle?

A. Review quality measures and propose new knowledge assets

B. Critique asset specifications and share expertise during knowledge engineering sessions

C. Author new knowledge assets using tools available within clinical knowledge management systems

D. Support end-user adoption of new knowledge assets

Answer: B. Critique asset specifications and share expertise during knowledge engineering sessions

Explanation: Domain experts are difficult to find and, once identified, typically have very limited time availability. Considering these restrictions, domain experts are primarily needed during the knowledge engineering phase of the lifecycle, where their expertise is essential to enable proper knowledge acquisition and elucidation. The roles described in the other options can more easily be fulfilled by other professionals.

Reference: Clinical Decision Support - The Road to Broad Adoption. 2nd Edition. Edited by Robert A. Greenes, Academic Press ISBN 978-0-12-398476-0

W06-4: According to Wright, what is the most common cause of CDS malfunctions?

A. Software and content upgrades

B. Database corruption

C. Human error

D. Inadequate testing prior to release

Answer: A. Software and content upgrades

Explanation: In one recently published study, over 60% of CDS malfunctions were ascribed to software and content upgrades.

Reference: Wright A. et al. Analysis of clinical decision support system malfunctions: a case series and survey, J Am Med Inform Assoc. 2016 Nov;23(6):1068-1076

W08: Workshop - Organizational Issues and Informatics: Translating Theory into Practice

Saira Haque, Kim Unertl

W08-1: When implementing health information technology, why is it a good idea to consider organizational theory when developing an implementation plan?

A. Academics love theory

B. To help identify concepts that are relevant for informatics practice

C. It doesn't make a difference

D. To inform your organization as a whole

Answer: B. To help identify concepts that are relevant for informatics practice

Explanation: Understanding theory is crucial to avoiding past mistakes and developing new insights.

Reference: Aarts J. A sociotechnical perspective of health information technology. Int J Med Inform. 2013 Dec;82(12):1133-5. doi: 10.1016/j.ijmedinf.2013.10.007. Epub 2013 Oct 26. PMID: 24216291.

W08-2: What paradox led to the research that established Sociotechnical Systems Theory?

A. The Profit Paradox, that profits were elevated when new technology was implemented

B. The Happiness Paradox, that workers were happier when their work was going poorly

C. The Productivity Paradox, that despite improved equipment and better working conditions, productivity went down

D. The Despair Paradox, that the better technology got, the less happy workers became

Answer: C. The Productivity Paradox, that despite improved equipment and better working conditions, productivity went down

Explanation: The Tavistock Institute was tasked with identifying the reason that productivity and morale decreased in the British coal industry in the 1940s, despite the fact that there was better equipment, higher wages, and amenities like housing provided for workers. They referred to this situation as the Productivity Paradox.

Reference: Fox W, Sociotechnical System Principles and Guidelines: Past and Present, Journal of Applied Behavioral Science 1995;31(1):91-105.

W08-3: Everett Rogers identified four major elements in how innovations are adopted in groups, as part of his Diffusion of Innovations Theory. What were the four elements?

A. The Innovation, Communication Channels, Time, A Social System

B. The Bosses, The Workers, The Tools, The Organizers

C. Advertising, New Technology, Coordinators, End Users

D. Great Ideas, Software Developers, Sales Representatives, Time

Answer: A. The Innovation, Communication Channels, Time, A Social System

Explanation: Rogers analysis of adoption of new farming technologies categorized components of innovation according to the four groups in the answer. Each component was a crucial piece of Diffusions of Innovation Theory.

Reference: Everett Rogers. Diffusion of Innovations. 3rd Edition, The Free Press, 1983

W08-4: Why is the low point of the Change Curve Model sometimes referred to as the "Valley of Despair"?

A. People like to whine

B. People worry for no reason when productivity goes down

C. When productivity dips because of new technology, people have a hard time understanding how the technology might help them in the future

D. The implementation productivity dip does not actually exist, but is rather just a theoretical model that has been disproven by years of technology implementation

Answer: C. When productivity dips because of new technology, people have a hard time understanding how the technology might help them in the future

Explanation: The implementation productivity dip has actually been proven repeatedly in technology implementations across organizations and fields. Depending on how a new technology is discussed before implementation, end users might not understand that a loss of productivity is an expected part of an organization coming back up to speed after a major change. This causes end users to lose confidence in the technology and to worry that it's not possible to actually get back to where they were before the new technology.

Reference: Elrod PD, Tippett DD, The “death valley” of change, Journal of Organizational Change Management, 2002, 15(3):273 – 291.

W09: Workshop - Machine Learning Basics for Informatics Professionals

Robert Hoyt

W09-1: Your hospital in NYC now has clinical data on 500 COVID-19 hospitalized patients. You are on a clinical research team that is developing a model to predict COVID-19 mortality (survived vs. died). Which machine learning method would you use?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

Answer: B. Supervised learning with classification

Explanation: The class you are trying to predict is binary and categorical (survived vs. died) so classification would be used. Because the outcome is known this is supervised learning.

Reference: Machine Learning Classifiers https://towardsdatascience.com/machine-learning-classifiers-a5cc4e1b0623

W09-2: You are on a bioinformatics team at a large healthcare system. The system now has a large genomic database integrated with EHR data, stored in an enterprise-level database. Your team is trying to determine if COVID-19 patients have any unusual genomic patterns. Which machine learning method would you use?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

Answer: A. Unsupervised learning with cluster analysis

Explanation: Clustering is frequently used with genomic data to identify hidden groups or patterns in the data. There is no known class or outcome so this is unsupervised learning.

Reference: Zhu, Y., Li, H., Miller, D.J. et al. caBIG™ VISDA: Modeling, visualization, and discovery for cluster analysis of genomic data. BMC Bioinformatics 9, 383 (2008). https://link.springer.com/article/10.1186/1471-2105-9-383

W09-3: Your CEO is concerned about the length of stay for uninsured asthmatic patients at your hospital who are admitted from the emergency department. Your data science team has excellent ED data that includes cost data, clinical data, and demographic data. What machine learning method would you use to predict hospital length of stay?

A. Unsupervised learning with cluster analysis

B. Supervised learning with classification

C. Unsupervised learning with association rules

D. Supervised learning with regression

Answer: D. Supervised learning with regression

Explanation: Length of stay is numerical, supervised learning with a regression approach is most commonly used.

Reference: Machine learning: Introduction to machine learning algorithms: regression https://towardsdatascience.com/introduction-to-machine-learning-algorithms-linear-regression-14c4e325882a

S01: Panel - Electronic Personal Protective Equipment (ePPE): A Strategy to Protect Emergency Department Providers During the Age of COVID-19

Michael Ward, Trent Rosenbloom, Daniel Savage, Ryan Ribeira, Patrice Callagy

S01-1: What central feature distinguishes electronic personal protective equipment (ePPE) from telemedicine?

A. The patient can see the provider outside the glass door

B. The patient and provider are in the same location

C. The provider is at home, but there are other providers to care for the patient

D. The use of non-encrypted software when performing an ePPE

Answer: B. The patient and provider are in the same location

Explanation: Nearly every definition of telehealth and telemedicine, including those related to Medicare, Medicaid, national organizations, and many state governments hinges on the fact that the provider and patient are in separate locations. ePPE's definition hinges on the provider and patient being at the same location (within the same hospital and immediately available for resuscitation or traditional physical exam based on the results of the medical screening examination if needed).

Reference: Turer RW, Jones I, Rosenbloom ST, Slovis C, Ward MJ. Electronic Personal Protective Equipment: A Strategy to Protect Emergency Department Providers in the Age of COVID-19 [published online ahead of print, 2020 Apr 2]. J Am Med Inform Assoc. 2020;ocaa048. doi:10.1093/jamia/ocaa048

S01-2: What overall group of billing codes would be most appropriate for an emergency medicine ePPE based evaluation/medical screening examination?

A. Traditional emergency medicine evaluation and management codes

B. Emergency medicine telemedicine evaluation and management codes

C. Outpatient clinic telemedicine evaluation and management codes

D. Initial hospital evaluation and management codes

Answer: A. Traditional emergency medicine evaluation and management codes

Explanation: Given the fact that ePPE hinges on the provider and patient being in the same location, CMS has consistently supported that ePPE-based exams are not telehealth/telemedicine and should be billed using traditional evaluation and management codes. Discuss with your local compliance officer prior to implementing ePPE.

References: American College of Emergency Physicians. "CMS Makes Sweeping Regulatory Changes for COVID-19." https://www.acep.org/corona/COVID-19/covid-19-articles/cms-makes-sweeping-regulatory-changes-for-covid-19/ April 28, 2020.

Centers for Medicare & Medicaid Services/American College of Emergency Physicians. Webinar: "CMS-ACEP Discussion on Telehealth/EMTALA." https://www.youtube.com/watch?v=pmcoi4XGflA&feature=emb_logo April 15, 2020.

S02: Presentation: Next Level Clinical Decision Support: Higher Expectations and Better Outcomes

Improving Clinical Decision Support for Lung Cancer Screening in an Electronic Health Record - *Nicholas Riley*

S02-1: A health care system wishes to improve its lung cancer screening rates. What is the most appropriate next step?

A. Implement CDS to determine lung cancer screening screening eligibility based on EHR data

B. Identify and address issues with the design and implementation of EHR tobacco smoking history collection

C. Address differences between Medicare Advantage programs in coverage of low-dose CT scans

D. Send reminder messages to patients meeting lung cancer screening eligibility criteria based on EHR data

Answer: B. Identify and address issues with the design and implementation of EHR tobacco smoking history collection

Explanation: The quality and completeness of EHR tobacco smoking history data is a limiting factor in determining eligibility — reminder messages should not be sent, nor CDS implemented, before this data is validated. Low dose CT scans for lung cancer screening are a covered benefit regardless of Medicare plan.

References: Triplette M, Kross EK, Mann BA, Elmore JG, Slatore CG, Shahrir S, et al. An Assessment of Primary Care and Pulmonary Provider Perspectives on Lung Cancer Screening. Ann Am Thorac Soc N Y. 2018 Jan;15(1):69–75.

Tarabichi Y, Kats DJ, Kaelber DC, Thornton JD. The Impact of Fluctuations in Pack-Year Smoking History in the Electronic Health Record on Lung Cancer Screening Practices. Chest. 2018;153(2):575-578. doi:10.1016/j.chest.2017.10.040

HIV-ASSIST, a clinical decision support tool to guide ARV selection – *Manoj Maddali*

S02-2: What is multiple-criteria decision analysis (MCDA)?

A. A stochastic model to evaluate randomly changing systems

B. A quantitative framework to simultaneously evaluate all decision considerations and compare across multiple conflicting outcomes of interest

C. A type of machine learning technique to predict healthcare outcomes

D. Difference in cost between two possible interventions divided by the difference in their effect

Answer: B. A quantitative framework to simultaneously evaluate all decision considerations and compare across multiple conflicting outcomes of interest

Explanation: MCDA is a quantitative framework that allows for comparison of decision options across multiple conflicting outcomes of interest. The other answers describe alternative modeling techniques, such as Markov models, Incremental Cost Effectiveness Ratios (ICER), or machine learning techniques.

Reference: https://www.hivassist.com

S03: Presentation: Social Determinants and Health Assessment

The Synergistic Effects of Social Determinants of Health and Racial-Ethnicity on 30-day Readmission Disparities in an Inpatient Population - *Wan-Ting Su*

S03-1: This study applied multiple analytic methods to investigate how the combination of social determinants of health (SDH) and race-ethnicity impact disparities in 30-day readmission. Based on the identification of sub-groups of patients at the highest risk of readmission, these findings will be used to establish priorities for limited resources to reduce readmission.

Which of the following is most appropriate statement to describe the synergistic effects of SDH and race-ethnicity on readmission disparities from different perspectives using multivariate logistic regression analysis (MLRA) and latent class analysis (LCA)?

A. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients was significant, but insignificant for White and African American patients.

B. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that Hispanic patients had the largest effect of depression on readmission compared to White and African American patients.

C. LCA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients, White, and African American patients were all significant.

D. LCA - In the high-readmission group, the majority of patients were Hispanic patients and had the high proportions of nearly all SDH.

E. LCA - In the high-readmission group, the majority of patients were African American and there was only high proportions of depression.

Answer: B. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that Hispanic patients had the largest effect of depression on readmission compared to White and African American patients.

Explanation: A. MLRA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients was significant, but insignificant for White and African American patients.

** The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients, White, and African American patients were all significant.

C. LCA - The effect of depression on readmission was dependent upon race-ethnicity. The three models stratified by race-ethnicity showed that the effect of depression on readmission for Hispanic patients, White, and African American patients were all significant.

** This is an appropriate statement from the perspective of multivariate logistic regression analysis (MLRA).

D. LCA - In the high-readmission group, the majority of patients were Hispanic patients and had the high proportions of nearly all SDH.

** In the high-readmission group, the majority of patients were African American.

E. LCA - In the high-readmission group, the majority of patients were African American and there was only high proportions of depression.

** In the high-readmission group, it had the high proportions of nearly all SDH.

References:

1. Kind AJH, Jencks S, Brock J, Yu M, Bartels C, Ehlenbach W, Greenberg C, Smith M. Neighborhood socioeconomic disadvantage and 30-day rehospitalization: A retrospective cohort study. Annals Intern Meds. 2014;161(11): 765-774.

2. Hu J, Gonsahn MD, Nerenz DR. Socioeconomic status and readmissions: evidence from an urban teaching hospital. Health Affairs. 2014;33:778-785.

3. Rodriguez F, Joynt EK, López L, Saldaña F, Jha AK. Readmission rates for Hispanic Medicare beneficiaries with heart failure and acute myocardial infarction. American Heart Journal. 2011;162(2): 254-261.

S04: Panel - Development and Validation of an Efficient, Effective, and Satisfying EHR Based on Clinician-Centered Design

John R. Windle, Thomas A. Windle, Martina A. Clarke, James E. Tcheng

S04-1: The Panel emphasized the use of functional usability to optimize the electronic health record. Functional usability requires measuring & optimizing:

A. efficiency, effectiveness, satisfaction

B. design, planning, testing,

C. data flow, workflow, cognition

D. time, satisfaction, ergonomics

Answer: C. data flow, workflow, cognition

Explanation: There are two commonly used definitions of health information technology. One developed by IEEE and the other by Dr. Zhang. The IEEE standard defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use (ISO 9241-11, 1998). The TURF model (https://doi.org/10.1016/j.jbi.2011.08.005) defines usability as useful, usable, and satisfying. In this

project found we needed to create a functional definition of usability to better understand and modify the clinical framework. The functional definition of usability in this project is to measure and optimize data flow, workflow, and cognition.

S04-2: The Panelists interviewed physicians and advanced practice providers to better understand the barriers, wants, and needs of clinicians. Clinician-centered design principles applied to EHR functionality will likely reduce clinician burn-out through which of the following mechanisms?

A. Additional revenue realization

B. Reduced clinician cognitive load

C. Better patient engagement

D. Increased note bloat

Answer B. Reduced clinician cognitive load

Explanation: Revenue and payments have been the major driver of EHR implementation and a major source of dissatisfaction by clinicians (Melnick. Mayo Clin Proc. 2020;95(3):476-487). This battle to optimize revenue has led to the creation of bloated, unreadable notes. The documentation of "impertinent negatives" was at the top of complaints by clinicians. While better patient engagement is a hoped outcome, it is not a direct product of our research. Reducing the cognitive load on clinicians is a key finding of our study.

S05: Presentation: Enhancing the Patient Care Experience Through Telehealth

Patient data, outcomes and perspectives in a remote monitoring program: realizing a comprehensive digital medical home strategy – *Emily Webber*

Remote home monitoring was implemented as a digital adjunct to a comprehensive cardiac medical home in the program presented. The following were all components necessary in adopting the technology except:

A. Alignment with parent/guardian questions used in national benchmarks

B. Strong multi-disciplinary collaboration and clinical team in place

C. Consideration of revenue stream supported by remote monitoring and EMR documentation

D. Consistent use of tablet protection cases

Answer: D. Consistent use of tablet protection cases

Explanation: The other answers correctly identify critical pieces of success in the interstage home monitoring program. All aspects were necessary to ensure success, as the technology required strong

clinical leadership and process. The use of technology also helped this program scale and increased the number of patients who could be served.

Reference:
Hehir DA, Ghanayem NS. Single-ventricle infant home monitoring programs: outcomes and impact. Curr Opin Cardiol. 2013 Mar;28(2):97-102. doi: 10.1097/HCO.0b013e32835dceaf. PMID: 23337893. https://pubmed.ncbi.nlm.nih.gov/23337893/?from_term=pediatric+single+ventricle+home+monitoring&from_pos=1

Utilization of Telemedicine in Pediatric Rheumatologic Care - *Rajdeep Pooni*

S05-1: Pediatric subspecialty video visits may vary in many ways including exam, communication, and ancillary needs following the visit. Like adult patients, pediatric patients/subjects have identified which of the following themes when considering video visits for follow-up care:

A. Convenience, Communication, Comfort, Time savings)

B. Cost, Audio, Connection felt with primary care provider

C. Duration, Comfort with parent guardian, Background noise

Answer: A. Convenience, Communication, Comfort, Time savings)

Explanation: These were themes repeatedly identified during patient/guardian visits. For pediatric patients, cost was not considered though school time lost was repeatedly brought up. None of the other distractor topics were of concern to patients during telehealth visits. Please consider the following article for further reading:

Reference: Powell RE, Henstenburg JM, Cooper G, Hollander JE, Rising KL. Patient Perceptions of Telehealth Primary Care Video Visits. Ann Fam Med. 2017 May;15(3):225-229. doi: 10.1370/afm.2095. PMID: 28483887; PMCID: PMC5422083. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5422083/

And for further pediatric telemedicine resources:

American Academy of Pediatrics. Section on Telehealth Care.
https://services.aap.org/en/community/aap-sections/telehealth-care/

S06: Presentation: Tackling Clinical Problems with Quality Improvement Approaches

The EQUIPPED Potentially Inappropriate Medication Dashboard (EPIMD): A Suitable Alternative to In-Person Academic Detailing? – *Zachary Burningham*

S06-1: A primary care provider wishes to identify patients in his/her panel at risk for psychiatric hospitalization. This provider does not have access to a care manager with the needed bandwidth to identify patients at risk. Fortunately, a Psychiatric Hospitalization Risk Assessment Dashboard exists, which identifies patients in a PCP's panel with a high probability of a psychiatric admission in the next 90 days. Which of the following Psychiatric Hospitalization Risk Assessment Dashboard components are most important to ensuring the PCP is effective at reducing the risk of a psychiatric admission amongst their patient panel?

A. In addition to displaying a patient's risk of a psychiatric admission over the next 90 days, the dashboard also provides detailed information on patient demographics.

B. The dashboard contains functionality that allows for the exportation of data and visuals to excel, pdf, and other commonly used formats.

C. The underlying data that supports this dashboard are updated nightly so that the end user can access the dashboard at any time to determine whether they are having a meaningful impact on risk reduction.

D. The backend data structure that supports this dashboard has been optimized to ensure load times when drilling down on different views are less than 1 second in duration.

Answer: C. The underlying data that supports this dashboard are updated nightly so that the end user can access the dashboard at any time to determine whether they are having a meaningful impact on risk reduction.

Explanation: Clinical dashboard systems that are supported by underlying data that are near real-time encourage a continuous feedback loop. End users can modify their care processes and then access the dashboard at regular intervals to determine whether they are having a meaningful impact on lowering a patient's risk for certain outcomes. The other described components of the Psychiatric Hospitalization Risk Assessment Dashboard may increase usability, but ultimately are not as important to ensure health care quality improves.

This feedback element is one of fifteen suggested by Brehaut et al that are believed to optimize the effect of information displays supported by health administrative data [1].

Reference: 1. Brehaut JC, Colquhoun HL, Eva KW, Carroll K, Sales A, Michie S, Ivers N, Grimshaw JM. Practice Feedback Interventions: 15 Suggestions for Optimizing Effectiveness. Ann Intern Med. 2016 Mar 15;164(6):435-41. doi: 10.7326/M15-2248. Epub 2016 Feb 23. PMID: 26903136. https://www.acpjournals.org/doi/10.7326/M15-2248

Tackling Problematic Problem Lists: A Quality Improvement Approach – *Jennifer Lee*

S06-2: Quality improvement involves doing small tests of change. Which of the following is the correct order for executing a test of change?

A. Plan, Act, Study, Do

B. Do, Study, Act, Plan

C. Plan, Do, Study, Act

D. Plan, Study, Act, Do

Answer: C. Plan, Do, Study, Act

Explanation: PDSA cycle is shorthand for testing of a small test of change in quality improvement. The order is to plan an intervention, do the intervention, study the consequences, and act upon the consequences. This allows rapid cycles of change to lead to improvement in outcome.

Reference:
http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx

S07: Panel - Technology and Person-generated Health Data to Enhance Shared Decision Making: The Current State and Future Opportunities

Katherine K. Kim, Patricia D. Franklin, Sarah M. Greene, Margo Edmunds

S07-1: Several models exist for large-scale culture change in health care delivery that seek to improve experience, quality and engagement. Among these models are the Chronic Care Model (a systems model that explains both the delivery of chronic care and self-management), Patient-Centered Medical Home (a healthcare delivery model that centralizes and streamlines care into a "home"), and Open Notes (a movement to make clinical notes in the electronic health record available to the patient). Central to these models is a focus on data-enabled shared decision making and the clinician-patient interface. Data include both clinical and person-generated health data which can provide a comprehensive view of a person's health and wellbeing. Despite the promise, wide-spread improvement in outcomes related to healthcare experience, quality and engagement have not yet materialized.

What is a common attribute across all three models mentioned?

A. Recognition of the importance of self-management

B. Use of electronic health data to create productive interactions between clinicians and patients and across different types of encounters

C. Leadership expressing explicit support for shared decision-making

D. Widespread adoption of “open” medical records

Answer: B. Use of electronic health data to create productive interactions between clinicians and patients and across different types of encounters

Explanation: Self-management support is an important facet of the Chronic Care Model, and also factors into the Medical Home, but is not a prominent feature of the Open Notes movement. Leadership support is necessary but not sufficient to create culture change. Opening up medical records has helped, but the Chronic Care Model and Patient-Centered Medical Home came of age before EHRs were ubiquitous. That said, in this contemporary and connected era, using EHRs and expanding their ability to ingest and integrate PGHD is a foundational need for effective shared decision-making.

Reference: Woods SS, Evans NC, Frisbee KL. Integrating patient voices into health information for self-care and patient-clinician partnerships: Veterans Affairs design recommendations for patient-generated data applications. J Am Med Inform Assoc. 2016 May;23(3):491-5. doi: 10.1093/jamia/ocv199. Epub 2016 Feb 5. PMID: 26911810. https://academic.oup.com/jamia/article/23/3/491/2909017

S07-2: One definition of person-generated health data (PGHD) is health-related data created, recorded, gathered, or inferred by or from individuals or their designees to help address a health concern. One distinction of PGHD from clinical data is the fact that it is generated by the individual rather than the healthcare delivery setting. PGHD in shared decision making can be collected or shared using a variety of technologies including web-based portals, personal health records, wearable devices, smartphone applications, and sensors. Which of the following is the best example of PGHD?

A. Lab test results available to a patient in a web portal

B. Alerts sent to a phone from a door webcam for the purpose of home security

C. Patient consent form for treatment

D. Symptoms reported via a smartphone application

Answer: D. Symptoms reported via a smartphone application

Explanation: PGHD has two primary requirements: it is generated by the individual and it is relevant to their health. Lab results are not generated by the individual but rather by the healthcare system. Although a door webcam could potentially be used to track movement that one might use to infer something about health, the alerts sent to a phone are primarily for home security. A consent form is used to document that an informed consent process has occurred. This document does not capture health data from the individual. The correct answer is D. Symptoms are an individual’s self-reported observations related to a health condition or indication of well-being thus fulfilling both requirements of PGHD.

Reference: Shapiro M, Johnston D, Wald J. Patient-Generated Health Data, White Paper: Office of the National Coordinator for Health Information Technology; 2012 [cited 2019 November 30]. Available from: http://www.healthit.gov/sites/default/files/rti_pghd_whitepaper_april_2012.pdf.

S08: Presentation: Informatics Solutions to Improve Patient Safety and Quality

Hidden Harm: Clinical Informatics and Health Policy Dimensions of a Prescription Monitoring Program Safety Event – A Clinical Case Report - *Joel Betesh*

S08-1: An attending physician searches the Drug monitoring program on an inpatient through his EHR and sees 20 controlled prescriptions filled on a patient over the last two years. He directs his resident to write a prescription for a narcotic for the patient to take at home. Later that day when the patient is being discharged the resident does her own search and only sees two controlled substance prescriptions written over the past two years. The resident is puzzled by the discrepancy between her search results and the attending's search results. The course of action with the broadest impact and the most likely to get to the root cause of the problem would be to:

A. Assume that the longer list seen by the attending is the more accurate one.

B. Question the patient about how many controlled substance prescriptions he had filled in the past 2 years.

C. Call the patient's pharmacy to see what controlled prescriptions they have on record for the patient.

D. File a Safety report with the hospital to investigate and see whether this problem might be affecting other patients as well.

Answer: D. File a Safety report with the hospital to investigate the root cause of this and see whether this problem might be affecting other patients as well.

Answer A does nothing to get to the source of the problem and may lead to incorrect prescribing decisions. Answers B. and C. are fine for the individual patient but do nothing to get to the root cause of the problem of discrepant search results. The question as stated asks for the choice with the broadest impact and most likely to get to the root cause of the problem and that would be choice D. which will get to the safety officer and trigger a root cause investigation

Reference: Classen DC, Resar R, Griffin F, Federico F, Frankel T, Kimmel N, Whittington JC, Frankel A, Seger A, James BC. 'Global trigger tool' shows that adverse events in hospitals may be ten times greater than previously measured. Health Aff (Millwood). 2011 Apr;30(4):581-9. doi: 10.1377/hlthaff.2011.0190. Erratum in: Health Aff (Millwood). 2011 Jun;30(6):1217. PMID: 21471476.
https://www.healthaffairs.org/doi/10.1377/hlthaff.2011.0190

Big Data Analytics and Visualization Break QI Silos and Empower Precision Targeting of Interdisciplinary QI: The INFECTALYTICS Project – *Allen Bryan*

S08-2: A practitioner has observed a quality improvement gap in the titration of heparin in anticoagulated patients. The current system permits lag at peak chemistry testing volume as the

laboratory prioritizes STAT orders and critical values. Practitioners have responded by marking all routine coagulation panels as STAT, which is impacting other patient's timely results while still not fully alleviating the problem with lag in resulting coagulation values.

The practitioner wishes to set up a multidisciplinary virtuous cycle model using holistic Big Data analysis of the patient population's test histories. What is the FIRST step in setting up the virtuous cycle?

A. Evaluate the feasibility of possible interventions to alleviate the lag problem

B. Assess the administrative and financial impact of addressing the lag problem

C. Define the quality gap in a measurable, structured manner and identify influencing factors

D. Recruit subject matter experts from lab staff, providers, and data support personnel

Answer: D. Recruit subject matter experts from lab staff, providers, and data support personnel

Explanation: All the listed elements are part of the virtuous cycle model of holistic data-driven quality improvement. Of the three analysis options, C is the first action step, with A and B coming later in the process. However, the most important step in any interdisciplinary quality improvement project is to obtain buy-in from groups at all stages of the laboratory utilization cycle of "collect-test-interpret-treat". Recruiting subject matter experts from across the cycle enhances the results at each stage of the cycle. In addition, early recruitment enables later buy-in by including peers of all relevant personnel at the earliest possible stage.

Reference: Greenhalgh T, Robert G, Macfarlane F, Bate P, Kyriakidou O. Diffusion of innovations in service organizations: systematic review and recommendations. Milbank Q. 2004;82(4):581-629. doi: 10.1111/j.0887-378X.2004.00325.x. PMID: 15595944; PMCID: PMC2690184. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2690184/

S08-3: Your quality improvement data team has identified a number of linkages between various factors causing a quality gap. These factors include a wide variety of sources, ranging from timestamps of collection and report views, to patient demographics, to provider service lines and rounding workflow models. The team is considering proposed visualizations to best convey the results for practitioners. One panel member complains that visualizations are difficult to read and asks why good old bar charts and scatter plots are not being used. What is the best response to her query?

A. Timelines are a better visualization because time is the most important factor to consider

B. Visualizations work best when they reflect the types of data being presented

C. Choosing the wrong visualization can confuse practitioners

D. There are too many variables to use scatter plots

Answer: B. Visualizations work best when they reflect the types of data being presented

Explanation: All the answers are plausible responses, but B best describes the motivation behind broadly considering options during visualization selection. It might be the case that timelines are a better visualization (A), but that is not necessarily because time is most important; for example, it could be because a timeline provides the clearest way to organize the data visually. Choosing the wrong visualization can be confusing (C), but this answer contributes nothing to the selection and does not explain why bar charts or scatter plots are "wrong". Having too many variables is not necessarily a bar to using scatter plots (D), as multiple scatter plots are frequently used in applications such as flow cytometry. Addressing the positive reason(s) for selecting a visualization (B) gives a direction to the discussion, while also addressing the query's underlying assumption: that familiar visualizations will be most easily interpreted. The most frequently used or most familiar visualization may not be visually efficient or can even be unintentionally deceptive; for instance, a tree-of-life visualization is far better suited to comparative genomics data than any number of bar charts, but is rapidly accessible (to various degrees) by personnel of all backgrounds.

Reference: Tufte E. Visual explanations: images and quantities, evidence and narrative. New York: Graphic Press, 1997. 158 pp.

S09: Ignite-style Talks 1 - Igniting Strategies to Tackle Burnout

Echoes of Overload: Sensing Clinician Adaptation to Time Pressure – *Dana Womack*

S09-1: A hospital wishes to analyze workplace data to support collaborative human-machine workplace monitoring and early recognition of supply-demand imbalance at the bedside. Which of the following common workplace activities has least time delay between the actual event and data production about that event?

A. Documentation of patient assessment

B. Documentation of intake and output

C. Record of a communication event such as a phone call

D. Documentation of a missed meal break

Answer: C. Record of a communication event such as a phone call

Explanation: Electronic communication devices produce automated records of each call event as they occur in time. These data are captured as transactional records or log file data as a byproduct of human use of the device. In contrast, documentation of a patient assessment and intake and output require intentional action on the part of a clinician who performs the care task, and then records it in the electronic health record at a later point in time. Similarly, documentation of a missed meal break requires intentional action in a time and attendance system, and this occurs at the end of a work shift rather than at the time of the event.

Reference: Womack DM, Nancy VN, Linsey SM, Deborah EH, Michelle HM, Gorman, PN. Subtle cues: Qualitative elicitation of signs of capacity strain in the hospital workplace. (2019) Applied Ergonomics, 81, art. no. 102893, DOI: 10.1016/j.apergo.2019.102893.

The Effects of a Problem Oriented View on Clinician Workflow - *Michael Semanik*

S09-2: A problem oriented view allows for:

A. A clinician to see all the information relevant to managing a problem in a single location

B. An administrator to see the number of patients with a specific problem

C. A business analyst to organize their work by problem

D. A nurse to prioritize the patient list by number of problems

Answer: A. A clinician to see all the information relevant to managing a problem in a single location

Explanation: The problem oriented view combines information about a specific problem into a single view to allow clinicians to manage that problem. The other options do not involve managing a particular patient's problems, and so is not what is envisioned by a problem oriented view.

Reference: Buchanan J. Accelerating the benefits of the problem oriented medical record. Appl Clin Inform 2017; 8: 180–190

Inbasket Diet Plan: - Strategy to Reduce the Weight of the EHR Inbasket – *Nitu Kashyap*

S09-3: The CMIO of a large organization is assigned to develop action items related to decreasing EMR "pajama time" for clinicians practicing within the organization. In addition to eliciting feedback from frontline clinicians, which of the following would be most appropriate next step?

A. Propose a scribe program for all clinicians

B. Propose switching from desktops to tablet devices for EMR access during patient visits

C. Review trend data on time spent and type of activities in EMR outside of business hours

D. Review specialty notes to assess document length and use of copy/paste function.

Answer: C. Review trend data on time spent and type of activities in EMR outside of business hours

Explanation: Wisdom of the crowd is often solicited first and offers an environmental scan. The next steps should be to gather and analyze relevant data before committing to any interventions.

Reference: Downing, N.L., D.W. Bates, and C.A. Longhurst. Physician burnout in the electronic health record era: Are we ignoring the real cause? Ann Intern Med, 2018. 169(1): p. 50-51.

S09-4: An Informatics physician is tasked with 'fixing' the EHR inbasket burden at her organization. To understand the problem, she meets with several colleagues who had expressed concerns. Reports and

trend data suggests that there is opportunity to improve incoming volume of inbasket messages. In deploying a strategy for improving provider experience with the inbaket, which of the following is the most appropriate outcome measure to track?

A. Incoming inbasket message volume

B. Number of inbasket message folders

C. Number of providers who delegate inbasket to a team member(s)

D. Time spent in inbasket

Answer: D. Time spent in inbasket

Explanation: Inbasket volume is likely a symptom of dysfunction elsewhere - upstream workflows, system design, provider or practice characteristics. Merely reducing the number of messages may inadvertently cause important information to be missed. Time spent in inbasket will therefore allow comparison regardless of the tactics used to Optimize inbasket. Incoming message volume will be an important process measure for changes that improve inbasket efficiency by eliminating unnecessary messages.

References: Kroth PJ, Morioka-Douglas N; Veres S, et al. Association of electronic health record design and use factors with clinician stress and burnout. JAMA Netw Open. 2019;2(8):e199609. doi:10.1001/jamanetworkopen.2019.9609
https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2748054

Nitu Kashyap, Allen Hsiao. Less time typing, more time caring: Using Informatics to mitigate physician burnout. AMIA Annu Symp. 2019

The Practice Experience Program (PEP)– Helping physicians finish faster - *Scott MacDonald*

S09-5: Although perhaps not causal, burnout is associated with EHR use, and efforts to improve facility and efficiency with this tool should improve physicians' experience and ability, and may lead to decreased burnout symptomatology. A combination of group learning and tailored one-one-one sessions has been demonstrated to improve:

A. Higher distribution of billing codes

B. Patient satisfaction with their care

C. Physician satisfaction with informatics tools

D. Burnout rate

Answer: C. Physician satisfaction with informatics tools

Explanation: Our data showed no change in coding levels over time, and we did not measure burnout directly- this, and linking the data to patient satisfaction is a future goal of the program.

We did show improvements in self-rated satisfaction with the system, confidence in their skills, and less after-hours time in the system.

Reference: Sieja A, Markley K, Pell J, Gonzalez C, Redig B, Kneeland P, Lin CT. Optimization Sprints: Improving Clinician Satisfaction and Teamwork by Rapidly Reducing Electronic Health Record Burden. Mayo Clin Proc. 2019 May;94(5):793-802. doi: 10.1016/j.mayocp.2018.08.036. Epub 2019 Feb 26. PMID: 30824281. https://pubmed.ncbi.nlm.nih.gov/30824281/

S09-6: Data on gender identity and sexual orientation is needed in the EHR in order to identify and reduce disparities, as well as to provide appropriate and patient centered care. Once any technical barriers are overcome, and structured data fields and their downstream dependencies have been assessed and mitigated, various change management and psychosocial issues come to the fore.

These can be uncomfortable questions for some clinicians to ask, and for some patients to answer. Which of the below is most important to surmount barriers and successfully capture this information?

A. Feedback from patients on how they would prefer to be asked

B. Physician training on importance and approaches to 'how to ask'

C. Engagement from leadership as to 'why to ask'

D. Workflows for office staff to routinely capture this information

Answer: D. Workflows for office staff to routinely capture this information

Explanation: Our efforts showed minimal increase in data capture rates with physician training and leadership encouragement, despite system design based on surveyed patient preferences. However, once workflows were established, with metrics and accountability, rates dramatically increased.

Reference: Grasso C, McDowell MJ, Goldhammer H, Keuroghlian AS. Planning and implementing sexual orientation and gender identity data collection in electronic health records. J Am Med Inform Assoc. 2019 Jan 1;26(1):66-70. doi: 10.1093/jamia/ocy137. PMID: 30445621; PMCID: PMC6657380. https://academic.oup.com/jamia/article/26/1/66/5185589

S10: Panel - Unleashing the Potential of the EHR

- *Amy Chaumeton, Chris Clune, Rod Tarrago*

S10-1: Among hospital-based physicians, what percentage of the EHR user experience is attributable to the EHR vendor?

A. 12%

B. 40%

C. 22%

D. 67%

Answer: C. 22%

Explanation: Contrary to popular belief, the vendor does not make or break the satisfaction of their customers. While vendors play the crucial role of innovative partner, the greatest opportunities to drive EHR satisfaction success lie with the organization and their clinicians.

Reference: Arch Collaborative Learning Summit, 2019, KLAS Research

S10-2: Organizations have very little control over the EHR user experience and should rely upon the vendor to handle this matter in most cases.

A. True
B. False

Answer: B. False

Explanation: Organizations control 78% of the variation seen in EHR satisfaction. Numerous organizations have measured in the Arch Collaborative and KLAS has identified best practices for organizations looking to improve their Net EHR Experience Score*. (*Metric used by KLAS to measure clinical end-user satisfaction.)

Reference: Arch Collaborative Learning Summit, 2019, KLAS Research

S10-3: What three areas can organizations focus their attention and efforts on to improve EHR user experience?

A. Workflow Efficiency, User Mastery and Governance

B. User Mastery, Shared Ownership and Personalization

C. Code Upgrades, User Mastery and Training

D. Clinical Leadership, Support and Personalization

Answer: B. User Mastery, Shared Ownership and Personalization

Explanation: These three areas explain nearly 70% of the variation in user satisfaction. Certainly, there is more to uncover of this explains more than two-thirds of the gap in satisfaction. Each of these high-level areas areas encompass multiple areas of improvement for an organization.

Reference: Arch Collaborative Learning Summit, 2019, KLAS Research

S11: Presentation: Beyond Desktop: Mobile and Messaging Innovations to Drive Care

Developing a Sustainable Secure Messaging Platform – *Matthew Cain*

S11-1: A healthcare facility has decided to investigate secure messaging platforms to replace the current paging system. Each system has its pros and cons. Which of the following is a key benefit of transitioning to secure messaging?

A. Secure messaging will be much easier to use for younger and older physicians alike. Therefore, education and policy changes will be minimal.

B. Individuals have often abused the paging system whereas secure messaging naturally curbs inappropriate messaging.

C. Secure messaging platforms are typically HIPAA compliant; pagers traditionally are not.

D. Secure messaging is highly adaptable; therefore, services should not have to alter their workflow significantly.

Answer: C. Secure messaging platforms are typically HIPAA compliant; pagers traditionally are not.

Explanation: Secure messaging platforms are typically HIPAA compliant, whereas paging has significant vulnerabilities. For example, it has been known for years that radio operators could intercept pages with PHI. Newer, secure messaging platforms offer a lot of functionality and security, which can lead to improved communications, but also take work. Policies must be updated to reflect the use of personal cell phone devices and an allowance may need to be implemented (especially for trainees and non-physicians). An outline for messaging etiquette is essential, as it is much easier to text someone than page.

Unfortunately, there is a learning curve associated with secure messaging technologies. More senior personnel may not understand how messaging can replace paging or even how to use it. Furthermore, services may have to adapt their workflows to the new technology. Workflows heavily relying on pagers may have to adapt significantly to incorporate this new technology.

Reference: Pourmand A, Roberson J, Gallugi A, Sabha Y, O'Connell F. Secure smartphone application-based text messaging in emergency department, a system implementation and review of literature. *Am J Emerg Med*. 2018;36(9):1680–1685. doi:10.1016/j.ajem.2018.06.067 https://pubmed.ncbi.nlm.nih.gov/29980488/

EHR-Integrated Core Competency Reporting - A story from the cath lab – *Emeka Anyanwu*

S11-2: A hospital's procedure service is looking to keep track of the procedures that residents and fellows do while on the procedure rotation. They have asked the hospital's EHR team to help them implement automated structured reports based on their procedure reports in the EHR. What is a potential disadvantage to implementing educational experience reporting based on the clinical record?

A. Trainees spend less time per case documenting their involvement
B. Changes to clinical documentation structure can result in changes educational reporting
C. Educational reporting data is warehoused using the same resources as clinical data
D. Less exposure of personal health information

Answer: B. Changes to clinical documentation structure can result in changes educational reporting

Explanation: Recall that in our model educational reports are generated using structured clinical documentation. If there is a need to change the content or structure of the clinical report the potential impact on the downstream educational reports must be considered.

For example, the procedure service might decide to remove the procedure type "venous catheter" from their report and create separate types for the different venous catheters that they place (i.e. dialysis catheter, PICC, triple lumen catheter). It is still possible to produce the same report for residents who place venous catheters, but the educational report will need to be adjusted. Additionally, any reports that span the two time periods with the different note structures.

S12: Presentation: Higher, Further, Faster! Continuous Improvement in Clinical Informatics Processes

Quantifying discharge medication reconciliation accuracy at scale – a semi-automated, multi-institution, retrospective review - *Keith Morse*

S12-1: Which of the following is **NOT** a commonly used method to identify medication reconciliation errors that occur during a hospitalization?

A. A system of tracking self-reported medication errors.

B. A pharmacist reviews medications with the patient prior to discharge.

C. A nurse reviews medications with the patient prior to discharge

D. A FHIR-based app on the patient's smartphone stores a list of the patient's home medications and automatically compares it to the reconciled medications.

Answer: D. A FHIR-based app on the patient's smartphone stores a list of the patient's home medications and automatically compares it to the reconciled medications.

Explanation: Options A-C are common methods to identify medication reconciliation errors that are employed either on an on-going basis or as part of hospital quality improvement initiatives. Option D is a theoretical method to identify medication reconciliation errors, however it is not commonly used in practice.

References: 1) Huynh C, Wong ICK, Tomlin S, et al. Medication discrepancies at transitions in pediatrics: a review of the literature. Paediatr Drugs. 2013;15(3):203-215. https://link.springer.com/article/10.1007/s40272-013-0030-8

2) Hron JD, Manzi S, Dionne R, et al. Electronic medication reconciliation and medication errors. Int J Qual Health Care. 2015;27(4):314-319. https://academic.oup.com/intqhc/article/27/4/314/2357432

Accelerating Change - Agility in governance and build drive faster, cleaner optimization - *Amy Miller*

S12-2: The ACE methodology at Partners was a success as demonstrated by which of the following?

A. It ensured that all sites had a voice in all decision making

B. It enables successful build even with new / inexperienced or weak analysts

C. It reduces the “cost” of the team by not requiring any involvement of physicians

D. It delivered more changes and more impactful changes

Answer: D. It delivered more changes and more impactful changes

Explanation: ACE delivered more changes, and more impactful changes, than our standard build approach. The ACE methodology actually takes away site input into decision making, relying instead on the clinical lead (physician or nurse) for the clinical domain to make all decisions and prioritization. In areas where this did not successfully occur, no improvement was seen. The project was successful when advanced analysts were used; using new/inexperienced analysts was not successful, even with close engagement from the clinical informatician. A physician builder is involved in all decision making (build prioritization and build design), and in many cases is actively building along with the analyst. While this is “expensive,” compared to large committees with multiple clinicians from each site, we believe that the overall cost is actually improved from our prior state.

Physician-led projects have been previously described in the literature (Stud Health Technol Inform. 2019 Jul 4;262:276-279). The ACE approach expands beyond a single project to give a clinician informatician authority and autonomy for EHR build in their clinical domain at the enterprise level.

Reference: Peticolas K, Khairat S, Seashore C, Law J. Physician-Led EHR Customization Tracking Assessments for Pediatric Patients with Turner Syndrome. Stud Health Technol Inform. 2019;262:276-279. doi:10.3233/SHTI190072. http://ebooks.iospress.nl/publication/51734

S13: Panel - So You Want to be a Clinical Informatician?

– *Noellee Clarke, Paul Fu, Natalie Pageler, Shama Patel, Thomas Payne, Emily Webber*

S13-1: Which of the following statements is **false** about clinical informaticians?

A. The practice pathway eligibility is planned through 2022.

B. Board-certified clinical informaticians also hold a primary clinical board certification.

C. All clinical informaticians take a specific set of data science classes in medical school.

D. Clinical informaticians had an evolving set of responsibilities.

Answer: C. All clinical informaticians take a specific set of data science classes in medical school.

Explanation: Statements A, B, and D are all true statements about career paths in clinical informatics.

Reference: https://www.theabpm.org/become-certified/subspecialties/clinical-informatics/

S13-2: Many clinical informaticians will see their careers adapt to the changing needs of health care systems. Being a clinical content expertise is helpful in driving specific work; however, clinical informaticians are required to understand clinical workflows in all venues. Which of the following were most instrumental to success in leading clinical informatics success:

A. Knowledge of video conferencing applications

B. Ability to embrace continuous learning and organizational change

C. Building an app

D. How to add a printer

Answer: B. Ability to embrace continuous learning and organizational change

Explanation: The continuous change required of clinical informaticians requires strong organizational change skills. Panelists have highlighted many different responsibilities: the need to design and implement EMRs, establish interoperability networks, adapt patient-facing applications, support evolving regulatory needs. The ability to adapt and contribute requires organizational change exceeds the specific knowledge base needed for the other choices.

S14: Presentation: CDS and Physician Diagnostic and Treatment Efficiency

Implementing Age-Specific CDS Promotes Adherence to Duration Guidelines for Acute Otitis Media in the Pediatric ED - *Jonathan Beus*

S14-1: As a clinical informaticist, you have been asked to help develop clinical decision support for appropriate antibiotic prescribing for acute otitis media (inner ear infection) in children. The appropriate duration of therapy according to the best available evidence varies by patient age. Of the following, which is most likely to be acceptable to the user and provide optimal care to the patient?

A. Provide a one-time education session for providers and post guidelines to an internally accessible website. Leave the default durations for antibiotics blank/empty.

B. Implement an order set to dynamically present the age appropriate durations. The order set will be "suggested" based on chief complaints or visit diagnoses.

C. Create an interruptive alert that prevents completion of a prescription if the duration does not match the age appropriate recommendation.

D. In the "plan" section of the provider documentation template for ear complaints, include a drop-down list of age-based durations to remind the prescriber of the recommended duration.

Answer: B. Implement an order set to dynamically present the age appropriate durations. The order set will be "suggested" based on chief complaints or visit diagnoses.

Explanation: Option (B) is most consistent with the CDS Five Rights model. While this could be workflow dependent because of the number of possible workflows conceivable in outpatient care, the decision to treat a patient for an infection is likely made while talking to or evaluating a patient. Since many providers may not be using the EHR at that point in time, the next best option is likely when the provider goes to execute the plan by placing an antibiotic order.

(A) is less preferable as research has shown that the effects of education alone are likely to degrade over time. While leaving default durations blank might encourage prescribers to think more carefully about antibiotic duration, it is also likely to be less efficient and cumbersome to use the system.

(C) An interruptive alert is unlikely to be warranted in this case. This intervention would notify the prescriber after they had already taken action, thus, would not occur at the right time in the workflow.

(D) Including default recommendations in the documentation template might be somewhat effective and could enhance the efficiency of documentation. This is less likely to be effective in workflows in which the provider documents after the prescription or after the visit, when the intervention would not occur at the right time in the workflow.

References: Gerber JS, Prasad PA, Fiks AG, Localio AR, Bell LM, Keren R, Zaoutis TE. Durability of benefits of an outpatient antimicrobial stewardship intervention after discontinuation of audit and feedback. JAMA. 2014 Dec 17;312(23):2569-70. doi: 10.1001/jama.2014.14042. PMID: 25317759.

Holstiege J, Mathes T, Pieper D. Effects of computer-aided clinical decision support systems in improving antibiotic prescribing by primary care providers: a systematic review. J Am Med Inform Assoc. 2015 Jan;22(1):236-42. doi: 10.1136/amiajnl-2014-002886. Epub 2014 Aug 14. PMID: 25125688; PMCID: PMC4433375.

S15: Presentation: Informatics and Public Health

Visualizing Opportunity Index Data using a Dashboard Application – *Naleef Fareed*

S15-1: How were the variables of the seven domains of the Ohio Opportunity Index reported in the Opportunity Index Dashboard?

A. Raw values

B. Logged values

C. Inverse values

D. Standard deviations

Answer: D. Standard deviations

Explanation: As the raw values were highly skewed for domain variables, use of standard deviations provided for a simple and quick means for end users to gauge whether a census tract's score is better or worse than its standardized mean for a specific variable.

Reference: Noble M, Wright G, Smith G, Dibben C. Measuring multiple deprivation at the small-area level. Environment and Planning A. 2006;38(1):168-185. http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.1015.8348&rep=rep1&type=pdf

Using CQL to Compare CDC Opioid Prescribing Guidelines with Washington State Regulations – *Maggie Dorr*

S15-2: A healthcare IT professional has created a program using HL7 standards that they think could be helpful for other facilities. Which is the most appropriate strategy to share the application?

A. Create a detailed Word document describing his process.

B. Develop an implementation guide.

C. Share his application in a marketplace/directory.

D. Write an email to his colleagues announcing his new application.

Answer: B. Develop an implementation guide.

Explanation Although A, C, and D are all other things the healthcare IT professional could do, an implementation guide aids a developer through a set of rules for how the particular problem is solved and is essential in healthcare interoperability. Without B, the other options would not be as helpful to those interested in using the application.

Reference: Resource ImplementationGuide [Internet]. HL7; c2019 [cited 8 May 2020]. Available from: https://www.hl7.org/fhir/implementationguide.html

S16: Panel - The Emerging Role of the Electronic Health Record Patient Safety Officer

--Ethan D. Gershon, Jim Russell, Eva Karp, Gianna Zuccotti

S16-1: Healthcare IT is pervasive in clinical practice today and there are a number of moderating and mediating factors for how useful technology is in practice. It will require collaboration across government agencies, healthcare organizations, and health informatics companies to ensure patient safety is kept as a key focus and measurement of effective and safe use of health informatics. Which of the following is the most important process for a HealthIT company to follow to ensure that the software supports a clinician's practice and patient care safety in the design and use of clinical software?

A. HealthIT companies have experienced engineers developing software for healthcare systems to support clinical practice.

B. HealthIT companies have significant involvement of clinical experts, human factors experts, and healthcare providers throughout the development implementation and post-implementation processes to ensure the design and application of technologies in health care are safe, supports clinical practice, and safe patient care.

C. Failure Mode and Effect Analysis (FMEA) is a required process throughout the development process to identify potential process failures before they occur, intending to eliminate them or minimize the risk associated with them.

D. HeatlhIT companies should have automated testing tools for regression testing to ensure the products meet the intended design and enhancements do not introduce errors.

Answer: B. HealthIT companies have significant involvement of clinical experts, human factors experts, and healthcare providers throughout the development implementation and post-implementation processes to ensure the design and application of technologies in health care are safe, supports clinical practice, and safe patient care.

Explanation: Clinicians and human factors experts need to be actively involved in the design, testing, implementation and post implementation assessment of the technology. Human factors experts aid in

integrating technology into existing workflow and in making interfaces easy to learn and use under stressful conditions. It requires collaboration and shared responsibility for all stakeholders involved with EHRs to achieve the vision of optimal clinician satisfaction and increased patient safety. Belmont has advocated for "shared responsibility in the design, implementation, and use of health IT among involved stakeholders through the contractual allocation of responsibility to ensure that the party who has the most control over the factors giving rise to particular health IT patient safety risk takes appropriate steps to prevent and mitigate risk, with a corresponding liability for damages apportioned accordingly." (Belmont, 2017), (pg.111)

References: Abbott PA, Weinger MB. Health information technology:Fallacies and Sober realities - Redux A homage to Bentzi Karsh and Robert Wears. *Appl Ergon*. 2020;82:102973. doi:10.1016/j.apergo.2019.102973. https://www.sciencedirect.com/science/article/pii/S0003687019301875?via%3Dihub

Belmont, E. "Health IT and patient safety: a paradigm shift to shared responsibility." J Health Life Sci Law 10.3 (2017): 115-116.

S17: Presentations - Considerations for Utilizing Consumer Focused Technologies

One PROMIS™ at a Time: Implementation of Depression and Anxiety PROMIS™ Domains as a Standard of Care for Adolescents Undergoing Anterior Cruciate Ligament Reconstruction. – *Lia McNeely*

S17-1: A hospital department has implemented a single patient reported outcome questionnaire to a few cohorts of patients within their department. The PRO will be given to patients on an iPad at the time of the visit or prior to the visit through the Patient Portal. The PRO questionnaires are being manually attached by administrative staff to each appointment based on certain criteria. The implementation team trained the provider staff on how to locate the data in the EHR using a reporting tool, and they reviewed with the clinicians the scoring cutoffs for potential interventions. For the first 4 weeks after implementation of the PRO, 85% of patients were completing the questionnaire, but by 12 weeks after implementation the rate had fallen to 50%.

Which of the following answers best explains why this decrease occurred?

A. Most patients were not completing the PRO prior to the office visits, and the department did not have enough iPads to give out during office visits to meet the demand.

B. Providers found it difficult to find the reporting tool and stopped looking for the patient scores.

C. Administrative staff missed many appointments that met the criteria and did not attach questionnaires.

D. Patient's scores were never discussed with them at the office visits and when following up at the next visit many patients opted not to complete the questionnaire since they did not see the point.

Answer: C. Administrative staff missed many appointments that met the criteria and did not attach questionnaires.

Explanation: Manually attaching questionnaires to office visits is time consuming and dull work. In addition, even with strict criteria, staff can miss visits that were supposed to have questionnaires attached. Without diligent reporting and follow-up with staff by someone on the project team who is carefully auditing the cohorts, questionnaires stop getting attached. Finding an automated way to attach a questionnaire to specific cohorts within a department offers a way around this and can improve the completion rates of the PRO while still allowing a targeted approach to PRO implementation.

Reference: Gerhardt WE, Mara CA, Kudel I, et al. Systemwide Implementation of Patient-Reported Outcomes in Routine Clinical Care at a Children's Hospital. Jt Comm J Qual Patient Saf. 2018;44(8):441-453. doi:10.1016/j.jcjq.2018.01.002. https://pubmed.ncbi.nlm.nih.gov/30071964/

S19: Presentation: Experiences with using Applied Clinical Informatics Tools

Speeding Access to Specialty Care with a SMART-on-FHIR Fax-to-Referrals Automation Tool – *Aaron Neinstein*

S19-1: A SMART on FHIR application was developed to enable inbound faxed referrals to be ingested as digital referral objects in the EHR. Which of these is an advantage to using SMART on FHIR for this application?

A. It allows a user to launch the application without a separate log-on and allows demographic data to be easily read out of the EHR into the application
B. It allowed an open source community of developers to contribute software code
C. It was SMART enough to read the data in the inbound faxes
D. SMART on FHIR ensured that the application would comply with privacy policies

Answer: A. It allows a user to launch the application without a separate log-on and allows demographic data to be easily read out of the EHR into the application

Explanation: SMART on FHIR stands for Substitutable Medical Applications and Reusable Technologies (SMART) on Fast Health Interoperability Resources. SMART defines a standard methodology for how a third-party application should interact with a FHIR API interface, including how the application should be launched to comply with security policies. FHIR defines the structure of the healthcare data. A SMART on FHIR application does allow a user to launch the application in context of the EHR without separate log-on, and does then allow Read API access to data like demographics (Correct Choice A).

SMART on FHIR does not define the software development process, so an application developer could choose to write open source code, or not (choice b). SMART on FHIR has nothing to do with optical character recognition, artificial intelligence, or natural language processing, any of which could be contained in an application, but are not necessarily related to SMART on FHIR itself (choice c). Neither SMART nor FHIR enforce or reflect the privacy policy of the application (choice d), which is a decision left to the individual application developer.

Reference: Mandel JC, Kreda DA, Mandl KD, Kohane IS, Ramoni RB. SMART on FHIR: a standards-based, interoperable apps platform for electronic health records. J Am Med Inform Assoc. 2016;23(5):899–908. doi:10.1093/jamia/ocv189

S20: Presentations - Informatics and Chronic Conditions

Human-Centered Methods to Inform the Design of Information Technologies for Team-Based Depression Care – *Jina Suh*

S20-1: Human-centered design provides several methods for developing easy to use, accessible, and appealing user experiences. Two methods for early investigative phases we discussed in the presentation are semi-structured interview and contextual inquiry. Below are four benefits of using these methods. Which of the following benefits is a strength unique to contextual inquiry?

A. Enumerate challenges and needs of providers

B. Directly observe care processes and behaviors as they unfold which may be omitted from self-reports

C. Capture qualitative descriptions of care processes, workflows, and roles

D. Identify competing demands for provider attention and resources

Answer: B. Directly observe care processes and behaviors as they unfold which may be omitted from self-reports

Explanation: Contextual inquiry is a method for collecting data from stakeholders in the field where they are working. Similar to how medical professionals are trained by 'shadowing' their supervisors, contextual inquiries follow an apprenticeship model where the apprentice (i.e., the researcher) uses observation, inquiry, and interpretation to learn the craft of the master (i.e., the stakeholder). Both contextual inquiries and interviews provide benefits of (A) enumerating challenges and needs, (C) capturing qualitative descriptions of care, and (D) identifying competing demands for resources. The unique aspect of contextual inquiry is that (B) the researcher is embedded in the context and directly watches the processes and behaviors as they unfold, providing external perspectives.

Reference: Beyer H, Holtzblatt K. Contextual Design: Defining Customer-Centered Systems. Elsevier; 1997 Dec 8.

Development and use of an advanced patient registry to support team based collaborative care of perinatal depression in community health centers – *Tess Grover*

S20-2: A collaborative care team at a local FQHC has recently started using a patient registry built into Epic to support their perinatal mental health program. As part of their regular weekly workflow, care managers at this FQHC use the registry to sort patients by when they last had a follow-up visit so that they can prioritize reaching out to those patients that have gone more than two weeks without an

appointment. Which of the following required functions of an advanced patient registry does this illustrate?

A. Tracking clinical outcomes across a target population

B. Tracking patient engagement across a caseload

C. Prompting treatment-to-target

D. Facilitating efficient, systematic psychiatric caseload review

Answer: B. Tracking patient engagement across a caseload

Explanation: B is the correct answer because using an advanced patient registry to prioritize patients based on how long it's been since their last appointment is a core part of tracking how engaged a patient is in their treatment program. Advanced patient registries are intended to provide clinicians with a way to see which patients are due for an appointment or need more intensive efforts to engage them in care, as early follow-up has been shown to improve patient outcomes in collaborative care programs. The other options provided (A, C, and D) are more focused on using patients' symptom monitoring scores to help guide care.

References: Bao Y, Druss BG, Jung HY, Chan YF, Unützer J. Unpacking collaborative care for depression: Examining two essential tasks for implementation. Psychiatr Serv. 2016 Apr 1;67(4):418-24. doi: 10.1176/appi.ps.201400577. Epub 2015 Nov 16. PMID: 26567934; PMCID: PMC5445658.

Unützer J, Choi Y, Cook IA, Oishi S. A web-based data management system to improve care for depression in a multicenter clinical trial. Psychiatr Serv. 2002 Jun;53(6):671-3, 678. doi: 10.1176/ps.53.6.671. PMID: 12045303.

S22: Presentation: Cybersecurity and Deidentification

Getting in Front of Cybersecurity Frameworks with a Cyber Vulnerability Profile: Assessing Risk from a Different Perspective - *Gemini Majkowski*

S22-1: Data breaches continue to rise and pose significant risk to patient safety, financial loss, litigation, and loss of public trust in our healthcare system. Using the Cyber Vulnerability Profile Framework as a basis for examining U.S. hospitals with data breach and without data breach, which of the four dimensions of vulnerabilities are most likely associated with data breaches in U.S. hospitals?

A. Human Factor & Operational Processes

B. Technology & Human Factor

C. Technology & Organizational Factors

D. Organizational & Operational Processes

Answer: C. Technology & Organizational Factors.

Explanation: Only the Technology and Organizational Factors dimensions demonstrated statistical significance in predicting the likelihood of breach for US hospitals. In the technology dimension, study results showed statistically significant difference between the two groups of hospitals "with breach" and "without breach" in the percentage of hospitals that attained advanced stages of the HIMSS Analytics EMRAMSM validation and use of server virtualization software in their facilities. The Electronic Medical Record Adoption Model (EMRAMSM) stage validation measured cyber vulnerabilities associated with the lag in security, over connectivity, and rapid adoption of EHR and MU. While server virtualization software measured cyber vulnerabilities associated with legacy systems. Server virtualization software is used to create multiple virtual servers within one physical server, allowing hospitals to continue hosting legacy systems. In the organizational dimension, comparison of hospitals with breach and without breach showed that Not-for-profit, health system membership, and net operating revenue were statistically significant predictors of data breach.

While the other answers, Human Factor and Operational Process dimensions are key dimensions of vulnerability, our study results did not demonstrate statistical significance. Study limitation attributed to the nature of secondary data warrant further investigation of the Human Factor and Operational Process dimension.

References: Kruse CS, Frederick B, Jacobson T, Monticone DK. Cybersecurity in healthcare: A systematic review of modern threats and trends. Technol Health Care. 2017;25(1):1-10. doi:10.3233/THC-161263. https://content.iospress.com/articles/technology-and-health-care/thc1263

Anwar, M., Joshi, J., & Tan, J: Anytime, anywhere access to secure, privacy-aware healthcare services: Issues, approaches and challenges. Health Policy and Technology. 2015; 4(4), 299-311. doi:10.1016/j.hlpt.2015.08.007. https://www.sciencedirect.com/science/article/abs/pii/S2211883715000659

Luna R, Rhine E, Myhra M, Sullivan R, Kruse CS. Cyber threats to health information systems: S systematic review. Tehcnology & Healt Care, 24(1), 1-9. Doi:10.3233/THC-151102 https://content.iospress.com/articles/technology-and-health-care/thc1102

HIMSS Cybersecurity Survey, Report, 2018: www.himss.org/sites/hde/files/d7/u132196/2018_HIMSS_Cybersecurity_Survey_Final_Report.pdf

S23: Panel - The Critical Role of Clinical Informatics in Addressing the Global Threat of Antibiotic Resistance, Emerging Infectious Diseases, and Healthcare Acquired Infections

Courtney Hebert, Nirav Shah, Juan D. Chaparro, Ari Robicsek, Keith F. Woeltje

S23-1: Which of these was the main objection raised by clinical staff about an EHR-based alert notifying front-line providers that an individual lives at an address with another known COVID-19 case?

A. They were concerned that the alert would go off so often, it would cause alert fatigue

B. They were concerned that the alert would lead to workflow disruption during an already busy time

C. They were concerned that it would be challenging to explain to the patient why they are being isolated without a potential HIPAA violation

D. They were concerned that there was insufficient clinical benefit to this alert

Answer: C. They were concerned that it would be challenging to explain to the patient why they are being isolated without a potential HIPAA violation

Explanation: This was the major objection raised by clinical staff about this alert. Although, the other answers are common issues when creating EHR-based alerts, there are unique ethical challenges related to the COVID-19 pandemic.

Reference: Ienca M, Vayena E. On the responsible use of digital data to tackle the COVID-19 pandemic. Nat Med. 2020;26(4):463-464. doi:10.1038/s41591-020-0832-5
https://www.nature.com/articles/s41591-020-0832-5

S23-2: The COVID-19 pandemic has created challenges throughout the health care system. Which of the following is one reason why there is a need for changes in research informatics infrastructure, that is unique to this pandemic?

A. Because of the urgency and timing of a pandemic, multiple trials are being proposed simultaneously on a similar patient population

B. Because with limited information on treatment for COVID-19, there is a greater urgency to conduct observational research rather than prospective clinical trials

C. Because personal data on patients with COVID-19 is considered protected health information

D. Because there are unique regulatory requirements for diseases that differentially affect children and adults

Answer: A. Because of the urgency and timing of a pandemic, multiple trials are being proposed simultaneously on a similar patient population

Explanation: One of the unique challenges addressed in this panel presentation is handling multiple studies on the same patient population occurring at the same time. The other answers are either not unique to the COVID-19 pandemic (C), or are incorrect (B and D).

Reference: Bhimraj A, Morgan RL, Shumaker AH, et al. Infectious Diseases Society of America Guidelines on the Treatment and Management of Patients with COVID-19 [published online ahead of print, 2020 Apr 27]. Clin Infect Dis. 2020;ciaa478. doi:10.1093/cid/ciaa478 https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciaa478/5825667

S24: Presentation: Using Predictive Algorithms for Patient Outcomes

Machine Learning Predicts Catheter Salvage in Pediatric Central Line-Associated Bloodstream Infection – *Lorne Walker*

S24-1: You wish to use your local EMR data to build a model to predict outcomes in CLABSI catheter salvage attempts. While applying this approach to your local patient population, which of the following is true?

A. CLABSI are rare, so EHR-based datasets are necessary to gather adequate sample size to train a predictive model.

B. A predictive model for CLABSI outcome could provide the optimal management strategy for most individuals.

C. Estimates of the likelihood of infection recurrence or catheter loss could augment provider decision making.

D. An EHR-based CLABSI predictive model could reliably predict outcomes in individuals who routinely have their catheters removed immediately.

Answer: C. Estimates of the likelihood of infection recurrence of catheter loss could augment provider decision making.

Explanation: The model described in this presentation suggests using forecasts of key outcomes (recurrence, catheter removal) to aid clinical decision making by allowing a detailed and individualized cost/benefit analysis for catheter salvage vs removal.

A - CLABSI are the most common healthcare-associated infection in pediatrics. EHR data sources provide relatively large sample size to work with, but this condition is not rare.

B - The goal of the presented model is not to mandate a specific management strategy, but instead to provide risk estimates that can aid in individualized decision making.

D - The machine learning models described here would not reliably make accurate predictions about scenarios not included in the training data.

References: Mermel LA, Allon M, Bouza E, Craven DE, Flynn P, O'Grady NP, Raad II, Rijnders BJ, Sherertz RJ, Warren DK. Clinical practice guidelines for the diagnosis and management of intravascular catheter-

related infection: 2009 Update by the Infectious Diseases Society of America. Clin Infect Dis. 2009 Jul 1;49(1):1-45. Doi: 10.1086/599376. PMID: 19489710; PMCID: PMC4039170.

Hastie, T., Tibshirani, R., & Friedman, J. H. (2001). The elements of statistical learning: Data mining, inference, and prediction. New York: Springer.

A Novel Artificial Intelligence Algorithm of Synthetic Sampling for Boosting Accurate Prediction of Infrequent Health Outcomes – *Gang Fang*

S24-2: A prediction model is being built and trained to predict the clinical event of major bleeding among patients taking anticoagulants as prevention management for thromboembolic events. The study cohort has 21,000 patients and 3% of them experienced a major bleeding event while 97% did not. Which of the following is most likely?

A. The 3% major bleeding event rate is called imbalanced data, which may cause low AUC (ROC) problem in the machine-learning prediction model

B. The 3% major bleeding event rate is called imbalanced data, which may cause low specificity problem in the machine-learning prediction model

C. The 3% major bleeding event rate is called imbalanced data, which may cause low sensitivity problem in the machine-learning prediction model

Answer: C. The 3% major bleeding event rate is called imbalanced data, which may cause low sensitivity problem in the machine-learning prediction model

Explanation: Imbalanced data leads to a low sensitivity problem in the machine-learning prediction model to predict the occurrence of the event and does not affect specificity or AUC (ROC). Instead, the specificity or AUC is typically high for imbalanced data.

References: Sun, Yanmin, Andrew KC Wong, and Mohamed S. Kamel. "Classification of imbalanced data: A review." International journal of pattern recognition and artificial intelligence 23.04 (2009): 687-719.

Alahmari, Fahad. "A Comparison of Resampling Techniques for Medical Data Using Machine Learning." Journal of Information & Knowledge Management (2020): 2040016.

S24-3: Methods to address imbalanced data problem in machine-learning prediction for clinical health outcome data with both numeric and categorical features (predictors) may include:

A. Random over-sampling of original samples

B. Over-sampling using synthetic samples

C. Use AUC as a model performance measure

D. A and B

Answer: D. A and B

Explanation: Random over-sampling and over-sampling with synthetic samples can be used to address imbalanced data problem. The use of AUC as a performance measure for prediction model training cannot resolve this problem.

References: Sun, Yanmin, Andrew KC Wong, and Mohamed S. Kamel. "Classification of imbalanced data: A review." International journal of pattern recognition and artificial intelligence 23.04 (2009): 687-719.

Alahmari, Fahad. "A Comparison of Resampling Techniques for Medical Data Using Machine Learning." Journal of Information & Knowledge Management (2020): 2040016.

Prediction of Unplanned Readmission in Infants with Single Ventricle Disease - *Christine Allen*

S24-4: WT is a 3-month-old with hypoplastic left heart syndrome (HLHS) that is home during the interstage period between the first two surgeries for single ventricle heart disease. He is on aspirin and furosemide. He eats all his feeds by mouth. His parents monitor his oxygen saturations, heart rates, weight gain, and video daily. They then enter that data into a mobile health application to transfer to their home monitoring team.

While reviewing the mobile application data, the healthcare team notes that WT has had weight loss for 3 days, high oxygen saturations over the goal of 85%, and harder breathing on his video. In addition, a predictive model calculates WT at a high risk for readmission, a status which has changed from a lower risk for readmission in the previous week. Which of the following best explains these observations?

A. He is having expected clinical changes with his cardiac anatomy.

B. His symptoms indicate possible viral respiratory illness.

C. His symptoms indicate a need for possible cardiac catheterization intervention due to aortic arch obstruction.

D. His symptoms indicate likely pulmonary blood flow obstruction.

Answer: C. His symptoms indicate a need for possible cardiac catheterization intervention due to aortic arch obstruction.

Explanation: Although the cluster of symptoms from the mobile application is mild, they indicate a possible coarctation of the aorta, which is a complication after cardiac surgery for HLHS. The predicted risk score draws attention to these symptoms and adds strength to this conclusion.

References: Bingler et al. (2018). Interstage outcomes in infants with single ventricle heart disease comparing home monitoring technology to three ring binder documentation: A randomized crossover study. World J Pediatric Congenit Heart Surgery. 9 (3), 305-314. doi: 10.1177/2150135118762401

Shirali et al. (2016). Harnessing teams and technology to improve outcomes in infants with single ventricle. Circulation Quality and Outcomes. 9(3), 303-311. doi: 10.1161/circoutcomes/115002452/

S25: Presentation: Innovative Methods in EHR Optimization

Using Computational Ethnography to Measure Changes in Workflow after Implementing Clinical Decision Support – *Jeritt Thayer*

S25-1: A hospital has gone live with a new clinical decision support tool. To ensure it is impacting clinical workflow as expected, system administrators must do which of the following:

A. Trust that developers of the tool knew what they were doing.

B. Use computational ethnography techniques in conjunction with traditional data collection methods on an ongoing basis.

C. Use only computation ethnography techniques.

D. Send out a single survey to a small sample of clinicians who use the tool.

Answer: B. Use computational ethnography techniques in conjunction with traditional data collection methods on an ongoing basis.

Explanation: Clinical decision support systems function in a complex environment where not all outcomes can be anticipated. In order to ensure that the tool is being used as designed and is impacting clinical care as expected, it is important to combine techniques from both computational ethnography and traditional data collection methods such as usability data, log files, tracking responses in the tool, and surveys. Trusting that the developers knew what they were doing may lead to adverse patient events. Using computational ethnography techniques by themselves may identify changes in workflow, but it may not identify the cause of the change. Sending out a single survey to a small sample of clinicians may not provide an accurate representation of how the tool is impacting work and does not update as the EHR evolves over time.

References:

Zheng K, Haftel HM, Hirschl RB, O'Reilly M, Hanauer DA. Quantifying the impact of health IT implementations on clinical workflow: a new methodological perspective [published correction appears in J Am Med Inform Assoc. 2010 Sep-Oct;17(5):612]. J Am Med Inform Assoc. 2010;17(4):454-461. doi:10.1136/jamia.2010.004440 https://www.ncbi.nlm.nih.gov/pubmed/20595314

https://link.springer.com/chapter/10.1007/978-3-319-17272-9_6

S27: Presentation: Tracking Serious Conditions

Aortic Aneurysm: Informatics Driven Detection, Risk Stratification and Treatment – *Victor Garcia*

S27-1: You are a clinical informatician working at a large hospital. You built an algorithm that predicts whether a patient's abdominal pain is due to a vasculitis. Experimenting on historical data, your algorithm predicts vasculitis with a sensitivity of 60% and a precision of 70%. You are excited to put it to work right away with the added feature of automatically sending your algorithm's results as a message to providers.

With institutional approval, you run your algorithm on the electronic health data of patients currently admitted from the emergency department, and it identifies two patients that may have an unrecognized vasculitis. A few days later, you and your team review the cases, and there is no evidence that the clinicians are treating or working up the patients for vasculitis.

Which of the following is a flaw in your implementation up to this point?

A. Your algorithm was not ready for clinical use because the sensitivity was too low.

B. Your algorithm was not ready for clinical use because the precision was too low.

C. You have not worked with your stakeholders to identify how best to validate and integrate your model into current workflows.

D. Your system should have automatically ordered the appropriate follow-up tests to evaluate for the disease of interest.

Answer: C. You have not worked with your stakeholders to identify how best to integrate your model into current workflows.

Explanation: When creating a machine learning algorithm or implementing a new process, an important component is working with your stakeholders and clinical experts. Though an algorithm may perform exceptionally well, if the output does not integrate with the users' workflow, users will not easily adopt the technology. This negates the impact any new algorithm or process could have. By involving clinicians and clinical experts early in the design and validation process, healthcare systems will be poised to smoothly and readily integrate new protocols into clinical workflows. A and B are incorrect because the sensitivity and specificity vary depending on the problem of interest. D is incorrect because algorithms should not determine treatment plans but rather support clinicians in the clinical decision-making process.

Reference: Wiens J, Saria S, Sendak M, Ghassemi M, Liu VX, Doshi-Velez F, Jung K, Heller K, Kale D, Saeed M, Ossorio PN, Thadaney-Israni S, Goldenberg A. Do no harm: a roadmap for responsible machine learning for health care. Nat Med. 2019 Sep;25(9):1337-1340. doi: 10.1038/s41591-019-0548-6. Epub 2019 Aug 19. Erratum in: Nat Med. 2019 Oct;25(10):1627. PMID: 31427808.
https://www.nature.com/articles/s41591-019-0548-6

Informing colorectal cancer screening in northern Canada using participatory simulation modeling - *Heather Smith*

S27-2: A rural health authority is looking to implement a colorectal cancer screening program in their region. What of the following is most likely to create a bottleneck in the screening process?

A. Media promotion

B. Identifying eligible individuals

C. Delivering fecal stool tests

D. Providing colonoscopy

Answer: D. Providing colonoscopy

Explanation: Colonoscopy is a procedure performed by specialist physicians and generally limited to urban centres. It is a critical in step in the screening process. It enables clinicians to diagnose a colorectal cancer suspected by a positive fecal screening test. Implementing a screening program would increase the demand for colonoscopy which could create a bottleneck for rural regions due to the limited availability of colonoscopy in those regions.

Reference: Champion C, Alvarez GG, Affleck E, et al. A systems perspective on rural and remote colorectal cancer screening access. J Cancer Policy 2017;14:27–32..

S28: Presentations - No Pain No Gain: Initiatives Around Improved Opioid Management

A Workflow-Oriented Approach to Clinical Decision Support for Effective Pain and Opioid Management – *Upendra Thaker*

S28-1: Which of the following statements best describes the 2016 CDC guidelines for responsible outpatient prescribing of opioid medications for chronic non-cancer pain?

A. Carefully evaluate the risks and benefits of opioid therapy and minimize risks by using the lowest effective doses as part of a multimodal analgesia strategy.

B. Rely on pharmacists to determine an effective pain management strategy for each patient

C. Never prescribe opioids, and only rely on non-pharmacologic and alternative therapies for pain control

D. Prescribe opioids as a first-line therapy for any reported pain, regardless of pain levels.

Answer: A. Carefully evaluate the risks and benefits of opioid therapy and minimize risks by using the lowest effective doses as part of a multimodal analgesia strategy.

Explanation: This answer best summarizes the CDC's 2016 twelve principles of appropriate opioid management for chronic non-cancer pain. Specific strategies include tracking risks and benefits, minimizing risks by using the lowest effective dose, and utilizing PDMPs and urine drug screens. The

other answers are incorrect because existing guidelines do not encourage a complete prohibition of opioids nor a complete reliance on opioid therapy.

Reference: https://www.cdc.gov/drugoverdose/prescribing/clinical-tools.html

S30: Presentation: Using Models to Learn Differences in Populations

Beyond χ2. Finding significant differences in cohort studies despite wide ranging demographic diversity – *Gordon Lemmon*

S30-1: You have patient data that includes demographics and categorical clinical information (ICD diagnoses and procedure codes). What two statistical approaches can be combined in order to discover correlations between categorical variables, while accounting for confounding effects?

A. Logistic regression and Poisson distribution

B. Linear regression and Poisson binomial distribution

C. Logistic regression and Poisson binomial distribution

D. Linear regression and binomial distribution

Answer: C. Logistic regression and Poisson binomial distribution

Explanation: First use logistic regression to model the effects of demographics on each clinical variable. Next sum over patient probabilities to calculate an expectation and variance and use Poisson binomial to calculate a p-value for the number of patients who have each pair of terms.

(A) and (D) use the wrong statistical distribution.

(B) and (D) use linear regression. Logistic regression should be used for predicting categorical outcomes.

References: https://en.wikipedia.org/wiki/Poisson_binomial_distribution

https://doi.org/10.1016/j.csda.2012.10.006

Results from the first EHR DREAM Challenge: Patient Mortality Prediction – *Timothy Bergquist*

S30-2: A health care system has an EHR repository that follows a well-documented common data model and they wish to host a community challenge using a model to data approach. They choose a clinically relevant question and establish their benchmarks. Which of the following resources will be the most important for enabling challenge participants to successfully run models on the EHR data.

A. A document detailing the distributions of the EHR data.

B. A synthetic dataset that closely mimics the real EHR repository

C. A detailed FAQ hosted on a website

D. An example Docker image.

Answer: B. A synthetic dataset that closely mimics the real EHR repository

Explanation: While A C and D are useful for participants, a synthetic dataset is essential to allow participants to locally test and debug their models. Participants running models locally on the synthetic dataset can catch most low-level and simple problems as well as estimate their model's runtime.

Reference: Guinney J, Saez-Rodriguez J. Alternative models for sharing confidential biomedical data. Nat Biotechnol. 2018;36(5):391-392. doi:10.1038/nbt.4128 https://www.nature.com/articles/nbt.4128

S31: Presentation: Pragmatic Human-centered Design

Requirements for Inpatient Hand-Off Software: Application of Design Thinking to the User-Centered Design Process – *Ryan Yarnall*

S31-1: A physician practice currently uses a software program and workflow for scheduling patient appointments that often causes scheduling errors and usually creates redundant work. They plan to design a more effective program for office staff. To design a tool that best meets the practice's needs, which of the following is the best first step in the design process?

A. A representative office staff member with informatics training creates a design based upon his experience.

B. A contracted developer presents three potential scheduling tools to select from that were designed in consultation with other developers working in different industries.

C. Leadership arranges a conference between a design team and physician champions to rank scheduling tool prototypes using a validated usability assessment.

D. A design team surveys physicians and office staff at the practice to understand what makes the current system ineffective and inefficient.

Answer: D. A design team surveys physicians and office staff at the practice to understand what makes the current system ineffective and inefficient.

Explanation: Human-centered design considers user needs at each phase of the design process, and Design Thinking techniques are intended to rapidly produce a wide range of ideas and innovative solutions based upon available market research. Empathizing with the end-user is a key initial step in the human-centered design process. In this scenario, a single office staff member implementing his

design does not utilize a key principle of Design Thinking by seeking multiple perspectives. A hired designer presenting potential scheduling tool designs to the practice without prior physician and office staff consultation excludes the end-user from the process. While use of a validated instrument to rank the usability of competing designs is essential to converge on the best solution, excluding office staff from the ranking process does not allow input from an important end-user of the product.

References: Dam RF, Teo YS. What is Design Thinking and Why Is It So Popular? [Internet]. The Interaction Design Foundation. [cited 2018Jul]. Available from: https://www.interaction-design.org/literature/article/what-is-design-thinking-and-why-is-it-so-popular

What is User Centered Design? [Internet]. The Interaction Design Foundation. [cited 2018Jul]. Available from: https://www.interaction-design.org/literature/topics/user-centered-design

Addressing Preventative Care Gaps Using Robotic Process Automation at Bedside - *Joshua Lystra*

S31-2: Your health informatics team to would like to evaluate the use of Robotic Process Automation in care gap closure at bedside in a primary care clinic, which is the most likely LEAN system tool to implement to ensure your team performs real time analysis of root cause problems related to care gap closure?

A. Carry out a Gemba walk to observe team performance as care is provided or received.

B. Implement the “5S methodology” to reduce waste and standardize work.

C. Apply the principles of the "eight wastes" to help reduce care gap opportunities.

D. Participate in a Kaizen event.

Answer: A. Going to the Gemba where work is being performed or received.

Explanation: By performing a "Gemba walk" the health informatics team would be able to observe, and potentially understand the challenges of addressing care gap opportunities first-hand. By observing people delivering care, the health informatics team would have an understanding of the care processes, and appropriate areas in which to leverage Robotic Process Automation. By observing and understanding the potential root causes of the problem through observations, the implementation of Robotic Process Automation can complement continuous change improvement while acknowledging current state workflow. The other answers are part of LEAN methodology but would not be directly applicable to seeing the challenges of care gap closure in real time from the provider and patient’s perspective.

Reference: Lot LT, Sarantopoulos A, Min LL, Perales SR, Boin IFSF, Ataide EC. Using Lean tools to reduce patient waiting time. *Leadersh Health Serv (Bradf Engl)*. 2018;31(3):343-351. doi:10.1108/LHS-03-2018-0016. https://www.emerald.com/insight/content/doi/10.1108/LHS-03-2018-0016/full/html

S32: Panel - Threading the Needle: Protecting Vulnerable Adolescents' Confidentiality in the EHR Without Information Blocking

Jennifer Lee, Jeffrey Hoffman, Chethan Sarabu, Natalie Pageler

S32-1: An important early step of natural language processing is preprocessing the free text. Which of the following describes the process of tokenization?

A. Removing punctuation

B. Dividing text into single words

C. Dividing text into bigrams (groups of 2 words, with occurring frequency)

D. Dividing text into trigrams (groups of 3 words, with occurring frequency)

Answer: B. Dividing text into single words

Explanation: A preprocessing step for natural language processing is called tokenization where a string of text is broken into individual words). The term bag of words refers to collections of words of multiple lengths, e.g. unigram (one word); , bigram (two-word); trigrams (three-word) and the frequency of occurrence within a document.

Reference: Nabi J. Machine Learning — Text Processing. Towards Data Science. Sep 13, 2018. https://towardsdatascience.com/machine-learning-text-processing-1d5a2d638958

S32-2: Confidentiality laws protecting adolescents vary by states. Adolescents are protected in most states by which of the following categories?

A. Mental health, Medication history, Reproductive health

B. Reproductive health, Mental health, Substance abuse

C. Oncology, Mental health, Substance abuse

D. Reproductive health, Oncology, Substance abuse

Answer: B. Reproductive health, Mental health, Substance abuse

Explanation: Each state has variable adolescent confidentiality laws and it is important for practicing clinicians to understand individual state laws when working with adolescent patients. In general, reproductive health, mental health, and substance abuse are three broad categories that most likely will be protected.

S33: Presentations: Organizational Considerations for Achieving Clinical Informatics Success

Encouraging Collaboration Between Applied and Academic Informatics Staff: The Case of the Vanderbilt Clinical Informatics Center – *Adam Wright*

S33-1: Which of the following resources has been demonstrated to be useful for connecting clinical informaticians with resources they need to do their job?

A. A community-edited knowledge base

B. Biostatistical consulting services

C. Facilitation of collaboration

D. Value sets

Answer: A. A community-edited knowledge base

Explanation: A knowledge base allows informaticians to quickly access information they need, and to contribute knowledge to the community.

Reference: http://www.vclic.org

HIT Capability Maturity Model: Strengthening the HIT Ecosystem through Self-assessment – *Jennifer Shivers*

S33-2: Please select the best answer below. The ECCM maturity model and Toolkit promote a learning health system by

A. Creating a standardized evaluation system that allows comparing different health facilities HIT abilities.

B. Defining a recipe that can quickly be used to fill in any gaps in facility HIT system requirements.

C. Ensuring that HIT systems will all reach maturity in each domain.

D. Providing a model that allows a facility to self-assess and make a plan for continued improvement.

Answer: D. Providing a model that allows a facility to self-assess and make a plan for continued improvement.

Explanation: The goal of the ECCM model and accompanying toolkit is not to ensure that each domain and subdomain reach maturity or to provide a grading scale for HIT systems and facilities. Instead the goal is to create a process that facilitates dialog about the HIT ecosystem and provides defined steps that can be taken to mature prioritized aspects of the HIT ecosystem.

Reference: Rocha, Álvaro. (2011). Evolution of Information Systems and Technologies Maturity in Healthcare. International journal of healthcare information systems and informatics. 6. 28-36. 10.4018/jhisi.2011040103.

S34: Panel - From Burnout to Wellness: Investing in People to realize the Value of IT Investment

Lu de Souza, Susan Locke, Michael Ross, John Schultz

S34-1: A strong Net EHR Experience Score is correlated with lower burnout; the more satisfied providers in a certain organization are with their EHR, the less likely it is that many providers in that organization are experiencing burnout.

The single greatest predictor of user experience is:

A. EHR vendor software choice.
B. EHR vendor software version.
C. Percentage of operating budget spent on IT
D. Perceived EHR training quality.

Answer: D. Perceived EHR training quality.

Explanation: For a physician, feeling safe with the tools of medicine is about more than the user interface. Physicians with poor training are over 3.5 times more likely to report that their EHR does not enable them to deliver quality care. High quality training improves the skill of the physician and allows for personalization of the system

Reference: Longhurst CA, Davis T, Maneker A, et al. Local investment in training drives electronic health record user satisfaction. *Appl Clin Inform*. 2019;10(2):331-335. doi:10.1055/s-0039-1688753. https://www.thieme-connect.com/products/ejournals/html/10.1055/s-0039-1688753

S34-2: A well- functioning care team improves patient outcomes, reduces repetition and incongruities in care, and improves patient satisfaction. Patients who think their care team works well together tend to report better experiences and feel safer. Studies have shown that team-based care also reduces clinician burnout.

Investing in a high-quality team-based training program overcomes the following barriers to team based care:

A. Financial Barriers
B. Inefficient and outdated workflows in the era of the EHR
C. Lack of clearly defined roles for team members
D. Regulatory barriers

Answer: B. Inefficient and outdated workflows in the era of the EHR

Explanation: Regardless of the barriers that may exist to implement true team-based care, a robust training program that addresses the redundancies in workflow and improves distribution of clerical tasks has tremendous potential to promote clinician well-being, which is foundational to effective and efficient health care

Reference: Implementing Optimal Team-Based Care to Reduce Clinician Burnout Cynthia Smith MD NAM.edu/Perspectives September 2018. https://nam.edu/wp-content/uploads/2018/09/Implementing-Optimal-Team-Based-Care-to-Reduce-Clinician-Burnout.pdf

S34-3: Adoption is the continuous process of keeping software users informed and engaged, providing innovative ways for them to become proficient in new tasks quickly, measuring changes in critical outcomes, and striving to sustain that level of performance long-term. Adoption is not a snapshot at a single point in time; it is a motion picture. Which of the following practices is most important to develop an ongoing, long-term adoption model?

A. Enforce mandatory adoption education for all users
B. Evaluate and share analysis of provider clinical and operational metrics before, during, and after adoption classes
C. Offer multiple classes at a variety of times to engage different provider populations
D. Provide Easily Readable Handouts and course aides

Answer: B. Evaluate and share analysis of provider clinical and operational metrics before, during, and after adoption classes.

Explanation: While both C (Offer multiple classes at a variety of times to engage different provider populations) and D (Provide Easily Readable Handouts and course aides) are recommended in the implementation of an adoption curriculum, only C (Evaluate and share analysis of provider clinical and operational metrics before, during, and after adoption classes) increases the likelihood of success in the development of a long term, sustainable model. Frequent analysis of clinical and operational metrics associated with EHR use by providers allows classes and curriculum to be adjusted to improve results, and demonstrated improvements supports ongoing resource allocation for future class development. Metrics serve as the "vital signs" for adoption over time, which reinforces the work being done by leaders and end users.

References: Haugen, Heather, and Charles L Fred. Beyond Implementation: A Prescription for the Adoption of Healthcare Technology. 2nd ed., Magnusson-Skor Publishing LLC.

S34-4: Known barriers to provider enrollment in a software adoption training curriculum include cost, staffing support, provider productivity, institutional change management, and organizational culture. Of the following factors, which aspect is MOST likely to improve these barriers.

A. a coexisting Train-the-trainer program

B. administrative support

C. leadership buy-in/protected provider time for classes

D. providing food and drink during classes

Answer: C. Leadership buy-in/protected provider time for classes

Explanation: While all answers enhance the likelihood of success of an adoption curriculum, only C – leadership buy in, with protected provider time for classes allows for the majority of the barriers cited above to be improved by increasing the likelihood of provider participation.

Reference: Kruse CS, Kothman K, Anerobi K, Abanaka L. Adoption Factors of the Electronic Health Record: A Systematic Review. *JMIR Med Inform*. 2016;4(2):e19. Published 2016 Jun 1. doi:10.2196/medinform.5525 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4909978/

S35: Presentation: Making it Actionable

An Infrastructure for Value Set Creation and Maintenance Utilizing a Clinical Interface Terminology – *Eric Rose*

S35-1: Which of the following is one of the layers of the architecture presented for building value sets based on clinical interface terminology (CIT)?

A. A standardized quality metric definition expansion

B. A value set expansion with codes from standardized health vocabularies such as SNOMED CT

C. Computable value components (""Outcome Code Maps"")

D. Human-readable definitional components (name, scope, inclusion criteria, exclusion criteria)

Answer: D. Human-readable definitional components (name, scope, inclusion criteria, exclusion criteria)

Explanation: The architectural layers of our value set approach include human-readable definitional components (name, scope, inclusion criteria, exclusion criteria), computable definitional components. The function of each of these layers is explained in the presentation. In order to leverage patient data captured using a CIT, it is necessary for value set output to consist of identifiers for the CIT terms themselves, not merely codes from standardized terminologies.

Reference: Winnenburg R, Bodenreider O. Metrics for assessing the quality of value sets in clinical quality measures. AMIA Annu Symp Proc. 2013 Nov 16;2013:1497-505. PMID: 24551422; PMCID: PMC3900160. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3900160/

Meaningful, Actionable Pharmacogenomic Patient Results – *Adam McDermaid*

S35-2: Pharmacogenomics provides a route to identify how a patient will respond to specific medications before they have been prescribed based on the patient's genetic code and can provide information as detailed as whether the patient would need a higher or lower dosage. This allows for a reduction in the "trial-and-error" method of prescribing medications. Pharmacogenomic testing provides the most benefit when it is done preemptively, with the results of the test being available at the time of the provider makes a prescription decision. MAPPeR is a recently developed method to aid in one critical step in pharmacogenomics. Of the following, what is the primary purpose of the MAPPeR tool?

A. Define new medications with pharmacogenomic significance
B. Identify patients that are most likely to benefit from pharmacogenomic testing
C. Identify possible adverse outcomes from a medication prescription
D. Performing analysis on genotype data to determine which medication is correctly prescribed

Answer: B. Identify patients that are most likely to benefit from pharmacogenomic testing

Explanation: As mentioned, the most benefit from pharmacogenomic testing is seen from preemptive testing. While it is recommended that everyone receive pharmacogenomic testing, current resource limitations do not allow that to occur. The reason for developing MAPPeR is to identify the subset of patient who would be most likely to benefit from pharmacogenomic testing based on their disease diagnoses and medical procedure history. While each of the alternative answers does have a direct importance to pharmacogenomics, they are not associated with MAPPeR. Defining new medications with pharmacogenomic significance is a step well before the use of MAPPeR, with the results of this process being used to train the MAPPeR model. Identification of possible adverse outcomes from a medication prescription is also not related to MAPPeR, as this tool does not put any emphasis on the type of adverse outcome. Lastly, performing analysis on genotype data to determine which medication is correctly prescribed is implemented after pharmacogenomic testing has been carried out, rather than when MAPPeR is utilized.

Reference: Relling MV, Evans WE. Pharmacogenomics in the clinic. Nature. 2015;526(7573):343-350. doi:10.1038/nature15817 https://www.nature.com/articles/nature15817

PheNominal: phenotype annotation at the point-of-care using an EHR-embedded web application – *Bimal Desai*

S35-3: Which of the following is an appropriate ontology for the annotation of phenotype attributes?

A. Human Phenotype Ontology (HPO)

B. Online Mendelian Inheritance in Man (OMIM)

C. International Statistical Classification of Diseases and Related Health Problems, 10th Edition (ICD-10)

D. Logical Observation Identifiers Names and Codes (LOINC)

Answer: A. Human Phenotype Ontology (HPO)

Explanation: Of the terminologies listed, HPO is the most appropriate for phenotype annotation. Human Phenotype Ontology provides a standardized vocabulary of phenotypic abnormalities encountered in human disease.

Reference: Human Phenotype Ontology: https://hpo.jax.org/app/

S35-4: Phenotypic annotations are best described using which FHIR resources?

A. BodyStructure or DiagnosticReport

B. Patient or CodeSystem

C. ClinicalImpression or DetectedIssue

D. Condition or Observation

Answer: D. Condition or Observation

Explanation: Of the listed options, Condition and Observation are the most appropriate for annotation of phenotypic findings. By definition, a phenotype is the observable manifestation of a genotype. The distinction between Condition and Observation depends on whether the finding is of medical concern or not. According to the HL7 FHIR standard, a "Condition" resource represents a "clinical condition, problem, diagnosis, or other event, situation, issue, or clinical concept that has risen to a level of concern".

However, many phenotype findings do not rise to the level of a concern, specifically they do not require ongoing therapy, monitoring, or management (e.g. the observation that a patient has abnormal fingerprint whorls consistent with a genetic syndrome), therefore the Observation resource (defined as a measurement or simple assertion about a patient) may be more appropriate and may avoid cluttering a problem list with physical findings.

BodyStructure is not appropriate for phenotype findings. DiagnosticReport may be more appropriate for genetic assays, but not for a list of clinical phenotype terms. Patient and CodeSystem are not appropriate resources for phenotype data, though both may be used in the transmission of data (a particular phenotype Observation may be mapped to the HPO CodeSystem and associated with a Patient). ClinicalImpression and DetectedIssue are not appropriate for phenotype findings.

References: A list of FHIR resources and their definitions are listed here: https://www.hl7.org/fhir/resourcelist.html

The FHIR Genomics Implementation Guide can be found here:
https://www.hl7.org/fhir/genomics.html#apps

S36: Ignite-style Talks 2 - Igniting Excellence, Efficiency and Ease of Use

A learning health network of one: how medical trainees can use the electronic health record for clinical feedback – *Samuel Yang*

S36-1: Which of the options below allow for compliant access of the EMR for clinical feedback for medical trainees?

A. The trainee should have a clinical relationship with the patient.

B. The trainee should have a clinical question that is answered by the patient's clinical course.

C. The trainee should not access a patient's chart after the question is answered.

D. The trainee should maintain a list of patients within the EMR.

E. All of the above.

Answer: E. All of the above.

Explanation: All of the answers (A-D) should be employed by a trainee to allow for clinical feedback and to ensure compliance with HIPAA.

Reference: Brisson, G.E., Barnard, C., Tyler, P.D. et al. A Framework for Tracking Former Patients in the Electronic Health Record Using an Educational Registry. J GEN INTERN MED 33, 563–566 (2018). https://doi.org/10.1007/s11606-017-4278-5

Feasibility and acceptance of mobile point-of-care self testing: a case study on the flu@home mobile app – *Victoria Lyon*

S36-2: In order to implement home-testing for flu into healthcare systems, we need to understand the patient and provider perspectives. All of the following perspectives were shared in the presentation EXCEPT:

A. Patients have demonstrated that they are motivated to adopt home-testing

B. Providers have demonstrated that they see value in home-testing

C. The majority of patients are willing to act upon a flu-positive self-test result by managing their illness and protecting others

D. The majority of providers are willing to prescribe antivirals to patients who receive a flu-positive self-test result

Answer: D. The majority of providers are willing to prescribe antivirals to patients who receive a flu-positive self-test result

Explanation: When providers were surveyed on how they would respond to a patient that receives a flu positive self-test result, there were no clear trends. Providers are not yet willing to prescribe antivirals based on a home-test result.

Reference: Rumbold B, Wenham C, Wilson J. Self-tests for influenza: an empirical ethics investigation. BMC Med Ethics. 2017;18(1):33. Published 2017 May 5. doi:10.1186/s12910-017-0192-y https://bmcmedethics.biomedcentral.com/articles/10.1186/s12910-017-0192-y

Ready or not, Real-time is needed – *Dana Womack*

S36-3: A hospital-based nursing work system experiences a rapid sequence of new patient admissions, followed shortly thereafter by a staff person falling ill and going home early, and a blood-transfusion reaction which required immediate action, in addition to regularly scheduled care tasks for patients on the unit. This places this system at risk for which common pattern of failure in complex adaptive systems?

A. Decompensating due to exhausting the capacity to adapt as disturbances or challenges cascade

B. Getting stuck in outdated behaviors: Circumstances change but the system remains stuck in previously adaptive strategies

C. Over-valuating rare or exceptional patterns during system training

D. Working at cross-purposes: Behavior that is locally adaptive, but globally maladaptive

Answer: A. Decompensating due to exhausting the capacity to adapt as disturbances or challenges cascade

Explanation: Decompensation occurs when challenges grow faster than responses can be generated and deployed. This pattern matches the scenario described and is a common pattern of failure in hospital work systems. Other patterns that occur, but which do not match the given scenario include: working at cross-purposes, or the inability to coordinate across subsystems in the midst of conflicting goals, and getting stuck in outdated behaviors which reflects system rigidity and limited capacity for organizational learning.

Reference: Woods, D. and M. Branlat, Basic patterns in how adaptive systems fail, in Resilience Engineering in Practice: A Guidebook E. Hollnagel, Paries, J., Woods, D., Wreathall, J. , Editor. 2011, Taylor & Francis Group: Boca Raton, FL. p. 127-144.

The 80's Called; They Want Their Pagers Back – *Ryan Jelinek*

S36-4: Which of the following is a risk associated with the use of alphanumeric or analog pagers?

A. Blocking of messages from non-authenticated sources

B. Encryption/decryption errors

C. Insecure transmission of protected health information

D. Geolocation errors

Answer: C. Insecure transmission of protected health information

Explanation: Alphanumeric pagers do not typically contain any type of encryption and thus can easily be intercepted. This puts the sender at risk for accidentally transmitting sensitive information and putting them at risk of violating patient privacy laws. The ability to send messages from a non-authenticated source also puts the receiver of pages at risk of spoofing or hacking.

Reference: Study Highlights Risk of PHI Exposure from Unencrypted Healthcare Pagers. HIPAA Journal Oct 27, 2016 https://www.hipaajournal.com/study-highlights-risk-phi-exposure-healthcare-pagers-3648/

Where Did the Time Go: A Multivariate Analysis of Epic's Signal Data at an 8-Hospital Healthcare Organization – *Christopher Kelly*

S36-5: At MultiCare Health System, which EMR activity accounts for the second most amount of time providers spend in the EMR per appointment, but is associated with the greatest variability?

A. Clinical / Chart Review

B. InBasket / Messaging

C. Notes / Clinical Documentation

D. Orders

Answer: A. Clinical / Chart Review

Explanation: The activity providers at this healthcare organization spend the most time in is note writing/clinical documentation. However, clinical review is associated with the greatest variation in time per appointment.

Reference: Overhage JM, Jr DM. Physician Time Spent Using the Electronic Health Record During Outpatient Encounters: A Descriptive Study [published online ahead of print, 2020 Jan 14]. Ann Intern Med. 2020;10.7326/M18-3684. doi:10.7326/M18-3684. https://www.acpjournals.org/doi/10.7326/M18-3684

S37: Panel - Celebrating the International Year of the Nurse and the Midwife: A *Look at Nursing in JAMIA*

Moore Slight, Ruth Masterson Creber

S37-1: There have been calls for more standardized research when conducting time and motion studies to investigate clinical work. Zheng et al., developed a checklist: The Suggested Time and Motion Procedures (STAMP) that aims to help researchers produce more compatible and comparable results. What feature do Time and Motion studies most commonly fail to report in their studies, based on the review by Zheng et al.?

A. Details about the empirical setting e.g., the institution type

B. Details about the human observer e.g., the training they received

C. Details about data recording e.g., how multi-tasking was handled

D. Details about the research design e.g., study duration

Answer: B. Details about the human observer e.g., the training they received.

Explanation: The authors found that for all elements of the Observer category at least 1/3 of the papers reviewed did not report the required information although there were failings of studies to report details about the research design (C) and data recording too (D).

Reference: Zheng K, Guo MH, Hanauer DA. Using the time and motion method to study clinical work processes and workflow: methodological inconsistencies and a call for standardized research. J Am Med Inform Assoc. 2011 Sep-Oct;18(5):704-10. doi: 10.1136/amiajnl-2011-000083. Epub 2011 Apr 27. PMID: 21527407; PMCID: PMC3168304. https://academic.oup.com/jamia/article/18/5/704/837937

S37-2: A large international survey was conducted that explored nurse satisfaction with the current state of functionality in EHRs. What level of the Stratified View of Health Information Technology usability evaluation (SV-HIT) did the majority of themes align to?

A. Education Issues

B. Environment Issues

C. User-task issues

D. System Issues

Answer: D. System Issues

Explanation: All of these issues were themes related to the Stratified View of Health Information Technology usability evaluation (SV-HIT) model, however over half of all reported concerns were associated with B, system issues (54.5%). D, Education issues are not a level of the SV-HIT model.

Reference: Topaz M, Ronquillo C, Peltonen LM, Pruinelli L, Sarmiento RF, Badger MK, Ali S, Lewis A, Georgsson M, Jeon E, Tayaben JL, Kuo CH, Islam T, Sommer J, Jung H, Eler GJ, Alhuwail D, Lee YL. Nurse Informaticians Report Low Satisfaction and Multi-level Concerns with Electronic Health Records: Results from an International Survey. AMIA Annu Symp Proc. 2017 Feb 10;2016:2016-2025. PMID: 28269961; PMCID: PMC5333337.

S38: Presentation: Social Connections for CMIOs

Regional Meeting of CMIOs of Competing Health Systems - In Unity There is Strength, - Or, if you want to go fast, go alone; if you want to go far, go together – *Joel Betesh*

S38-1: Acme Health system is located in a medium size metropolitan area and has been using an EHR from Vendor CIPE for over 15 years. Over the past 2 years 4 other local health systems have converted their ambulatory and inpatient EHRs to CIPE. These 5 health systems are located within a 12-mile radius and are in competition with each other for market share. Acme Health systems best next step is to:

A. Answer EHR related questions from other health systems but not reach out with proactive advice

B. Benefit from having the most mature version of CIPE in the area.

C. Ignore requests for collaboration on EHR issues from other local health systems.

D. Set up a regional collaboration of the 5 local health systems to work together to solve mutual EHR related issues.

Answer: D. Set up a regional collaboration of the 5 local health systems to work together to solve mutual EHR related issues.

Explanation: Answers A B and C are based on the assumption that Acme health system has nothing to learn from the new users of the same EHR Vendor. Our collaboration has shown that not to be the case. Also by working together everyone can benefit in ways that are impossible alone, such as data sharing with "opt out" consent. One recent benefit of our collaboration was that we were poised to help each other when the COVID pandemic started sharing order sets, reports, and resource strategies.

Reference: Regional Meeting of CMIOs of Competing Health Systems - In Unity There is Strength, - Or, if you want to go fast, go alone; if you want to go far, go together – *Joel Betesh*

Social Media for the Physician IT Leader: How to Leverage Online Tools to Facilitate Change Management, Professional Development, and Physician Engagement – *Craig Joseph*

S38-2: A new physician is considering becoming more active on social media in order to increase patient referrals and be seen by her peers as an expert. Best practice includes:

A. Create ad hominem attacks against colleagues with whom she disagrees.

B. Maintain separate personal and professional social media accounts.

C. Re-post a message that makes derogatory statements about protesters who don't follow COVID-19 CDC recommendations.

D. Tag all of her colleagues in all of her posts.

Answer: B. Maintain separate personal and professional social media accounts.

Explanation: One should only tag colleagues in relevant social media posts, and ideally with their permission. Much as a physician shouldn't publicly shame patients who are non-compliant with recommendations, one should refrain from similar disparaging remarks on a professional social media account. Further, personal attacks against colleagues are not helpful, in the real world or on social media. If a physician plans to post personal thoughts and opinions on non-medical or non-informatics topics, strongly consider having two separate social media accounts.

Reference: Choo EK, Ranney ML, Chan TM, et al. Twitter as a tool for communication and knowledge exchange in academic medicine: A guide for skeptics and novices. Med Teach. 2015;37(5):411-416. doi:10.3109/0142159X.2014.993371
https://www.tandfonline.com/doi/full/10.3109/0142159X.2014.993371

S38-3: A physician is presenting at a national conference about new research she has just published. She is concerned that prominently placing her Twitter handle and relevant hashtags in the presentation would be unprofessional. Your advice to her would be:

A. Avoid self-promotion at all costs and include only your institutional email address

B. It is acceptable to use your professional Twitter handle and relevant hashtags as this has been shown to be an effective way to broaden the audience for scientific research

C. Only use the approved conference templates which likely has no social media references

D. Some participants at the conference may not be on social media, so referencing your Twitter account will not help in any way

Answer: B. It is acceptable to use your professional Twitter handle and relevant hashtags as this has been shown to be an effective way to broaden the audience for scientific research.

Explanation: Using Twitter and other social media professional accounts is common and acceptable, as is an institutional email account. While it's fine to include an email address, one shouldn't limit oneself to that alone. While a conference PowerPoint template might include a hashtag (e.g. #CIC20), it's good practice to include more specific hashtags as well. If a conference audience member isn't active on social media, they will not typically be distracted by a hashtag. Social media references help spread the news beyond the walls of the conference hall, increasing networking to colleagues who weren't at the conference.

Reference: Markham MJ, Gentile D, Graham DL. Social Media for Networking, Professional Development, and Patient Engagement. Am Soc Clin Oncol Educ Book. 2017;37:782-787. doi:10.1200/EDBK_180077. https://ascopubs.org/doi/pdf/10.1200/EDBK_180077

S40: Presentation: Utilization Readmission Risk and Adherence

Impact of risk stratification and referral to social services on subsequent emergency and hospital utilization – *Joshua Vest*

S40-1: Which of the following situations suggests that a stepped-wedge design is an appropriate approach to evaluating a new technology in a multi-clinic health care organization?

A. When end users practice at multiple different clinics on a regular basis (i.e. staff cross over).

B. When patient-level randomization is ethical and feasible.

C. When the health care organization is more comfortable with a phased-in approach.

D. When the study duration is very short.

Answer: C. When the health care organization is more comfortable with a phased-in approach.

Explanation: The stepped-wedge design introduces the intervention at different sites over time. As a result, organizations do not have to support widespread change at a single point in time. Instead, the process can be introduced a manner consistent with the organization's capabilities to change and introduce new work processes. The phasing-in of different sites increases the time necessary for this design. The design is challenged by potential cross contamination if end users are practicing in control and intervention sites simultaneously.

Reference: Vest JR, Menachemi N, Grannis SJ, et al. Impact of Risk Stratification on Referrals and Uptake of Wraparound Services That Address Social Determinants: A Stepped Wedged Trial. Am J Prev Med. 2019;56(4):e125-e133. doi:10.1016/j.amepre.2018.11.009 https://www.ncbi.nlm.nih.gov/pubmed/?term=30772150

Relationship between adherence to daily home telehealth use and cardiology clinic visit in Veterans with heart failure – *Jenice Guzman*

S40-2: Which of the following is the greatest challenge when promoting the use of home telehealth (also known as remote patient monitoring) for heart failure monitoring and management to health care leadership and program funders?

A. Decreased funding support for heart failure telemonitoring.

B. Lack of large-scale, randomized trials that show consistent positive outcomes.

C. Limited number of telemonitoring technologies to choose from.

D. Poor implementation guidance for specific patient populations.

Answer: B. Lack of large-scale, randomized trials that show consistent positive outcomes.

Explanation: Both the European Society of Cardiology (2016) and American College of Cardiology/American Heart Association Guidelines (2013) noted that the quality of evidence is mixed (e.g., meta-analyses suggest good benefits, but these are not confirmed in prospective clinical trials). The highest recommendation that the European Society of Cardiology gave was for a couple of implantable systems (CardioMems & ICD (IN-TIME approach)with a class IIb (may be considered)/level B (data derived from a single RCT or large non-randomized study) recommendation for their use.

Reference: Brahmbhatt DH, Cowie MR. Remote Management of Heart Failure: An Overview of Telemonitoring Technologies. Card Fail Rev. 2019;5(2):86-92. Published 2019 May 24. doi:10.15420/cfr.2019.5.3 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6545972/

S41: Presentations: FHIR: Application from the Lab to the Globe

FHIR-based Laboratory Order Interoperability between OpenMRS and OpenELIS in Haiti - *Piotr Mankowski*

S41-1: A healthcare system in a Low and Middle Income Country (LMIC) is planning to develop laboratory order communication between EMRs used at the point-of-care clinics and Laboratory Information Management Systems. This implementation faces challenges similar to those in many LMICs, including limited IT resources and support, unstable funding and developer time, and inconsistent network connectivity. Leadership wants to use lessons learned from previous efforts and considers the recommendations made in the referenced article titled “Implementing medical information systems in developing countries, what works and what doesn’t.”

Of the below recommendations based on FHIR, which one will have the greatest utility?

A. Support and training of local developers

B. Off-site backup of clinical data

C. Definition of a core clinical dataset

D. Use of existent, scalable systems instead of reinventing the wheel

Answer: D. Use of existent, scalable systems instead of reinventing the wheel

Explanation: Arguments can be made that each one of these recommendations can benefit from the use of open clinical data standards like FHIR. The use of standards, software, and technologies with existing developer communities and resources can certainly facilitate the support and training of local developers. An off-site centralized backup requires the clinical data to be uploaded from various sources in some agreed-upon format, which standards like FHIR can provide. The definition of a core clinical dataset that needs to be supported across a healthcare system again requires an agreed-upon format

for representing the structure and content of the data. FHIR, for example, fits this need with implementation guides and profiles. However, the use of open standards can have the biggest impact on answer D by making sure healthcare systems do not have to continually reinvent the wheel with their solutions. Systems in limited-resource environments are unlikely to be able to afford to purchase commercial solutions, and rarely have the capability to develop high-quality solutions of their own. The use of open clinical data can facilitate the incorporation of existing, tested solutions to address local needs, encourage collaboration on tools and implementation strategies, facilitate interoperability with existing systems, and reduce the local development and maintenance burdens.

Reference: Fraser HS, Blaya J. Implementing medical information systems in developing countries, what works and what doesn't. AMIA Annu Symp Proc. 2010 Nov 13;2010:232-6. PMID: 21346975; PMCID: PMC3041413.

S43: Presentation: Linking Data and CDS to the Point of Care

Real World Data and Research Common Data Elements: A Case Study in HIV – *Vojtech Huser*

S43-1: Which of the below is a data dictionary standard for clinical research study ?

A. Fast Healthcare Interoperability Resource (FHIR)

B. Research Electronic Data Capture (REDCap)

C. Clinical Data Interchange Standards Consortium (CDISC)

D. Logical Observation Identifiers Names and Codes (LOINC)

Answer: C. CDISC Define-XML

Explanation: FHIR and LOINC are EHR standards. REDCap is not a formal standard backed by an Standards Development Organizations (SDO).

References: Hume S, Aerts J, Sarnikar S, Huser V. Current applications and future directions for the CDISC Operational Data Model standard: A methodological review. J Biomed Inform. 2016 Apr;60:352-62. doi: 10.1016/j.jbi.2016.02.016. Epub 2016 Mar 2. https://www.ncbi.nlm.nih.gov/pubmed/26944737

Implementing a Clinical Decision Support Service to Deliver Recommendations Using a Clinical Decision Support Hook - *Rebecca Shaw*

S43-2: MayoExpertRecommendations is an application that provides recommendations for patient care in an outpatient setting. The generation of these recommendations is triggered by the entry of the patient's blood pressure into the EHR. According to the HL7 Clinical Decision Support Specification, this trigger is known as a Clinical Decision Support _____

A. Service

B. Hook

C. Client

D. Card

Answer: B. Hook

Explanation: HL7's CDS Hook specification defines a CDS Hook as "A defined point within the client system's workflow with well-known contextual information provided as part of the request". In this case, the entry of a patient's blood pressure would be the defined point within the client system's workflow. The MayoExpertRecommendation application would be considered the CDS Service, the Electronic Health Record would be considered the CDS Client, and the response from the CDS Service would be a CDS Card.

Reference: CDS Hooks [Internet]. CDS Hooks. HL7 International & Boston Children's Hospital; 2019 [cited 2020May3]. Available from: https://cds-hooks.hl7.org/1.0/

S44: Presentation: Expanding Mobile Health Applications to a Wider Patient Audience

Supporting the Future Interoperability of a Game-Based Symptom Reporting App for Children – *Lauri Linder*

S44-1: Mapping clinical terms to standards-based terms included in databases such as SNOMED-CT and LOINC supports which type of interoperability with electronic health record systems?

A. Foundational

B. Structural

C. Semantic

D. Organizational

Answer: C. Semantic

Explanation: Semantic interoperability provides for common underlying models and codification of the data including the use of data elements with standardized definitions from publicly available value sets and coding vocabularies, providing shared understanding and meaning to the user (https://www.himss.org/what-interoperability)

References: Interoperability in the Healthcare Ecosystem https://www.himss.org/what-interoperability

SNOMED International http://www.snomed.org

LOINC https://loinc.org

Health apps for everyone: developing inclusive user experience (UX) criteria – *Elaine Lum, Geronimo Jimenez*

S44-2: What inclusive features should developers incorporate into health apps?

A. Navigation

B. Language Comprehension

C. Motivation

D. Data Security

Answer: B. Language Comprehension

Explanation: Apps with inclusive design features strive to serve users regardless of their level of literacy and can overcome this by providing information in an easy to comprehend format and wording, with relevant illustrations in addition to text and in multiple languages if possible. Navigation and Data Security are points of consideration for good design practices applicable to all target audience, not just those with accessibility concerns. Poor motivation cannot be addressed by optimizing user experience alone, however a good user experience does help lower resistance to adoption.

Reference: Wildenbos GA, Peute L, Jaspers M. Aging barriers influencing mobile health usability for older adults: A literature based framework (MOLD-US). Int J Med Inform. 2018 Jun;114:66-75. doi: 10.1016/j.ijmedinf.2018.03.012. Epub 2018 Mar 27. PMID: 29673606. https://www.sciencedirect.com/science/article/abs/pii/S1386505618302454?via%3Dihub

Spanish Translation of mHealth Technology – *Bonnie Gance-Cleveland*

S44-3: Describe the Beaton Process for translation and cultural adaptation of decision support technology that provides individualized patient education materials.

A. Translation, back translation, synthesis, testing with target audience

B. Translation, synthesis, back translation, synthesis, testing with target audience

C. 2 Translations, synthesis, 2 back translations, synthesis, testing with target audience

D. Translate and test with native target language speakers

Answer: C. 2 Translations, synthesis, 2 back translations, synthesis, testing with target audience

Explanation: The model outlines a five-stage development process to include: Stage I: Translation into Spanish, Stage II: Synthesis of the translations, Stage III: Back translation, Stage IV: Synthesis and Expert committee review, Stage V: Pretesting, Stage VI: Submission of all materials for review.

Reference: Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-cultural adaptation of self-report measures. Spine. 2000;25(24):3186-3191.

S45: Presentation: Exemplars in Health Information Exchange and Interoperability

Delivering Value to the Veteran: - Advancing Informatics/ Data Infrastructure and Process Interoperability to Ensure a Single Standard Level of Care Across the VHA Enterprise during its 10-year EHR Modernization Effort – *David Massaro*

S45-1: A large, integrated health care system desires to implement the principles of high reliability organizations and learning health systems to improve the care it delivers. Baseline data reveals that care delivery processes and the electronic health record and other supporting infrastructure and tooling contain significant variation in their implementation across the enterprise, thereby resulting in clinical staff who inadvertently contribute to practice variation. As a result, the health care system experiences difficulty in measuring, monitoring and reporting enterprise-wide outcomes for select disease states.

Assuming that each of the following options are possible and necessary, which would be the most appropriate first step to support clinical standardization and integration within the healthcare organization?

A. Identify and conform to relevant standards

B. Establish clinical governance processes to identify and reconcile practice variation

C. Validate technical, process, and data interoperability efforts

D. Conduct robust training and orientation programs for staff

Answer: B. Establish clinical governance processes to identify and reconcile practice variation

Explanation: A key principle of a learning health system is that it possesses a governance function which is necessary to support its sustainable operations, set required standards, and build and maintain trust. A goal of the health system in this example is to reduce practice variation across the enterprise and thereby improve Veteran outcomes in a manner that can be measured, monitored, and reported on for

the purposes of quality improvement. To accomplish this important goal, a diverse and multi-disciplinary clinical community must come together and agree upon those clinical practice standards it wishes to implement. Once those have been agreed to, the informatics and health IT communities should have sufficient information about the clinical care requirements to be able to apply appropriate technical standards, terminologies, configuration and tooling, and change management and communications processes to enable a standardized, interoperable health practice pattern. While all other options are correct, they cannot be completed until there is consensus on the clinical practice standards that will be adopted by the healthcare delivery team.

Reference: Friedman CP, Rubin JC, Sullivan KJ. Toward an Information Infrastructure for Global Health Improvement. Yearb Med Inform. 2017 Aug;26(1):16-23. doi: 10.15265/IY-2017-004. Epub 2017 Sep 11. PMID: 28480469; PMCID: PMC6239237. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6239237/

The in's and out's of Veteran Health Information Exchange (VHIE) – Veteran reactions to changing from Opt-in to Opt-out – *Eric Pan*

S45-2: A Health Information Exchange (HIE) is preparing press release, participant email announcements, and direct-to-patient communication campaigns to inform its participating organizations, partners, and patient population that it's changing from an "Opt-In" policy to an "Opt-out" policy. Which of the following best summarizes the key change and implications?

A. "Optionality of data standards" – the HIE is changing from allowing free text and non-standard terminologies and data formats to only accepting standardized data.

B. "Default legal position" – the HIE will no longer voluntarily submitting ("Opting in") to HIPAA privacy requirements since it's not a healthcare provider.

C. "Optionality of patient participation" – the HIE now consider patient participation mandatory and will no longer allow member organizations to offer the option of non-participation to their patients.

D. "Default consent" – the HIE will default to sharing all patient data while allowing individuals the option to disallow data sharing. The previous default was only sharing data on individuals who explicitly granted permission to share.

Answer: D. "Default consent" – the HIE will default to sharing all patient data while allowing individuals the option to disallow data sharing. The previous default was only sharing data on individuals who explicitly granted permission to share.

Explanation: In the context of HIE, "Opt-In" and "Opt-Out" refer to the two dominant types of patient consent model. In an "opt-in" model, the default is that no patient data are automatically made available for electronic exchange. In an "opt-out" model, the default is for all or some pre-defined set of data (e.g., labs, summary record information) to be eligible automatically for exchange, with a provision that patients must be given the opportunity to opt out in full.

References: Goldstein MM, Rein AL, Hughes PP. Consumer consent options for electronic health information exchange: policy considerations and analysis. March 2010, https://library.ahima.org/PdfView?oid=99465

Bass D. Opting for opt out. How one HIE manages patient consent. J AHIMA. 2011;82(5):34-36.

Mello MM, Adler-Milstein J, Ding KL, Savage L. Legal Barriers to the Growth of Health Information Exchange-Boulders or Pebbles?. Milbank Q. 2018;96(1):110-143. doi:10.1111/1468-0009.12313

S46: Presentations: Using Data Visualization to Improve Patient Care

Visualizing patient-level risk factors from clinical risk prediction algorithms - *Nate Apathy*

S46-1: When providing clinicians with aggregated "risk" scores for any adverse health outcome, it is important to also present information about what aspect of a patient's risk?

A. How the patient's risk compares to the population risk.

B. The key factors driving the individual patient's risk, ideally limited to those that can be intervened upon.

C. Exact confidence intervals and point estimates of the patient's risk score and it's percentile in the population.

D. A color-coded scale to ensure easy interpretability by the clinician.

Answer: B. The key factors driving the individual patient's risk, ideally limited to those that can be intervened upon.

Explanation: In our presentation, we illustrate that each patient's aggregate risk score is driven by different factors, not all of which are intervenable or obvious based on the risk score itself. Presenting specific drivers of risk allow for clinicians to tailor interventions and treatment to the factors driving a specific patient's risk, rather than overall population risk.

Reference: https://bit.ly/risk_pred

Identifying and Analyzing Inequity in Quality Care – *Mark Connolly*

S46-2: Your organization asks you to develop a report to look at hypertension management outcomes across your system. You have a Business Intelligence (BI) solution that allows filtering and interaction. Which of the below is important to ensure about your underlying data to keep an equitable lens in analysis?

A. That it is pre-aggregated, providing the quickest answer on your hypertension management for the whole organization.

B. That it is dis-aggregated by only patient MRN, allowing aggregation of performance to occur within your BI platform. If people want to look at performance by demographics they can take patient MRNs and check against your EHR.

C. That it is disaggregated by patient MRN with demographic information like gender, age, and race included in the underlying data. While aggregation will be possible in your final report, this would allow comparative analysis for various needs and populations to occur as needed.

D. Aggregate performance by patient demographics in the underlying data and display these in the final report.

Answer: C. That it is disaggregated by patient MRN with demographic information like gender, age, and race included in the underlying data. While aggregation will be possible in your final report, this would allow comparative analysis for various needs and populations to occur as needed.

Explanation: This provides the greatest flexibility within your reporting and allows for various patient populations to be evaluated. While B and D still make mention of looking at performance by various demographics, they do not allow for flexibility or agility in analysis.

Reference: Chin, M.H., Clarke, A.R., Nocon, R.S. et al. A Roadmap and Best Practices for Organizations to Reduce Racial and Ethnic Disparities in Health Care. J GEN INTERN MED 27, 992–1000 (2012). https://doi.org/10.1007/s11606-012-2082-9

S47: Presentation: Measuring and Governing Data Sharing

A Proposed Scorecard to Prioritize Successful Health Information Exchange Projects – *Kristina Garrels*

S47-1: There are still many barriers to achieving wide-spread system interoperability for health information exchange. Which of the following remains a barrier?

A. Exchanging health information of patients shared with a local health system has the lowest number of barriers to health information exchange.

B. User centered design helps overcome the largest barriers of health information exchange.

C. The National Academy of Medicine Report “Procuring Interoperability” provides a step by step plan for overcoming barriers to health information exchange.

D. Consent to exchange policy requirements can be a significant barrier to health information exchange.

Answer: D. Consent to exchange policy requirements can be a significant barrier to health information exchange.

Explanation: Patient consent policy can significantly impact health information exchange. (1) This is true of both internal consent policy and the policy of the external health entity. Metrohealth’s experience shows the impact of external policy, the volume of exchange with a local hospital increased after their policy was changed. Another example of this is the limitation to exchange created by the Veteran Affairs handwritten, opt-in requirement for consent in place until July 2019.

HIE barriers vary on case to case basis. The number of barriers to exchange, even between local health systems may vary. Similarly, which barrier is largest varies will vary case by case. Lack of user-centered

design may be a barrier to HIE but ensuring user-centered design does not guarantee successful exchange.

The "Procuring Interoperability" report discusses an acquisition strategy for achieving HIE but does not discuss how to overcome barriers, or a strategy to decide which types of HIE to implement first. (2)

References:

1. Eden KB, Totten AM, Kassakian SZ, Gorman PN, McDonagh MS, Devine B, et al. Barriers and facilitators to exchanging health information: a systematic review. Int J Med Inform. 2016;88:44-51. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4778080/

2. Pronovost P, Johns MME, Palmer S, Bono RC, Fridsma DB, A. Gettinger, J, et al., Editors. 2018. Procuring Interoperability: Achieving High-Quality, Connected, and Person-Centered Care. Washington, DC: National Academy of Medicine. https://nam.edu/wp-content/uploads/2018/10/Procuring-Interoperability_web.pdf

S48: Presentation: Improving Processes with Data & Algorithms

Calculation and Utilization of a Risk-Adjusted Test Utilization Index for Process Improvement – *Mariah Ondeck*

S48-1: As per the many Choosing Wisely initiatives from various professional societies, a healthcare system is searching for a way to eliminate repetitive laboratory testing. Lab reduction can both benefit the patient and improve their experience and reduce costs for the hospital. Research has demonstrated that patient safety has not been compromised with reduced laboratory testing. Which method is most likely to find long-term success in this quality improvement goal?

A. Provide the cost of each lab ordered

B. Pop up prompts alerting the user of duplicate ordering

C. Use a multimodal system that provides timely feedback

D. 1x education on limiting laboratory use

Answer: C. Use a multimodal system that provides timely feedback

Explanation: Implementing a timely process that utilizes several ways of impacting change has been most successful in research studies. While many methods have found transient success, long-lasting effects have been seen in studies that have some combination of education, audit and feedback on clinician-ordering practices and EMR-enabled restrictive ordering yielded the best results. Providing the cost of the labs ordered lead to improvement that was not sustained in the long run. Pop up prompts due to duplicate ordering were overridden 30-60% of the time and education that was not repetitively given caused the initial benefits to dissipate.

Reference: Eaton KP, Levy K, Soong C, Pahwa AK, Petrilli C, Ziemba JB, Cho HJ, Alban R, Blanck JF, Parsons AS. Evidence-Based Guidelines to Eliminate Repetitive Laboratory Testing. JAMA Intern Med. 2017 Dec 1;177(12):1833-1839. doi: 10.1001/jamainternmed.2017.5152. PMID: 29049500. https://pubmed.ncbi.nlm.nih.gov/29049500/

S49: Presentation: Patient Centered Decision Support: A Critical Look

Systematic assessment of suicide prevention strategies in health apps - *Laura Martinengo*

S49-1: Suicide prevention comprises a multidimensional approach that includes the following strategies EXCEPT

A. Tracking of mood and suicidal thoughts

B. Completing a thought record form

C. Information and education

D. Access to emergency counseling

Answer: B. Completing a thought record form

Explanation: Thought records are used in Cognitive Behavioral Therapy to identify and modify thought patterns in the treatment of several mental disorders including depression and anxiety. They are not used as a suicide prevention strategy.

Reference: Martinengo L, Van Galen L, Lum E, Kowalski M, Subramaniam M, Car J. Suicide prevention and depression apps' suicide risk assessment and management: a systematic assessment of adherence to clinical guidelines. BMC Med. 2019 Dec 19;17(1):231. doi: 10.1186/s12916-019-1461-z. PMID: 31852455; PMCID: PMC6921471.

How good is the decision support provided by apps for self-management of blood glucose for type 2 diabetes? - *Elaine Lum*

S49-2: A general practitioner would like to advise patients under her care on suitable self-monitoring diabetes apps. She downloads several popular apps from the commercial marketplaces to test. Of the features commonly offered by diabetes apps, what would be the most critical to ensure appropriate, time sensitive, self-management of glycemia levels?

A. The app provides a comprehensive list of diabetes-appropriate food recipes

B. The app provides personalized physical activity programs

C. The app alerts the user if the blood glucose levels are outside the normal range

D. The app offers a forum where the user can contact other app users to discuss topics related to diabetes management

Answer: C. The app alerts the user if the blood glucose levels are outside the normal range

Explanation: Glycemia readings outside the normal range should be highlighted to the user and trigger a response according to pre-established guidelines (that the user should have previously agree on with his/her healthcare provider)

Reference: Lum E, Jimenez G, Huang Z, Thai L, Semwal M, Boehm BO, Car J. Decision Support and Alerts of Apps for Self-management of Blood Glucose for Type 2 Diabetes. JAMA. 2019 Apr 16;321(15):1530-1532. doi: 10.1001/jama.2019.1644. PMID: 30990543; PMCID: PMC6484806.

S50: Presentation: Inclusive & Family-focused Care

Maintaining Adolescent Confidentiality in the Age of Online Patient Portals - *James Xie*

S50-1: Providing adolescent healthcare can be fraught with inadvertent breaches of confidentiality even when providers and their respective clinics or hospital systems are mindful about maintaining confidentiality. Electronic health records and online patient portals represent a specific area in which confidentiality can be hard to maintain.

Which of the following poses the GREATEST risk to maintaining confidentiality?

A. Adolescent healthcare providers educating patients and families about how they can use patient portals.

B. Healthcare providers offering portal access and confidential messaging to adolescents aged 13 to 17.

C. Vendors of EHRs and patient portals already having incorporated privacy and confidentiality features into their products so it is unnecessary to pursue a custom configuration during implementation.

D. An EHR designed to designate problems, medications, visit notes, results, social and family history as confidential.

Answer: C: Vendors of EHRs and patient portals have already incorporated privacy and confidentiality features into their products so it is unnecessary to pursue a custom configuration during implementation.

Explanation: Although EHR and patient portal vendors should have privacy and confidentiality controls, due to inconsistency in adolescent consent and confidentiality laws among different states, it would be incorrect to assume a product is pre-configured appropriately to meet all relevant laws and standards in a given location of practice.

Incorrect answers:

A: During the registration and consent process for adolescents to have a patient portal account, providers should educate patients and their families about the intent and rationale for providing such access, what kind of communication is timely and appropriate, and how confidentiality extends to patient portal accounts.

B: Although it requires additional vigilance on the part of the healthcare provider and health system, permitting access to medical information and confidential messaging to adolescent patients is ideal. This promotes greater self-ownership and management of their health and offers another venue to build a trusting relationship between adolescent and provider. Meanwhile, parents should still be able to access non-confidential information, which requires thoughtful blocking of confidential information.

D: Designating certain chart elements (e.g. problems, medications, visit notes, results, social and family history) as confidential allows them to be suppressed from being included in printed materials such as in an after-visit summaries or discharge summaries. It also allows access permission controls for patient proxies who should not have access to such information. These features are helpful in maintaining adolescent confidentiality.

Reference: Anoshiravani A, Gaskin GL, Groshek MR, Kuelbs C, Longhurst CA. Special requirements for electronic medical records in adolescent medicine. J Adolesc Health. 2012;51(5):409-14. https://www.jahonline.org/article/S1054-139X(12)00335-7/pdf

Developing a Matching Algorithm for Identifying Family Units – *Colby Uptegraft*

S50-2: The matching algorithm uses current and historical data points to identify potential family units. Which one of the following combinations is most likely to result in a match between two or more patients?

A. Identical phone numbers

B. Identical guarantor names

C. Identical addresses

D. Similar guarantor names and identical street addresses

Answer: A. Identical phone numbers

Explanation: If two or more patients have the same current phone number, the deterministic portion of the algorithm treats them as a match. The remaining choices feature data points included in the probabilistic portion of the match. Identical guarantor names or addresses does not necessitate a match, especially if the other data components are much different from each other.

Reference: Corrigendum to: Journal of the American Medical Informatics Association, Volume 23, Issue 1, 1 January 2016, Pages 230-239, https://doi.org/10.1093/jamia/ocv100. J Am Med Inform Assoc. 2018 Sep 1;25(9):1270-1271. doi: 10.1093/jamia/ocy063. Erratum for: J Am Med Inform Assoc. 2016 Jan;23(1):230-9. PMID: 29850831.

Supporting LGBT+ healthcare through capture of structured data in the HER – *Scott MacDonald*

S50-3: Although perhaps not causal, burnout is associated with EHR use.Efforts to improve facility and efficiency with this tool should improve physicians' experience and may lead to decreased burnout symptomatology. A combination of group learning and tailored one-one-one sessions has been demonstrated to improve:

A. Higher distribution of billing codes

B. Patient satisfaction with their care

C. Physician satisfaction with informatics tools

D. Burnout rate

Answer: C. Physician satisfaction with informatics tools

Explanation: Our data showed no change in coding levels over time, and we did not measure burnout directly- this, and linking the data to patient satisfaction is a future goal of the program.

We did show improvements in self rated satisfaction with the system, confidence in their skills, and less after-hours time in the system.

Reference: Sieja A, Markley K, Pell J, et al. Optimization Sprints: Improving Clinician Satisfaction and Teamwork by Rapidly Reducing Electronic Health Record Burden. Mayo Clin Proc. 2019;94(5):793-802. doi:10.1016/j.mayocp.2018.08.036 https://www.mayoclinicproceedings.org/article/S0025-6196(18)30788-2/fulltext

S50-4: Data on gender identity and sexual orientation is needed in the EHR in order to identify and reduce disparities, as well as to provide appropriate and patient centered care. Once any technical barriers are overcome, and structured data fields and their downstream dependencies have been assessed and mitigated, various change management and psychosocial issues come to the forefront.

These can be uncomfortable questions for some clinicians to ask, and for some patients to answer. Which of the below is most important to successfully capture this information?

A. Gain feedback from patients on how they would prefer to be asked

B. Improve physician training on importance and approaches to 'how to ask'

C. Elicit engagement from leadership as to 'why to ask'

D. Create workflows for office staff to routinely capture this information

Answer: D. Create workflows for office staff to routinely capture this information

Explanation: Our efforts showed minimal increase in data capture rates with physician training and leadership encouragement, despite system design based on surveyed patient preferences. However, once workflows were established, with metrics and accountability, rates dramatically increased.

Reference: Grasso C, McDowell MJ, Goldhammer H, Keuroghlian AS. Planning and implementing sexual orientation and gender identity data collection in electronic health records. J Am Med Inform Assoc. 2019;26(1):66-70. doi:10.1093/jamia/ocy137. https://doi.org/10.1093/jamia/ocy137