Decreasing Documentation Burden:
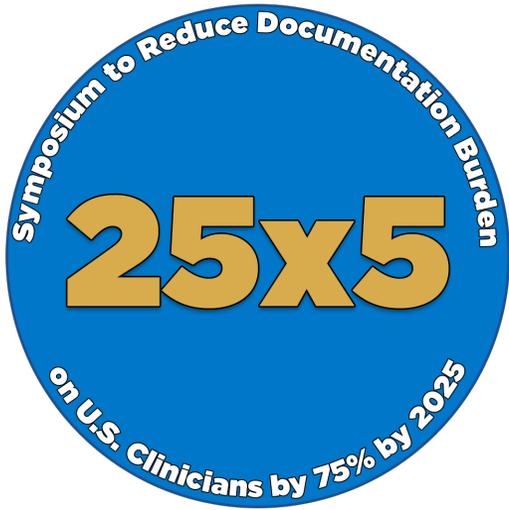# 25x5 Symposium Overview, Findings, & Action Plan, and Analytical Approaches to Measurement

Symposium to Reduce Documentation Burden on U.S. Clinicians by 75% by 2025

25x5

CONCERN

Sarah Collins Rossetti, RN, PhD, FACMI, FAMIA

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COLUMBIA UNIVERSITY

School of Nursing

Taking Action Against Clinician Burnout

A Systems Approach to Professional Well-Being

NATIONAL ACADEMY OF MEDICINE

21st Century Cures Act

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https://www.fda.gov/regulatory-information/selected-amendments-fdc-act/21st-century-

The 21st Century Cures Act (Cures Act), signed into law on December 13, 2016, is
to help accelerate medical product development and bring new innovations and
to patients who need them faster and more efficiently.

The Office of the National Coordinator for
Health Information Technology

Strategy on Reducing Regulatory and Administrative Burden Relating to the Use of Health IT and EHRs

FINAL REPORT

As Required by the 21st Century Cures Act

Public Law 114-255, Section 4001

HealthIT.gov   @ONC_HealthIT

Quadruple Aim

- Enhancing patient experience

- Improving population health

- Reducing costs

- Improving the work life of health care provider

From Triple to Quadruple Aim: Care of the Patient Requires Care of the Provider

Thomas Bodenheimer, MD[1]

Christine Sinsky, MD[2,3]

[1]Center for Excellence in Primary Care, Department of Family and Community Medicine, University of California San Francisco, San Francisco, California

[2]Medical Associates Clinic and Health Plan, Dubuque, Iowa

[3]American Medical Association, Chicago, Illinois

ABSTRACT

The Triple Aim—enhancing patient experience, improving population health, and reducing costs—is widely accepted as a compass to optimize health system performance. Yet physicians and other members of the health care workforce report widespread burnout and dissatisfaction. Burnout is associated with lower patient satisfaction, reduced health outcomes, and it may increase costs. Burnout thus imperils the Triple Aim. This article recommends that the Triple Aim be expanded to a Quadruple Aim, adding the goal of improving the work life of health care providers, including clinicians and staff.

INTRODUCTION

Since Don Berwick and colleagues introduced the Triple Aim into the health care lexicon, this concept has spread to all corners of the health care system. The Triple Aim is an approach to optimizing health system performance, proposing that health care institutions simultaneously pursue 3 dimensions of performance: improving the health of populations, enhancing the patient experience of care, and reducing the per capita cost

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Background on Documentation Burden

- We know documentation time is excessive (across health professions and settings) and linked to burnout
  - https://www.dbmi.columbia.edu/25x5/
  - https://www.dbmi.columbia.edu/wp-content/uploads/2021/02/25by5-Readings-Feb11.docx

- EHRs optimization is still early on
  - Paper records finely tuned over decades

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Review

Measurement of clinical documentation burden among physicians and nurses using electronic health records: a scoping review

Amanda J. Moy [ID],[1] Jessica M. Schwartz [ID],[2] RuiJun Chen [ID],[1,3] Shirin Sadri,[4] Eugene Lucas,[1,5] Kenrick D. Cato,[2] and Sarah Collins Rossetti [ID][1,2]

[1]Department of Biomedical Informatics, Columbia University, New York, New York, USA, [2]School of Nursing, Columbia University, New York, New York, USA, [3]Department of Translational Data Science and Informatics, Geisinger, Danville, Pennsylvania, USA, [4]Vagelos School of Physicians and Surgeons, Columbia University New York, New York, USA, and [5]Department of Medicine, Weill Cornell Medical College, New York, New York, USA

- Standard and validated measures of documentation burden are lacking

- Core concepts measured:
  - Effort:
    - EHR usage and workload
    - Clinical documentation/review
    - EHR work after hours and remotely
    - Administrative tasks
    - Cognitively cumbersome work
    - Fragmentation of workflow
    - Patient interaction
  - Time
    - Average time
    - Proportion of time
    - Timeliness of completion
    - Activity rate
    - 11 units of analysis

- No consensus on best approach or degree of rigor to study documentation burden
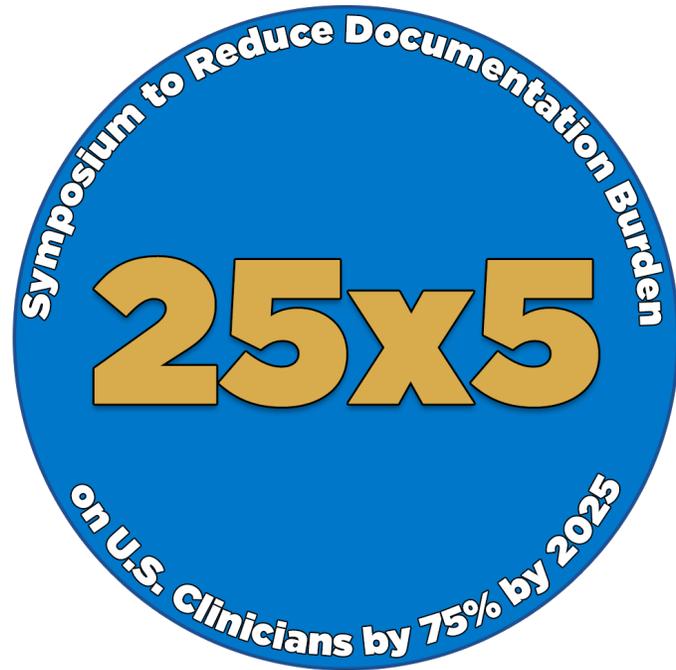
Co-Chairs

Sarah Collins Rossetti, RN, PhD, FACMI, FAMIA
Assistant Professor of Biomedical Informatics and Nursing
Columbia University

S. Trent Rosenbloom, MD, MPH, FACMI
Professor and Vice Chair of Faculty Affairs
Departments of Biomedical Informatics, Internal Medicine & Pediatrics
Vanderbilt University

https://www.dbmi.columbia.edu/25by5-symposium/

January 15, 2021 –
February 19, 2021

Symposium to Reduce Documentation Burden on U.S. Clinicians by 75% by 2025

25x5

Funded by the National Library of Medicine
(1R13LM013581-01)

#25x5

Steering Committee Members

Kenrick Cato, RN, PhD, FAAN
Assistant Professor of Nursing
Columbia University

Dasha Cohen
Director of Meetings
AMIA

Don Detmer, MD, FACMI
Professor of Medical Education, Dept. Public Health Sciences
University of Virginia School of Medicine

Kevin Johnson MD, MS, FAAP, FACMI
Professor and Chair of Biomedical Informatics
Vanderbilt University

Eugene Lucas, MD
Internal Medicine Physician, Clinical Informatics Fellow
Columbia University

Amanda Moy, MPH, MA
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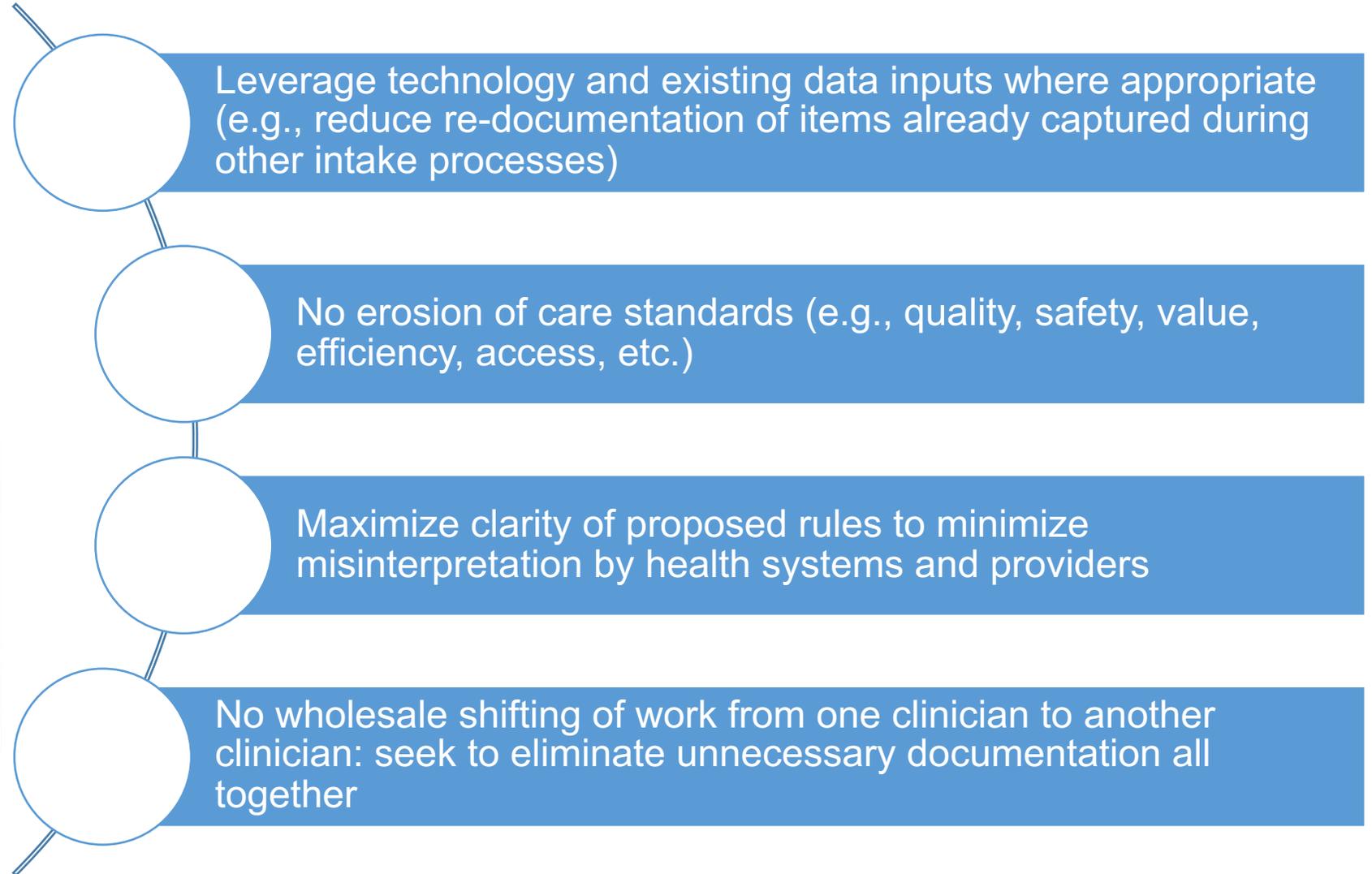Columbia University

Jeff Williamson, M.Ed.
Vice President of Education and Academic Affairs
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Symposium Goals

- Create a meeting that engages a diverse group of key stakeholders and leaders focused on reducing documentation burden

- Assess the likely potential for burden reduction within each category of documentation burden tasks

- Establish approaches for immediate (6 months), short-term (12 months), and longer term (30 months) elimination of clinical documentation burden

- Develop a 25x5 Community of stakeholders and allies to keep momentum going and to support dissemination and change

- Maximize techquity* of any proposed solutions

*defined as the consideration, design, development, and implementation of technology solutions that promote, assure and potentially enhance health equity

Principles of Engagement

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Leverage technology and existing data inputs where appropriate (e.g., reduce re-documentation of items already captured during other intake processes)

No erosion of care standards (e.g., quality, safety, value, efficiency, access, etc.)

Maximize clarity of proposed rules to minimize misinterpretation by health systems and providers

No wholesale shifting of work from one clinician to another clinician: seek to eliminate unnecessary documentation all together

#25x5

Symposium's Agenda

Jan 15, 2021

Session 1: Introduction & Current Challenges Related to *What* We Document

- Keynote Panel + QA: Policy and Reimbursement Issues
- Keynote Panel: Clinical Practice and Documentation Issues
- Summarization & Prioritization of Challenges/use audience polling

Jan 22, 2021

Session 2: Current Challenges Related to *How* We Document

- Keynote Panel 1 + Data Entry Challenges
- Keynote Panel 2 + QA: Alternative Data Entry
- Summarization & Prioritization of Challenges/use audience polling

Jan 29, 2021

Session 3: Exemplars and Key Successes

- Exemplars

Feb 5, 2021

Session 4: Emerging and Future Innovations as Solutions

- Moderated Panel Discussion: What is
- Discussion - What are the solutions coming out of industry?
- Review of COVID-19 Survey

Feb 12, 2021

Session 5: Reactor and Prioritization Session for Actions

- Breakout Sessions to identify actions based on prior sessions and prioritize as short-term, medium term, long-term actions

Feb 19, 2021

Session 6: Plenary on Insights for Action

- Plenary Speaker for convergent actions
- Breakout Sessions to refine actions based on prior sessions and prioritize as short-term, medium term, long-term actions

Over 300 Participants!

#25x5

Speakers and Topics

Panel on Policy and Reimbursement Issues
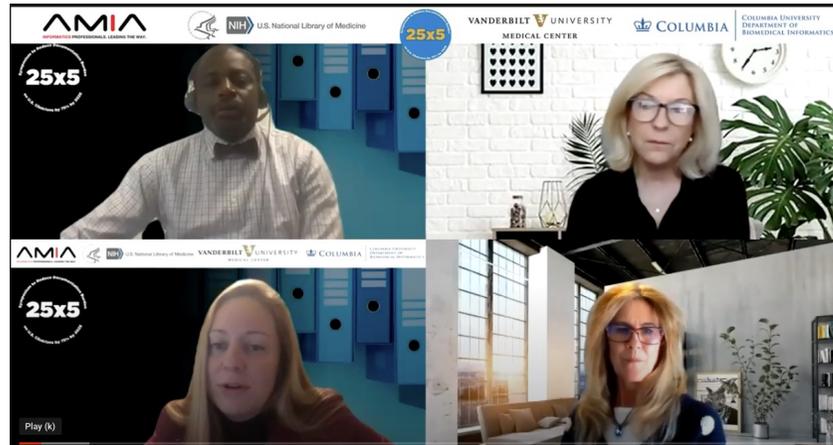
Panel on Clinical Practice and Documentation Issues

- Andrew Gettinger, MD (Chief Clinical Officer, ONC)

- Mary Greene, MD (Director, Office of Burden Reduction & Health Informatics, CMS)

- Brent James, MD (Clinical Professor (Affiliated), Dept of Medicine, Stanford University School of Medicine)

- Sharon Kirby, MSN, RN-BC (Previous Chief Nursing Informatics Officer, Department of Nursing, Mayo Clinic)

- Sherri Hess, MS-IS, BSN, RN-BC, FHIMSS (Chief Nursing Informatics Officer, Banner Health)

- Kenrick Cato, PhD, RN, CPHIMS (Assistant Professor, Columbia University School of Nursing; Nurse Researcher, NewYork-Presbyterian Hospital)

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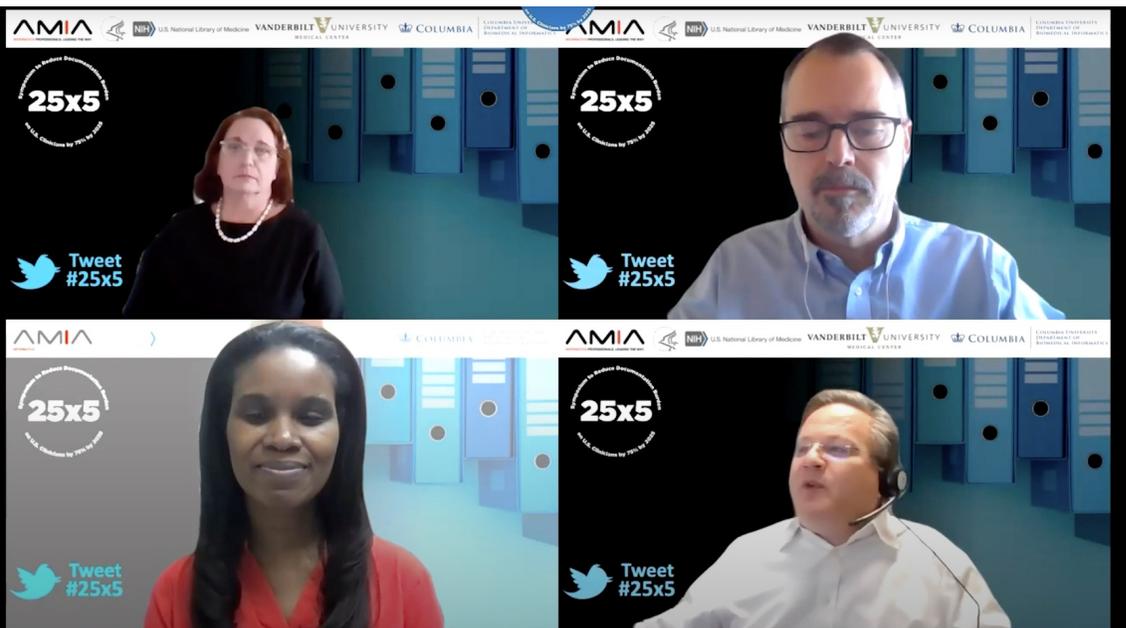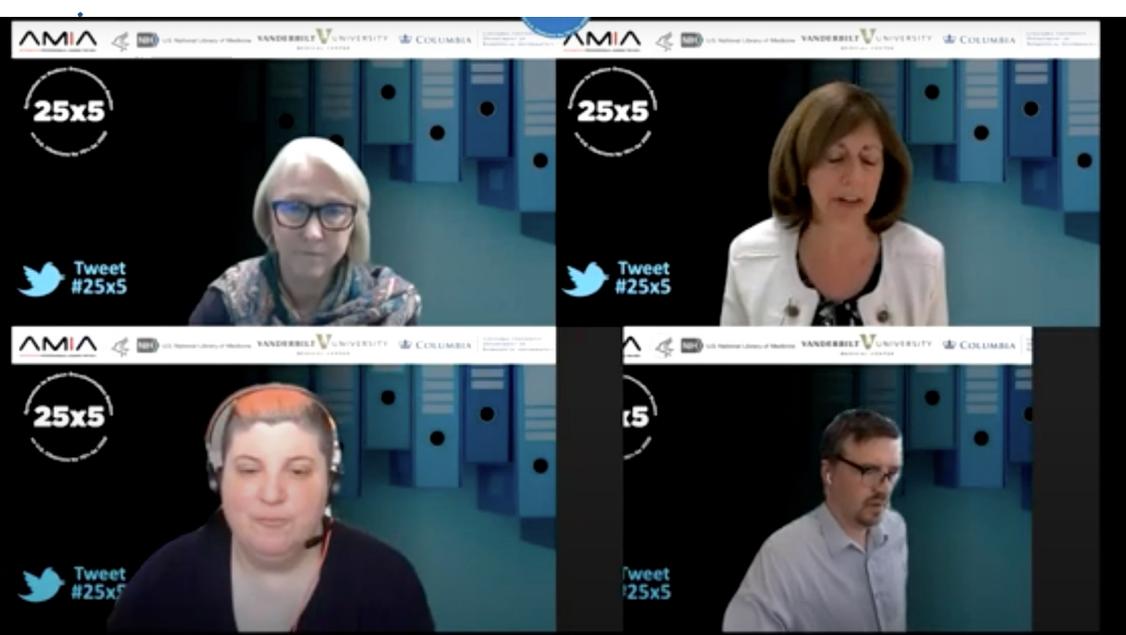
- (Aaron) Zachary Hettinger, MD (Director of Cognitive Informatics, MedStar Health National Center for Human Factors in Healthcare)

- Kim Unertl, PhD (Associate Professor of Biomedical Informatics in the School of Medicine at Vanderbilt University)

- Susan McBride PhD, RN-BC, CPHIMS, FAAN (Professor, Program Director Nursing Informatics Graduate Program, Texas Tech University Health Sciences Center)

- Peter Chabot Smith, MD (Department of Family Medicine, University of Colorado)

- Yaa Kumah-Crystal, MD, MPH, MS (Assistant Professor of Biomedical Informatics and Pediatric Endocrinology at Vanderbilt University Medical Center)

- Lorraine Possanza, DNP, JD, MBE (Program Director, Partnership for Health IT Patient Safety)

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Challenges to What and How We Document - Highlighted Points

(AG) 21st century cures – changed the certification program to attest to maintenance, pediatric requirements, USCDI v2, FHIR

(MG)

- Prior authorization- must be simplified or eliminated. (DaVinci FHIR API)
- Documentation requirements – work is underway, impact must be evaluated
- Importance of getting providers clear guidance about requirements

(BJ) Selection and ranking processes need to stop, in favor only of measurement for change and learning with transparency at the front line.

(SK) Eliminate, simplify, integrate and automate (ESIA model for business process reengineering); Learn from the pandemic!

(SH) Stressed the importance of ESIA

(ESIA = Environmental and Social Impact Assessment)

Relevant Points

AG = Andrew Gettinger, MD (Chief Clinical Officer, ONC)
MG = Mary Greene, MD (Director, Office of Burden Reduction & Health Informatics, CMS)
BJ = Brent James, MD (Clinical Professor (Affiliated), Dept of Medicine, Stanford University School of Medicine)
SK = Sharon Kirby, MSN, RN-BC (Previous Chief Nursing Informatics Officer, Department of Nursing, Mayo Clinic)
SH = Sherri Hess, MS-IS, BSN, RN-BC, FHIMSS (Chief Nursing Informatics Officer, Banner Health)

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(ZH) We need to address the usability challenges of duplicate documentation, "siloed" notes, and readability of the output. We need to make better use of data generated through IoT, PROM, HIE.

(KU) Workflow integration and attention to who, what, why, when where, how. A research approach to session 1 comments!

(SM) Too many clicks can be balanced by need for structured data to measure and improve. There are frameworks to assess and act on the volume of clicks we require from providers of care.

(PS) There are benefits to sidekicks (scribes) following the provider, and even more to teamlets (MA, RN, trainer…) following the patient, and possibly more for teams of teams (multiple disciplines). More disruption to our systems with more complex models, but also more benefits.

(YK) There are new capabilities offered using speech recognition that can decrease the time to find relevant information in the EHR

(LP) Copy and Paste is a way to document stability, is used by everyone, but may propagate misinformation, increase cognitive requirements for the reader, and result in work arounds or usability issues.

Relevant Points

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ZH = (Aaron) Zachary Hettinger, MD (Director of Cognitive Informatics, MedStar Health National Center for Human Factors in Healthcare)
KU = Kim Unertl, PhD (Associate Professor of Biomedical Informatics in the School of Medicine at Vanderbilt University)
SM = Susan McBride PhD, RN-BC, CPHIMS, FAAN (Professor, Program Director Nursing Informatics Graduate Program, Texas Tech University Health Sciences Center)
PS = Peter Chabot Smith, MD (Department of Family Medicine, University of Colorado)
YK = Yaa Kumah-Crystal, MD, MPH, MS (Assistant Professor of Biomedical Informatics and Pediatric Endocrinology at Vanderbilt University Medical Center)
LP = Lorraine Possanza, DNP, JD, MBE (Program Director, Partnership for Health IT Patient Safety)

Rich Information in the Chat!

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Diversity Equity and Inclusion (DEI) Sub-Committee

1 **Structure**

2 **Process**

3 **Outcomes**

- Culture
- Organizational
- People
- Technology

- Who defines goals of documentation?

- Information is filtered through systems and processes

NT Cheung (Chief Medical Informatics Officer, Hong Kong's Hospital Authority)

Natasha Phillips, RN (Chief Nursing Information Officer NHSX, London, England, United Kingdom)

Viet Nguyen, MD (Founder, Stratametrics; Technical Director, HL7 Da Vinci Project)

William Dan Roberts, PhD (Vice President Care Delivery and Performance at HCA Healthcare)

Bonnie Adrian, PhD (RN-BC, Research Nurse Scientist, Clinical Informatics, UC Health)

Adam Wright, PhD, FACMI, FAMIA, FIAHSI (Professor Department of Biomedical Informatics, Vanderbilt University)

Subha Airan-Javia, MD (CEO & Founder CareAlign.AI; Associate Professor of Clinical Medicine, University of Pennsylvania)

Helen Palomino, LCSW (Chief Executive Officer, The Cancer Resource Center of the Desert)

Project Joy at UCHealth in Colorado

Bonnie Adrian, PhD RN-BC
Clinical Informatics Research Nurse Scientist
Bonnie.Adrian@uchealth.org

18

Fewer minutes in flowsheets
per inpatient RN 12 hour shift
(21% reduction)

~2500 inpatient RNs,
~16,000 shifts

496

Flowsheet rows eliminated

**64,800 RN hours
worth over $2.8M annually**

**360 Million fewer
"clicks" a year**

Workflow analyzer results, charting same real patient case before and after.

https://www.dbmi.columbia.edu/wp-content/uploads/2021/01/25x5Symposium-Adrian-Joy-final.pdf

Exemplars and Key Successes - Take-Aways

- Exemplars are doing excellent work, with tangible results

- Broad learning, dissemination, and spread to other providers/health systems are not happening
  - Spread to Vendors and Policy/Advocacy groups also not apparent

- International groups do not have the same reimbursement and regulatory constraints, but still experience burden and are focused on decreasing "size" of EHR content and notes

360 Million fewer "clicks" a year

Project Joy, UC Health

optimizing & learning

sharing & dissemination

spread and adoption
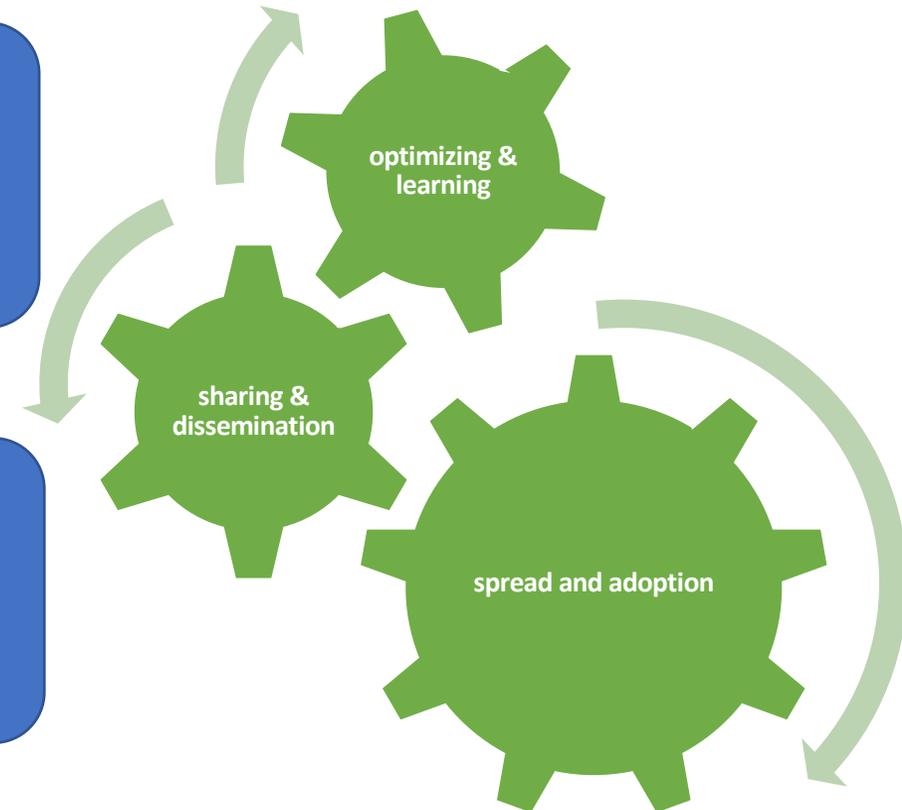
25x5 Survey on Post-COVID Documentation Reduction

- 351 responses

- Majority (80.3%) experienced **telehealth expansion** and preferred that it remain permanent
  - Rated moderately high in impact (60.1-61.5)

- Over two-thirds (67.9%) experienced **telehealth coding changes for E&M**
  - Rated lower impact than telehealth strategies alone (55.8)

- Majority supported *additional* **documentation strategies associated** with:
  - **EHR usability** (e.g., eliminating alerts, login optimization, EHR optimization sprints, and monitoring and improving EHR use measures)
  - **Data entry** (e.g., documenting only pertinent positives, device integration/efficient data capture)

- **Less** support for **shifting work** to ancillary staff (e.g., documentation assistance, medication reconciliation)

- **Variability in perceptions** and experience of documentation burden (e.g., templates charting by exception)

Position Paper of the American Nursing Informatics Association Board of Directors

Two weeks of work involving over 100 participants in 19 breakout groups
=> LOADS of data

Sengstack PP, Adrian B, David R-B, Boyd L, Davis A, Hook M, et al. The Six Domains of Burden: A Conceptual Framework to Address the Burden of Documentation in the Electronic Health Record Position Paper of the American Nursing Informatics Association Board of Directors

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82 Action Items
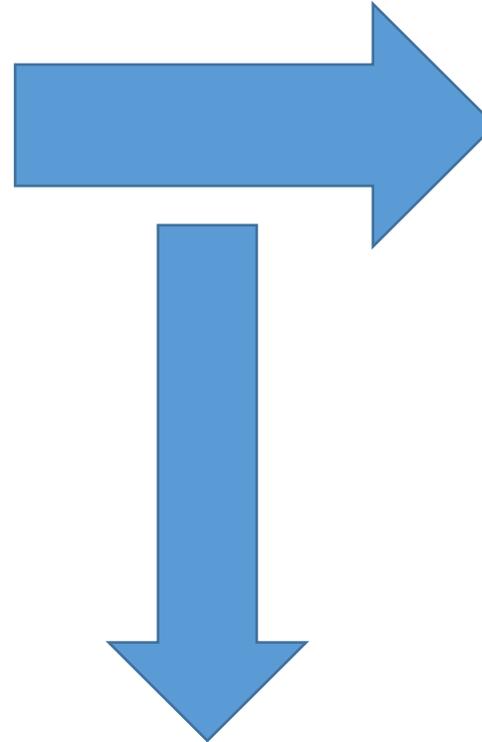
4 Themes

- **Accountability**
  - "Not working in silos"
  - Clarity of roles
  - Cohesive understanding/requirements among agencies and stakeholders
- **Evidence matters**
  - Evidence-based practice informing measures
  - Generation of evidence
  - Clinician input
- **Education and training**
  - Documentation requirements and standards
  - Brevity and clarity training for new clinicians
  - Focus on quality over quantity
  - Incentivize training
- **Innovation of technology**
  - Integration of tech variety
  - Increased interoperability

3 Stakeholder Groups

1. **Provider and Health System Calls to Action**
2. **Vendor Calls to Action**
3. **Policy Advocacy Calls to Action**

Themes

Accountability
- "Not working in silos"
- Clarity of roles
- Cohesive understanding/requirements among agencies and stakeholders

Evidence matters
- Evidence-based practice informing measures
- Generation of evidence
- Clinician input

Education and training
- Documentation requirements and standards
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- Focus on quality over quantity
- Incentivize training

Innovation of technology
- Integration of tech variety
- Increased interoperability

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Call to Action: **Providers/Health Systems** should ...

Accountability and Evidence

Establish guiding principles for adding documentation to EHR with multidisciplinary collaboration led by clinician experts

Generate evidence for reduced documentation and impact on risk/compliance and removing documentation that isn't positively impactful

Education and Training

Develop and host national roadshow; directed towards professional clinicians & clinicians in training

Med Student & Resident education: Universities and Health Centers to train brevity in addition to completeness

Technical Innovation

Expect/support real time information retrieval, documentation, and ordering

Implement interdisciplinary notes/team-based documentation

Call to Action: **Vendors** should …

Accountability and Evidence

Promote ecosystem of interoperable systems to allow for complementary technology beyond single EHR vendor

Develop metrics to review and grade a user's documentation based on length/efficiency/redundancy; provide ongoing user feedback and peer benchmarking

Education and Training

Package best training practices into toolkits to promote user's workflow revisioning and "best practice" EHR use

Plan recognition programs and publicize exemplars to incentivize the sharing of documentation burden reduction success stories

Technical Innovation

Create simplistic EHR views to see that new clinical data has been reviewed - then bookmark for user and document as reviewed by that user in the EHR

Implement personalized CDS with AI to drive user-specific workflows and care recommendations

Call to Action: **Policy/Advocacy Groups** should …

Accountability and Evidence

Urge NIH (NLM, PCORI), AHRQ & ONC to fund research related to capturing all coding information (E&M & CPT, etc.) w/o engaging any clinician time

Means: Payers to clarify & unify rules; develop data handoff 'handshakes'; create prior authorization call centers; assume responsibility for code validation

Education and Training

Select 'best of breed' & implement systems throughout the Health Care System

Means: mixture of public & private funding

Technical Innovation

Develop technology to reliably & accurately create reimbursement/payment data for all care settings w/o clinician engagement

Means: A/V components in care settings to capture all information relevant to coding & note generation

• Key Takeaway Points –

- 25x5 Symposium brought together stakeholders to consider how to reduce documentation burden by 75% in 5 years
  - Presentations from 33 formal stakeholder representatives

- Documentation burden has numerous contributing factors
  - Work to date has untangled contributors to burden
  - We have presented several action-oriented next steps
  - We found exemplars from other industries and clinical settings
  - Next steps will involve working with providers/health systems, HealthIT vendors, and national policy/advocacy groups

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- Where are we?
  - All recordings and chats from Symposium Series are available online
  - Breakout outputs => draft action plan
  - Multiple national report-outs – including CIC!

- What is Next?
  1. Develop 25x5 Reports focused on Future Needs and Action Plan
     - Executive Summary
     - Full report - Cohesive, overall action plan to fine-tune the actions
     - Peer-reviewed and White Papers

  2. Create Network of Allies
     - Ongoing Dissemination Activities & Conversations
       - ACMI, ONC, HIMSS, OHSU, NLM, NYONEL's, AMA, NLM…
  3. Convene Key Stakeholders From Community to Mobilize Strategies Nationally (e.g., NAM, CMS, ONC, AMA, ANA)
     - Convening Sessions for Strategic Planning
     - Formation of Working Groups
     - Future Activities and Reports

#25x5

Studies to quantify & measure burden

Clinical *Decision* Support
or
Clinical *Documentation* Support*???*

CDS Recommending to….	% (n)
Document a Plan of Care Template	21% (9)
Order a Consult	17% (7)
Perform a Care Activity to Impact Clinical Outcomes	12% (5)
Document a Quality/Compliance Measure	12% (5)
Document Required Item to Task List	12% (5)
Perform a Care Activity to Impact Clinical Processes	10% (4)
Review an Order	7% (3)
Document Missing Required Documentation	5% (2)
Document Patient Education	5% (2)
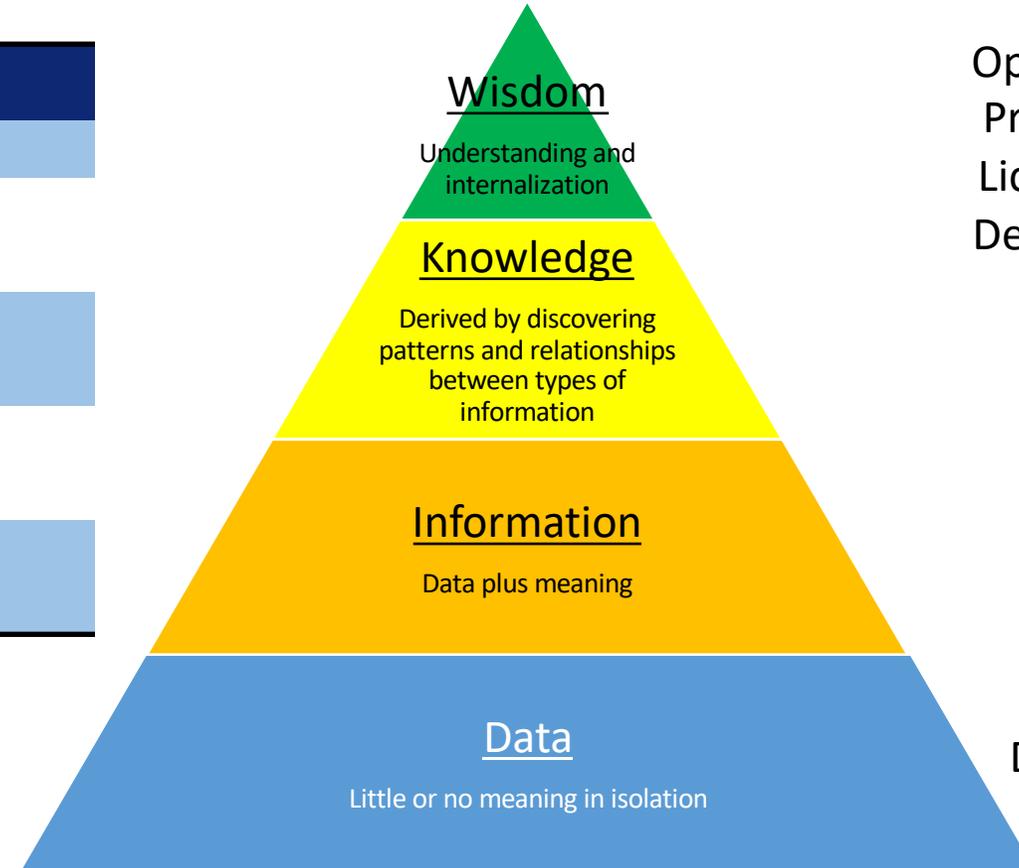
Whalen K, Bavuso K, Bouyer-Ferullo S, Goldsmith D, Fairbanks A, Gesner E, et al. Analysis of Nursing Clinical Decision Support Requests and Strategic Plan in a Large Academic Health System. Appl Clin Inform 2016;7:227–37.

Wisdom
Understanding and internalization

Knowledge
Derived by discovering patterns and relationships between types of information

Information
Data plus meaning

Data
Little or no meaning in isolation

DIKW Framework for Nursing CDS (ANA 2008; Matney, 2011)

Opportunities to Promote Top of Licensure Nurse Decision Making

Clinical Documentation Support

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Quantifying and Visualizing Nursing Flowsheet Documentation Burden in Acute and Critical Care

Sarah Collins RN, PhD[1,2], Brittany Couture[3], BS, Min Jeoung Kang[3,4], RN, PhD, Patricia Dykes, RN, PhD[3,4], Kumiko Schnock, RN, PhD[3,4], Chris Knaplund, MPhil[2], Frank Chang, MSE[3], Kenrick Cato, RN, PhD[2]

[1]Columbia University, Department of Biomedical Informatics, New York, NY; [2]Columbia University, School of Nursing, New York, NY; [3]Brigham and Women's Hospital, Boston, MA; [4]Harvard Medical School, Boston, MA;

Abstract

Documentation burden is a well-documented problem within healthcare, and improvement requires understanding of the scope and depth of the problem across domains. In this study we quantified documentation burden within EHR flowsheets, which are primarily used by nurses to document assessments and interventions. We found mean rates of 633-689 manual flowsheet data entries per 12-hour shift in the ICU and 631-875 manual flowsheet data entries per 12-hour shift in acute care, excluding device data. Automated streaming of device data only accounted for 5-20% of flowsheet data entries across our sample. Reported rates averaged to a nurse documenting 1 data point every 0.82-1.14 minutes, despite only a minimum data-set of required documentation. Increased automated device integration and novel approaches to decrease data capture burden (e.g., voice recognition), may increase nurses' available time for interpretation, annotation, and synthesis of patient data while also further advancing the richness of information within patient records.

Introduction

Clinical data capture and documentation should be: clinically pertinent, of high quality, efficient and usable, support multiple downstream uses as a byproduct of recording care delivery, enable shared decision-making and collaboration, enable collection and interpretation of information from multiple sources, and be automated whenever appropriate.[1] Decreasing documentation burden across healthcare settings and professionals is a priority of several professional

- On average & excluding device data
  - 1 data point every **1.04 - 1.14 minutes** in the **ICU**
  - 1 data point every **0.82 – 1.14** minutes in **Acute Care**

- Patterns observed
  - Short intervals (in minutes) exist between a nurses' flowsheet data entries
  - Nurses entered up to 40 flowsheet data points at a time with relative frequency
  - Larger batch of data at only one or two time points during their shift

Acute Care 12 Hour Day Shift (RN4): Number of Data Entries per Time Stamp
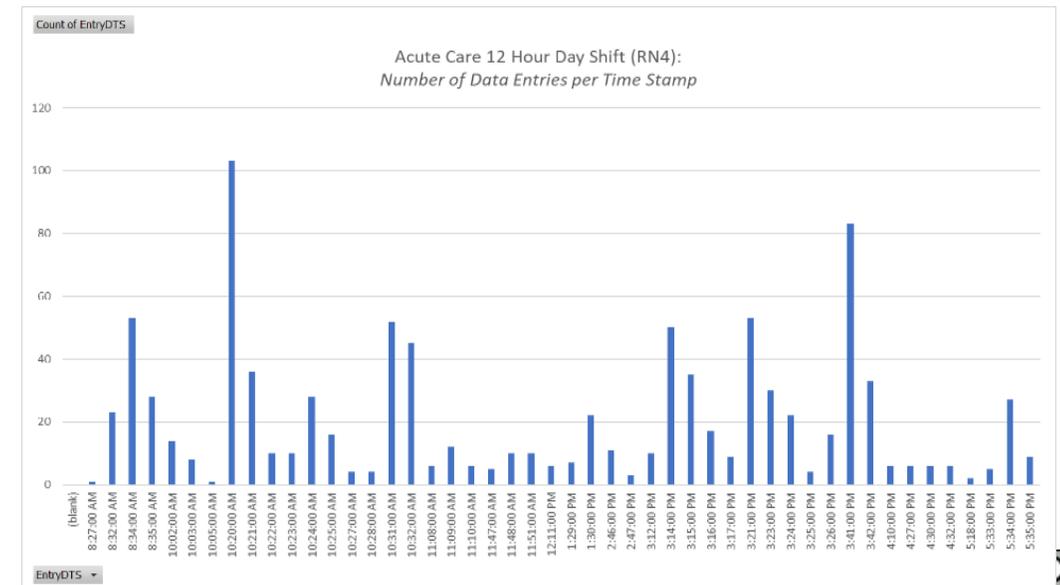
Time-motion examination of electronic health record utilization and clinician workflows indicate frequent task switching and documentation burden

Amanda J. Moy, MPH,[1] Jessica M. Schwartz, RN, BSN,[2] Jonathan Elias, MD,[1,3]
Seemab Imran,[3] Eugene Lucas, MD,[1,3] Kenrick D. Cato, RN, PhD,[2,4]
Sarah Collins Rossetti, RN, PhD[1,2]

[1]Columbia University Department of Biomedical Informatics, NY, NY; [2]Columbia University School of Nursing, NY, NY; [3]NewYork-Presbyterian Hospital, NY, NY; [4]Columbia University Vagelos School of Physicians and Surgeons, NY, NY

Abstract

Clinical documentation burden has been broadly acknowledged, yet few interprofessional measures of burden exist. Using interprofessional time-motion study (TMS) data, we evaluated clinical workflows with a focus on electronic health record (EHR) utilization and fragmentation among 46 clinicians: 33 advanced practice providers (APPs) and 13 registered nurses (RNs) from: an acute care unit (n=15 observations [obs]), intensive care unit (n_{obs}=14), ambulatory clinic (n_{obs}=3), and emergency department (n_{obs}=14). We examined workflow fragmentation, task-switch type, and task involvement. In our study, clinicians on average exhibited 1.4±0.6 switches per minute in their workflow. Ninety-nine (21.3%) of the 464 task-switch types presented in the data accounted for 80.0% of all switches. Among those, data viewing- and entry-related tasks were involved in 47.5% of all switches, indicating documentation burden may play a critical role in workflow disruptions. Therefore, interruption rate evaluated through task switches may serve as a proxy for measuring burden.

Introduction

Over one third of nurses and nearly half of all physicians experience some degree of burnout due to chronic work-related stress.[1,2] Driven by individual and institutional factors such as excessive workloads, process inefficiencies (e.g., frequent interruptions),[3,4] technological advances, and changes in care delivery (among other factors),[5] professional burnout is characterized by three main symptoms: inefficiency, emotional exhaustion, and depersonalization.[6] The growing body of literature has demonstrated a compelling association between burnout and the unintended negative consequences, including increased medical errors, poorer patient outcomes, decreased adherence to practice guidelines, and risks to patient safety and care quality.[8-10]


Entering Data :: Viewing Data :: Procedure :: Viewing Data

time

:: Symbolizes a transition
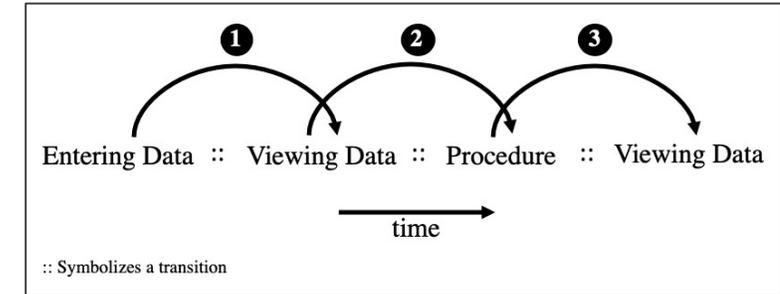
	mean(# switches/min)	SD	min	max
Advanced Practice Provider				
Acute Care	1.5	0.7	0.6	2.3
Ambulatory	0.9	0.2	0.7	1.1
Emergency	1.5	0.6	0.6	2.6
Intensive Care	1.4	0.5	0.6	2.2
Total	1.4	0.6	0.6	2.6
Registered Nurse				
Acute Care	1.7	0.5	1.2	2.7
Intensive Care	1.1	0.3	0.8	1.4
Total	1.5	0.5	0.8	2.7

Moy et al., AMIA 2020

The Power of <u>Optional</u> Documentation – *Signals of Autonomy, Quality, and Safety within the Nursing Process*

The likelihood of an event occurring 48 hours after observing a CONCERN high risk score is comparable to the likelihood of an event occurring 6 hours after observing a high risk MEWS or NEWS score – a difference of 42 hours.
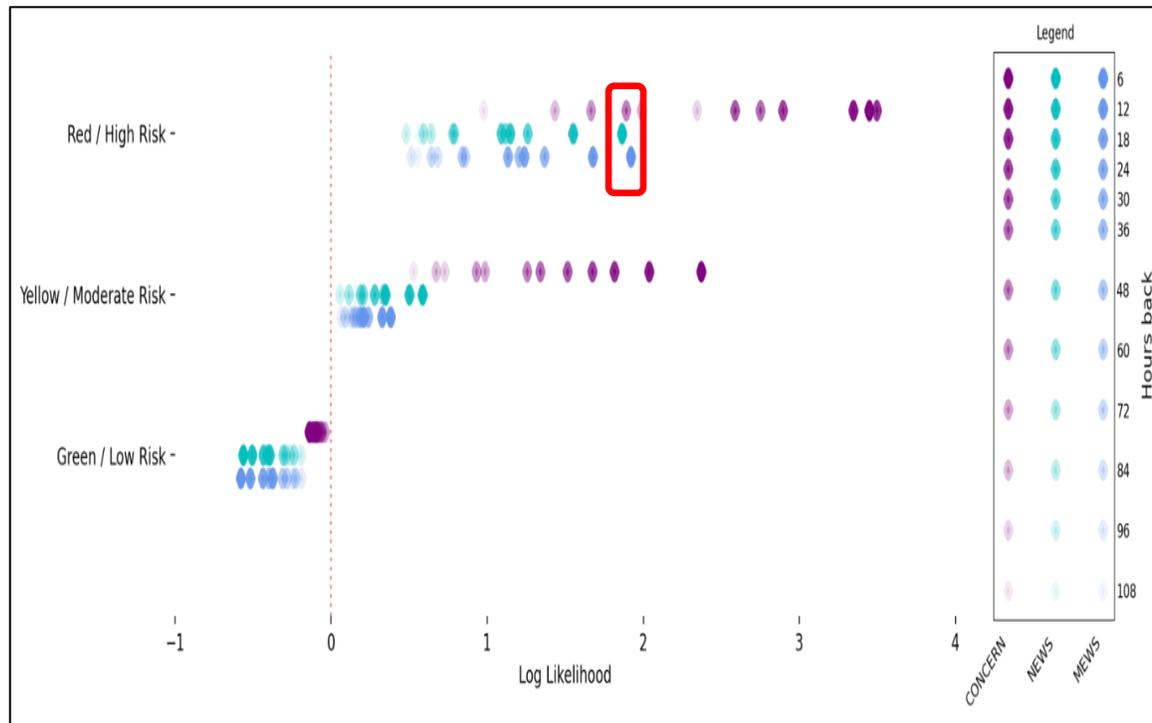
Acute Care Units Day Shift Manual Entries Per Nurse Per Patient
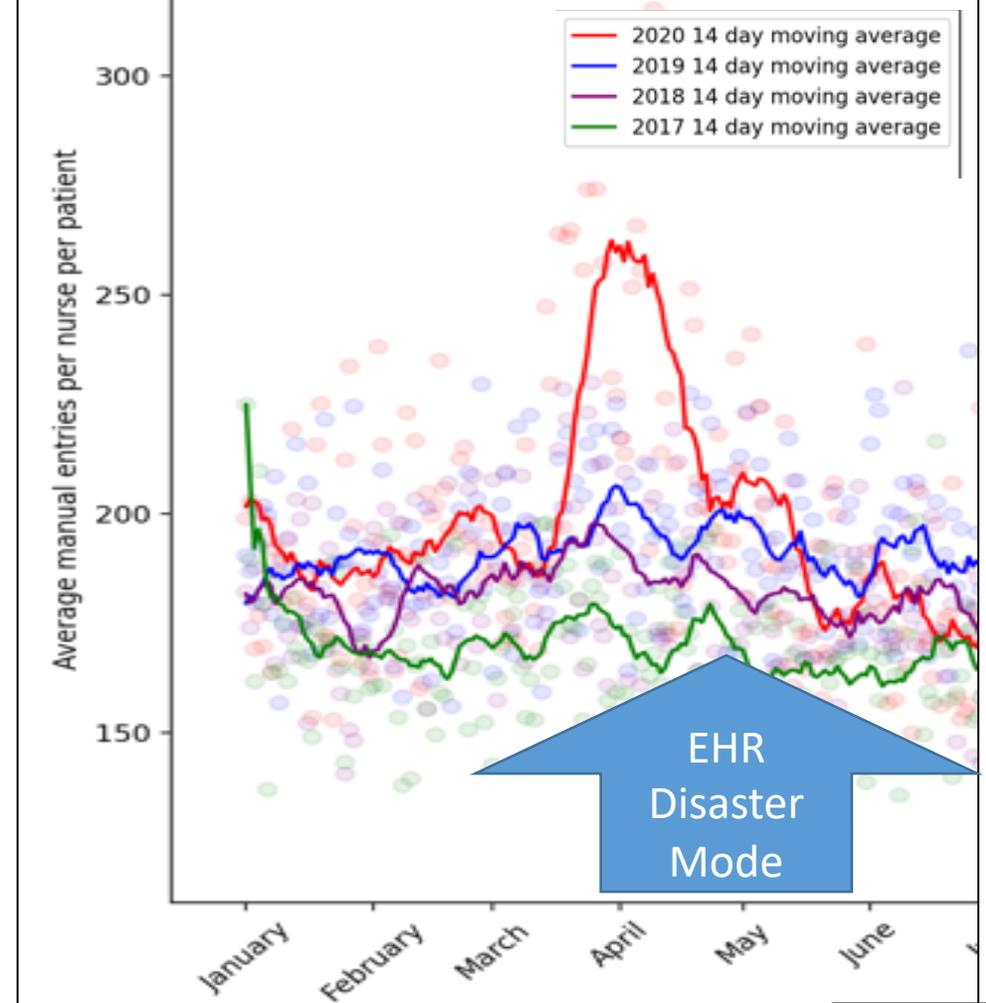
Rossetti SC, Knaplund C, Albers D, Dykes PD, Kang MJ, Korach TZ, Zhou L, Schnock K, Garcia J, Schwartz J, Fu LH, Klann JG, Cato K. Healthcare Process Modeling to Phenotype Clinician Behaviors for Exploiting the Signal Gain of Clinical Expertise (HPM-ExpertSignals): Development and Evaluation of a Conceptual Framework. Journal of the American Medical Informatics Association. Accepted Jan 2021.

Variability in metadata patterns

Nurses increase their frequency of surveillance – and subsequently frequency of documentation – for patients that fit a concerning pattern
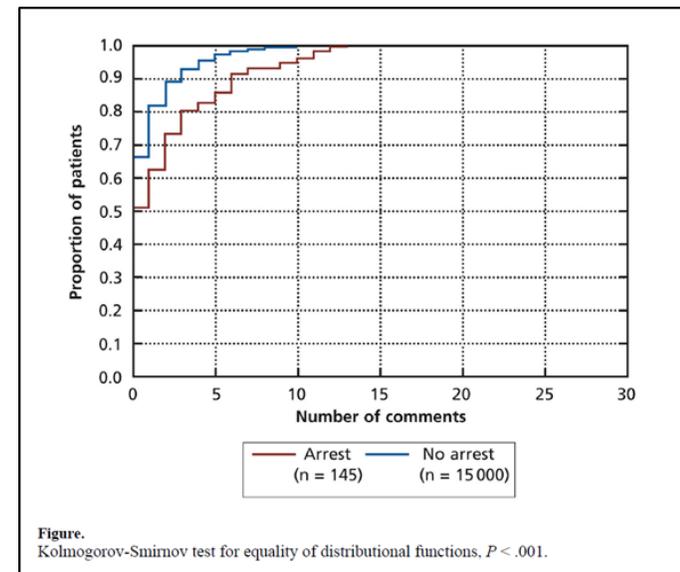
Focus only on values of EHR data will miss healthcare processes and nursing interventions activated far before a patient's vital signs are abnormal

Approach can shift how we understand and leverage clinical observational skills and clinician entered data within a patient's chart and measure burden

The act of documenting a free-text comment or other optional data in a flowsheet row
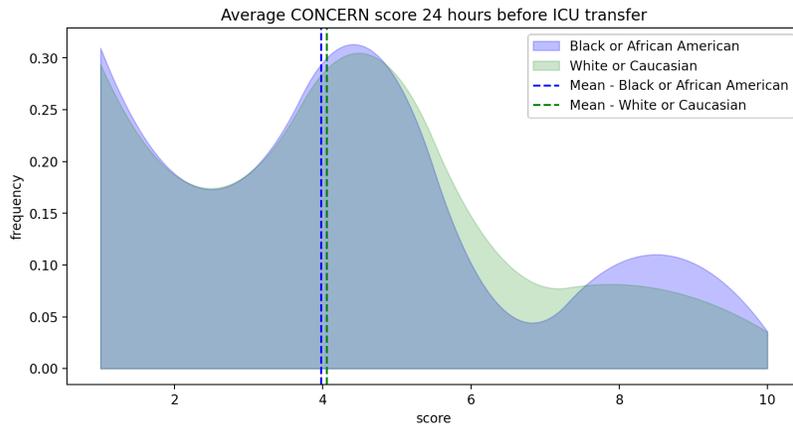
⬇

Information that the nurse likely determined an event or observation was clinically significant enough to record

Figure.
Kolmogorov-Smirnov test for equality of distributional functions, $P < .001$.

*Collins S, Cato K, Albers D, Scott K, Stetson P, Bakken S, Vawdrey D. Relationship Between Nursing Documentation and Patients' Mortality. American Journal of Critical Care. 2013 Jul;22(4):306-13.

Comparison of three Early Warning Scores

COLUMBIA
COLUMBIA UNIVERSITY
DEPARTMENT OF
BIOMEDICAL INFORMATICS

COLUMBIA UNIVERSITY
School of Nursing

CONCERN

Average CONCERN score 24 hours before ICU transfer

Mean – Black or African American	Mean – White or Caucasian	P-value
3.976190	4.053905	0.210805

National Early Warning Score (NEWS)

Average NEWS score 24 hours before ICU transfer
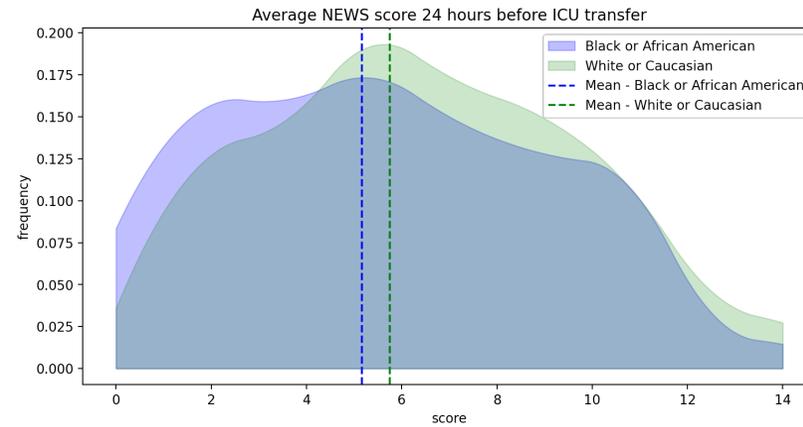
Mean – Black or African American	Mean – White or Caucasian	P-value
5.161055	5.752857	0.009656

Modified Early Warning Score (MEWS)

Average MEWS score 24 hours before ICU transfer
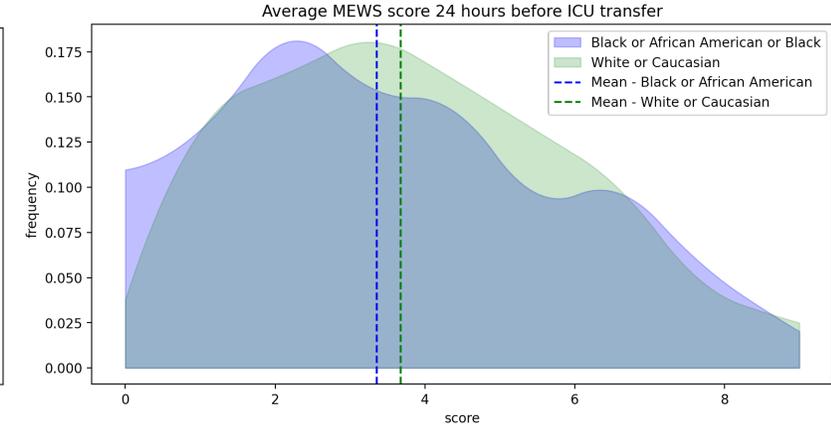
Mean – Black or African American	Mean – White or Caucasian	P-value
3.355838	3.673857	0.046306

- Anticipated that race (and other patient demographics) would play a role in an EWS based on documentation patterns (CONCERN). Demographic information was included in the model building and postprocessing steps to reduce racial bias in the score.
- NEWS and MEWS based on a patient's physiological state and do not account for potential racial biases. White or Caucasian patients who are transferred to the ICU receive a statistically higher average scores then Black or African American patients.

- CONCERN, NEWS and MEWS scores were generated every hour for the 24-hour period preceding an unanticipated transfer to ICU. The average score was calculated for each patient.
- The dataset was comprised of 157 Black or African American patients and 1600 White or Caucasian patients.
- Race identified by race field in the EHR.

•Subbe, C. P., Kruger, M., Rutherford, P. & Gemmel, L. Validation of a modified Early Warning Score in medical admissions. *QJM* **94**, 521–6 (2001).
•Pimentel, M. A. F. *et al.* A comparison of the ability of the National Early Warning Score and the National Early Warning Score 2 to identify patients at risk of in-hospital mortality: A multi-centre database study. *Resuscitation* **134**, 147–156 (2019).

Data Science & Applied Clinical Informatics Opportunity: Healthcare Process Modeling

- **<u>Healthcare Process Models</u>** –

  - Identify features from user interaction with clinical systems which are patterns of clinical behaviors

  - Patterns interpreted as proxies of an individual's decisions, knowledge, and expertise

  - Use patterns in predictive models for associations with outcomes

- *Clinical domain expertise is essential for accurate and comprehensive interpretations.*
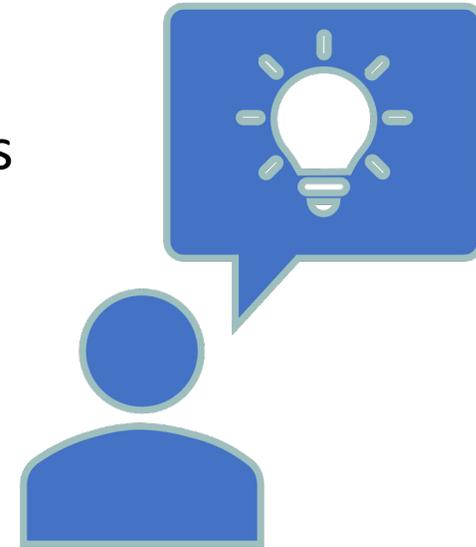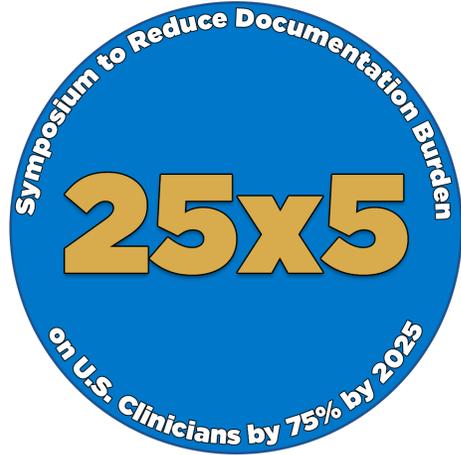
Discussion and Thank You!

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