

7.5b Evaluation of the EHR

10x10 – Introduction to Biomedical Informatics & Artificial Intelligence
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Outcomes of the EHR

Early studies

- Pre-HITECH giving incentive for increased adoption
- Post-HITECH mostly comparing EHR and paper records

Widespread EHR era outcomes

Drilling down

- Usability
- Organizational issues
- Clinician time and efficiency
- Clinician burnout

Using results in reducing EHR burden

Usability challenges

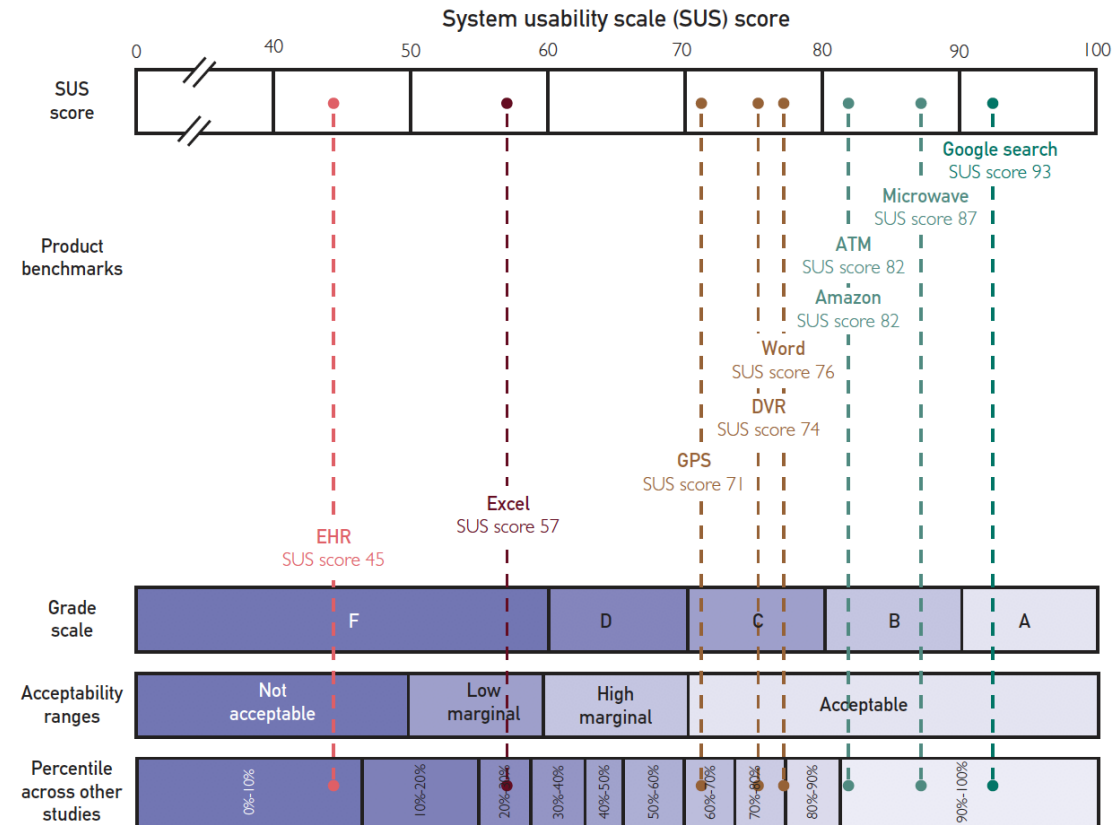
Comparison of EHR to other computer applications (Melnick, 2020)

- Used common usability tool, System Usability Scale (SUS) (Peres, 2013)
- Mean score “not acceptable”
- Poor rating associated with higher level of physician burnout

Suboptimal usability associated with adverse nurse outcomes, increased surgical mortality, and increased readmission (Kutney-Lee, 2021)

Progress notes increased in length and redundancy between 2009-2018 (Rule, 2021)

Changing EHRs resulted in increased workload for >2 years (Lopez, 2021)



Usability challenges (cont.)

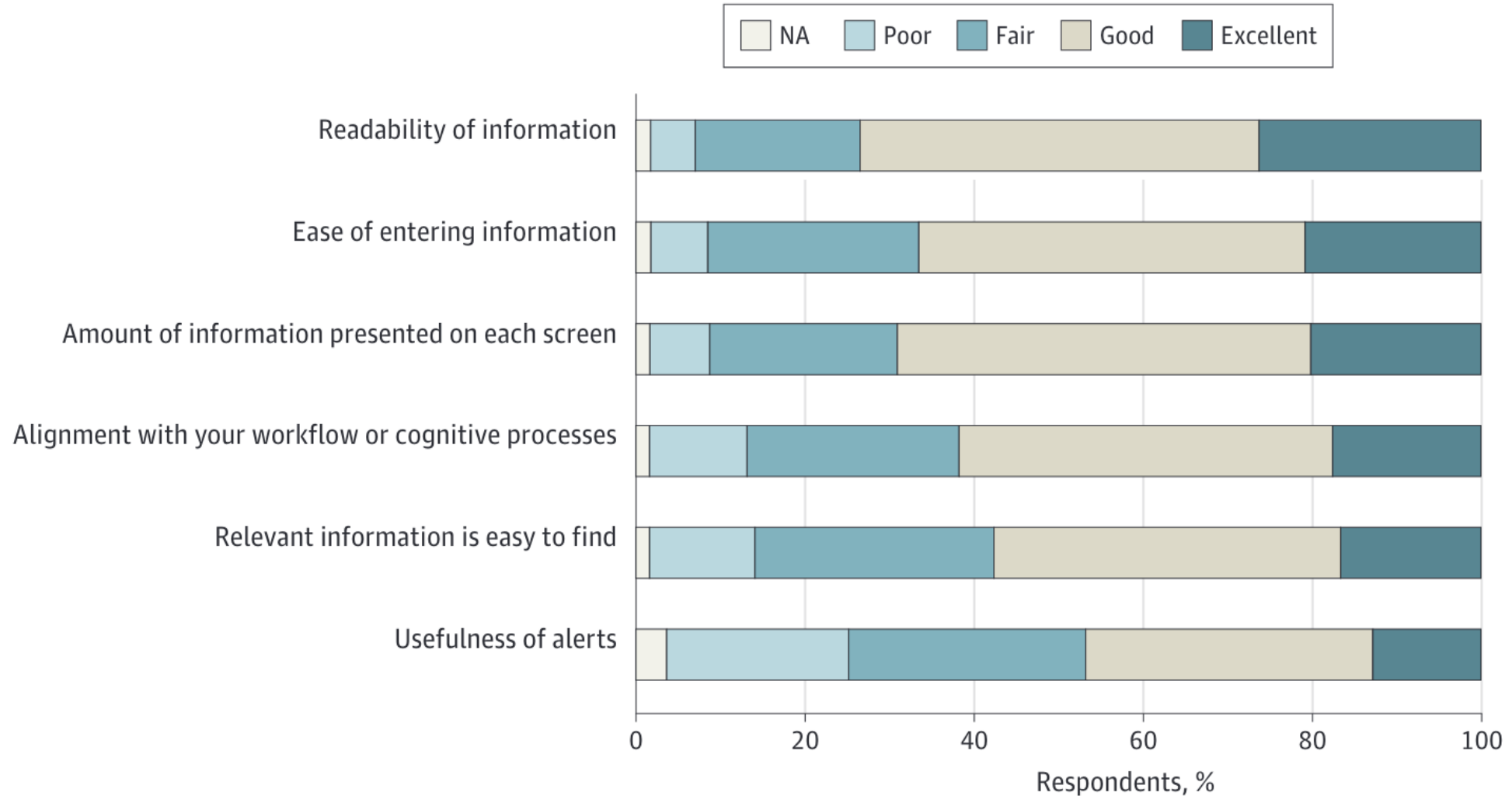
EHR is predominant communication modality for clinical teams but is limited for rich and social communication (Amano, 2023)

Transitions to Epic at academic medical centers showed mixed user satisfaction but improvement over time, with a number of ongoing problems

- New York-Presbyterian Hospital (Lefchak, 2023)
- Brigham & Women's Hospital (Garabedian, 2023)

Current EHRs and other systems have shortcomings for medication reconciliation – larger strategies needed (Kashyap, 2024)

Satisfaction and usability high but vary by function (Holmgren, 2024)



Usability solutions

Improving efficiency of inbox management (Murphy, 2019)

Physicians recognize value of EHR and higher perceived EHR usability associated with improved patient care and lower levels of worsened patient interactions and work-life integration (Melnick, 2020)

Usability redesign project led to improved rates of screening (Pierce, 2020)

Limiting to one open chart at a time did not add time (Kneifati-Hayek, 2023)

CDS intervention helped improve problem list completeness but not associated with improved quality measures (Wright, 2023)

People and organizational issues

Qualitative studies, sometimes “triangulated” with other data, seek to uncover themes, interactions, and other observations of people and/or organizations (Ash, 2008)

Some well-known results include

- Importance of “special people” (Ash, 2003)
- “Unintended consequences” of EHR systems (Ash, 2004) and CPOE (Campbell, 2006)
- Mixed results from the UK National Program for HIT (Hendy, 2007; Greenhalgh, 2010)
- During hospital rounds, wide variation across teams in ways used and workarounds, with poor support for communication and workflow (Assis-Hassid, 2019)

Analyses of difficulties with VA migration from VistA to Cerner found combination of technical, usability, and organizational problems (VA, 2023; GAO, 2023)

Clinician time and the EHR

Consistent concern has been increased time required by clinicians

- Can be measured via EHR log data but challenging to measure due to actual time spent with EHR (Levy, 2023)
- Significant time for “work outside of work,” aka “pajama time” (Arndt, 2023)

Physicians have always been known to spend up to half of time in practice in “indirect” care of patients, including documentation, even before EHR era (Mamlin, 1973; Tipping, 2010)

- How much is too much for best patient care?

Early studies of clinician EHR time

Emergency physicians found to spend 43% of time on data entry, making around 4000 clicks in 10-hour shift (Hill, 2013)

Time-motion study of 57 outpatient physicians (Sinsky, 2016)

- 27% of time with patients and 49% with EHR and desk work
- In exam room, 53% direct clinical face time and 37% EHR and desk work
- About one-third reported 1-2 hours after work each night of mostly EHR tasks

Residents in academic teaching hospital found to spend 50% of time with computers vs. 10% time directly with patients (Mamykina, 2016)

EHR time-stamp log study of 471 physicians (Tai-Seale, 2017)

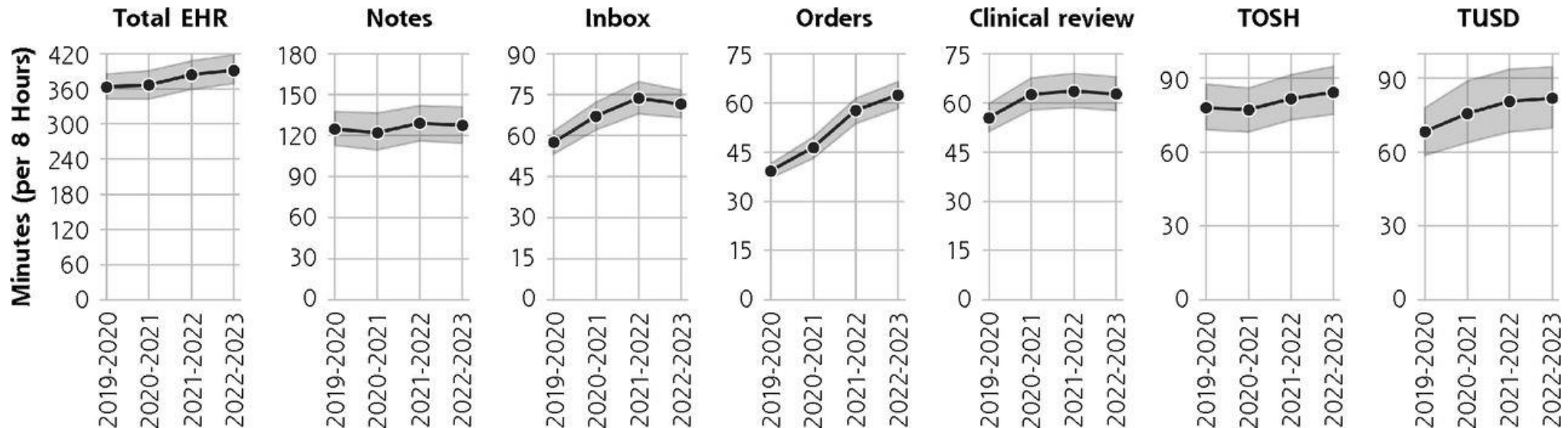
- 3.1 hours on office visits and 3.2 hours on desktop medicine each day
- Over 2011-2014, decline in visit and increase in desktop medicine

Problem has persisted and not limited to physicians

Systematic review of time studies found inpatient and outpatient physicians spent about 37% of work time using EHR and nurses in inpatient settings spending about 22% of work time (Pinevich, 2021)

Ambulatory physicians spent 5.8 hours per 8 hours of patient-care scheduled time (Holmgren, 2024)

EHR time for academic primary care physicians increasing over time (Arndt 2024)



EHR time use varies by many factors

Specialty – more for medical than surgical (Rotenstein, 2021; Safian, 2022; Holmgren, 2024)

Gender – female physicians

- Spent more time in ambulatory EHR and in-basket (Tait, 2021; Rittenberg, 2022; Rotenstein, 2022)
- Spent more time with EHR and messaging in inpatient settings (Safian, 2022)
- Messaging excess due in part to staff and patients making more requests (Rittenberg, 2025)

No reduced time from

- QuickActions and SmartPhrases associated with increased time (Nguyen, 2021)
- Use of templates and copy/paste did not save time (Apathy, 2022)
- Physicians reported copy/paste widely used and perceived to improve efficiency (Hudkins, 2025)

No association between time and state-level malpractice rate and EHR time (Holmgren, 2022)

Improved quality measures from EHR associated with increased time (Rotenstein, 2022)

EHR time factors (cont.)

Telemedicine associated with greater physician time spent working in EHR (Holmgren, 2023)

After changes for E/M coding, small reductions in note length and EHR time (Shah, 2024)

Virtual (human) scribes reduce EHR, note, and pajama time (Rotenstein, 2024)

Ambient dictation reduces EHR time (Hassan, 2025; Kim, 2025)

Clinician time variability and organizational factors

Physicians who work part-time spent more time in the EHR (Micek, 2023; Weinreb, 2026)

Most variable physician EHR usage patterns occurs at individual physician level and decreases up to practice and health system levels (Cross, 2023; Overhage, 2024)

Increased team support, briefer documentation, and 2021 E/M code changes associated with higher physician productivity (Li, 2023)

For PCPs, organization-level factors, such as greater team collaboration on orders, the presence of specific clinic staff, and practicing in a community health center, associated with significantly lower per-visit EHR time across multiple categories (Rotenstein, 2023)

Team-based documentation reduces EHR time (Apathy, 2024)

EHRs and clinician burnout

Use of EHR use after work associated with increased rate of burnout (Peccoralo, 2021; Eschenroeder, 2021)

Burnout lower among those who report strong organizational support EHR implementation, training, and support (Eschenroeder, 2021)

No association between in-basket message volume, length, or sentiment and physician burnout (Baxter, 2022)

Perceived EHR stress and prescription reauthorization messages are significantly associated with burnout, as are non-EHR factors such as not feeling valued or aligned in values with clinic leaders (Tai-Seale, 2023)

Systematic review of interventions to reduce EHR-related burnout included use of scribes, EHR training, and EHR modifications – subjective improvement in time and satisfaction but less objective data (Kang, 2024)

Higher climate and safety climate associated with lower odds of emotional exhaustion, depersonalization, and burnout (Rotenstein, 2024)

High-efficiency teams associated with lower burnout (Rotenstein, 2024)

EHR differences by country

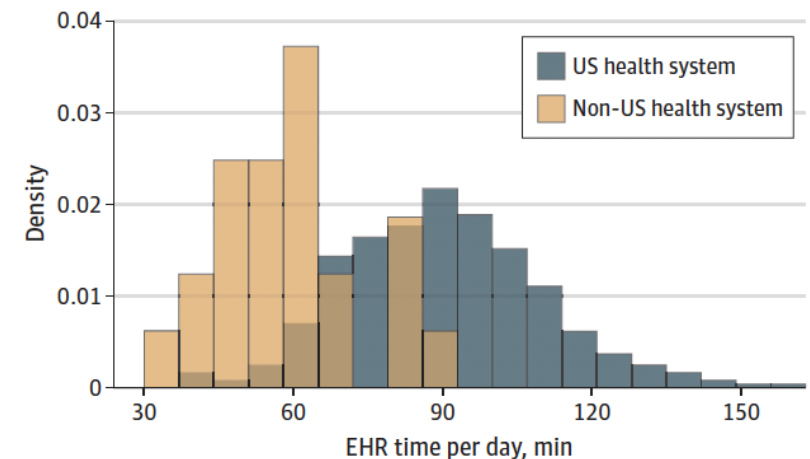
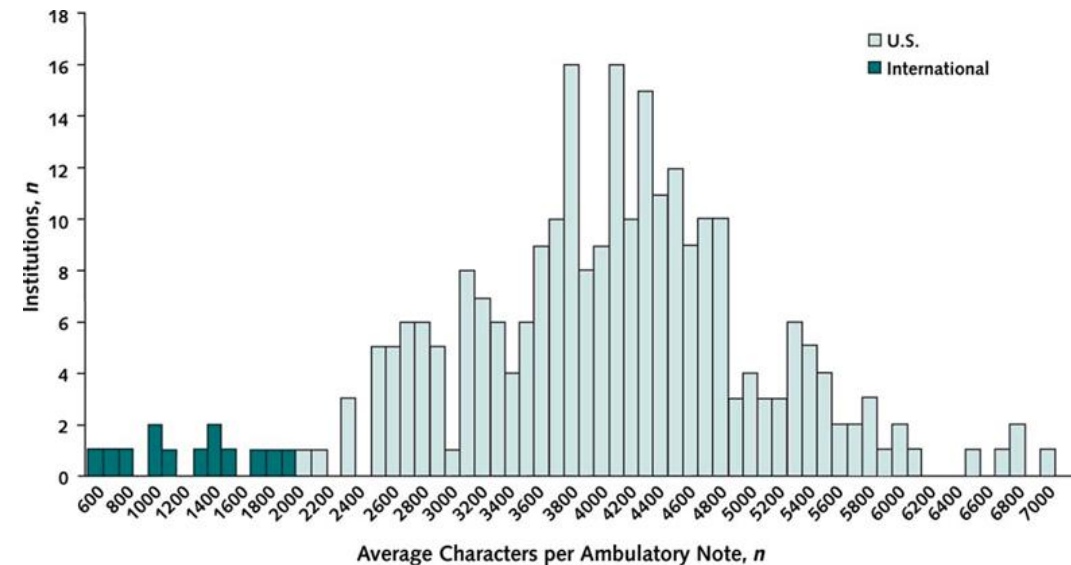
Comparative study of EHR note length in Epic implementations in US vs. other countries found much longer in US (Downing, 2018)

- EHR dissatisfaction less in other countries; related to excess regulatory requirements in US?

Epic has been challenging to implement outside US, e.g., Denmark (Allen, 2019) and Finland (Hertzum, 2022)

Physicians in other countries spend less time using EHR than in US, with fewer messages and less after-hour use (Holmgren, 2021)

Many barriers in developing countries (Woldemariam, 2023)



Reducing EHR burden

ONC report mandated by 21st Century Cures Act, published in 2020

Burdens identified and recommendations made in four areas

- Usability
- Public health reporting
- EHR reporting
- Clinical documentation

Perceived role of EHR and workflow fragmentation on clinician documentation burden in the emergency department (Moy, 2024)

- EHR factors
- Cognitive load/burden
- Workflow fragmentation

Chief burdens reported by stakeholders:



Billing-related documentation
“note bloat”



Prior authorization



Quality measurement



Poor user experience with health
IT and clinical workflow



Too much time outside of patient
care spent on electronic records



PDMPs poorly integrated into
EHRs



25x5 initiative (AMIA 2023; Levy; 2023)



Providers & Health Systems	Health IT Vendors	Policy & Advocacy Group
• Establish guiding principles for adding documentation to EHRs and generating evidence for reduced documentation • Develop a national roadshow and educate clinicians and clinicians in training on balancing brevity and completeness in documentation • Increase support of functions like real-time information retrieval, documentation, and ordering in the EHR • Implement interdisciplinary notes to decrease redundant documentation	• Promote an ecosystem of interoperable systems to allow for complementary technology • Develop measurement tools to categorize documentation practices • Package best training practices into toolkits to promote best practice EHR use and plan recognition programs to publicize exemplars • Create simplistic EHR views to see that new clinical data has been reviewed, then bookmark for the user and document as reviewed by that user in the EHR • Implement user-personalized Clinical Decision Support to drive specific workflows	• Urge agencies to fund innovative research that captures all billing code information without taking up clinicians' time • Select the best of breed approaches to documentation and implement throughout the health care system • Develop technology to reliably and accurately create reimbursement and payment data for all care settings

Another approach is “deimplementation” (Berg, 2021)

EHR

☐ Minimize alerts

- Retain only those alerts with evidence of a favorable cost-benefit ratio

☐ Simplify login

- Simplify and streamline login process, leveraging options like single sign-on, RFID proximity identification, bioidentification (fingerprint, facial recognition, etc.)

☐ Extend time before auto-logout

- Consider extending time for workstation auto-logout
- Consider customizing workstation location and the security level to use patterns of the specific user

☐ Decrease password-related burdens

- Consider extending the intervals for password reset requirements
- Help users create passwords that are both strong and easy to remember (i.e., by allowing special characters and spaces, and by allowing longer passwords that can be passphrases)
- Consider use of password keeper programs

☐ Reduce clicks and hard-stops in ordering

- Reduce requirements for input of excessive clinical data prior to ordering a test
- Eliminate requirements to fill fields attesting to possible pregnancy in males or women over 60 years old

☐ Eliminate requirements for password revalidation

- Identify ways to reduce unnecessary requirements for users to [re-enter username/password](#) when already signed in to EHR, to send prescriptions (Note: Organizations may choose to keep this requirement in place for opioid prescriptions.)

☐ Reduce note-bloat

- Reduce links imbedded in visit note documentation templates that automatically pull in data from other parts of EHR contributing to “note bloat,” but adding little if any true clinical value

Compliance

☐ Allow verbal orders in low-risk and in crisis situations as legally permitted

☐ Reduce signature requirements

- Eliminate signature requirements for forms that do not legally require a physician signature
- Eliminate order requirements for low-risk activities that do not legally require a physician signature (ear wash, fingerstick glucose, oximetry)
- Consider eliminating “challenge questions” to electronically sign orders when the user already logged in and actively using the EHR

☐ Evaluate annual trainings and attestations

- Review current compliance training modules and consider removal of those that aren't required by a regulatory agency or for which evidence of benefit is lacking

☐ Reduce attestations required daily or every time one logs in

- Eliminate requirements as allowed by state or federal requirements (i.e., for privacy protection attestation) that occur on a daily or every-time-one-logs-in basis (i.e., consider whether or not an annual attestation is sufficient)

Quality assurance/improvement

☐ Eliminate the rote ascertainment of learning style preference

☐ Perform condition screens no more frequently than recommended

- Include a “grace period” of at least 30–50% of the guideline recommended time interval when constructing a performance measure from a clinical practice guideline

Example: If clinical practice guideline recommends annual screening for depression, then set performance measurement with an interval of performing this task within 18 months—otherwise staff will waste limited clinical resources screening more often than is required to meet the 365-day annual interval.