Usability of Electronic Health Record Systems

J. Marc Overhage, MD, PhD

*VP Intelligence Strategy and CMIO*

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The research experience

• Providers were happy
• Gushing love for clinical repository functions. Patient record data always available from anywhere and fast.
• They were okay with order entry and note writing.
• Order writing provided lots of guidance, defaults and panels so could write fairly fast. And system was responsive (0.1 second responses). But still it took a bit longer than before.¹

Benefits of HIT adoption

- Increase the efficiency of health care (improve physician, nurse and overall healthcare productivity)
- Improve the quality (patient outcomes) of healthcare, resulting in improved patient safety
- Reduce healthcare costs
- Improve healthcare access with technologies such as telemedicine
- Improve communication, coordination, and continuity of care
- Improve medical education for clinicians and patients
- Standardize of medical care
The Ugly!
Physicians are Suffering…

“I am no longer a physician but the data manager, data entry clerk and steno girl… I became a doctor to take care of patients. I have become the typist.”

“I hate being a doctor…I can’t wait to get out.”

“The joy of practicing medicine is gone.”

“I can’t tell you how defeated I feel…The feeling of being punished for delivering good care is nerve-racking.”
It’s personal

• My mentor, Clem McDonald went to his niece’s college graduation party in Madison, Wisconsin.
• His brother (her father) had been bragging to his neighbors that he had invented the Electronic Medical Record.
• Two of those neighbors, both women physicians, cornered him at the party and accused him of ruining their lives.
• They couldn’t get home in time to see their little kids since the EMR was installed. Tears welled up.
• They compared him to J. Robert Oppenheimer. For them, Clem’s invention was worse than his.

“I am become death, the destroyer of worlds”

J. Robert Oppenheimer
Many similar findings

- Clem did two survey studies after that finding EHRs required an additional 48 min/day.¹
- [Providers] perceived documentation as taking 13 minutes per patient. It was seen as interfering with personal and educational time.²
- 45 minutes extra per clinic day.³
- Poor EHR usability, time-consuming data entry, inefficient work content, inability to exchange health information, degradation of clinical documentation.⁴
- Satisfaction in EMRs is dropping.⁵

5. Brookstone A. American EHR blog 2013
Ambulatory Care

Original Investigations

Research Paper

Controlled Trial of Direct Physician Order Entry:
Effects on Physicians’ Time Utilization in Ambulatory Primary Care Internal Medicine Practices

J. Marc Overhage, MD, PhD, Susan Perkins, PhD, William M. Tierney, MD, Clement J. McDonald, MD

Abstract Objective: Direct physician order entry (POE) offers many potential benefits, but evidence suggests that POE requires substantially more time than traditional paper-based ordering...
## Ambulatory Care

<table>
<thead>
<tr>
<th>Analysis Group</th>
<th>Minutes per Patient (%)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Intervention</td>
<td></td>
</tr>
<tr>
<td>Administrative</td>
<td>0.5 (1)</td>
<td>0.8 (2)</td>
<td></td>
</tr>
<tr>
<td>Direct patient care</td>
<td>15.8 (46)</td>
<td>16.1 (45)</td>
<td></td>
</tr>
<tr>
<td>Indirect patient care:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read</td>
<td>3.3 (10)</td>
<td>3.6 (10)</td>
<td></td>
</tr>
<tr>
<td>Write</td>
<td>6.2 (18)</td>
<td>6.9 (19)</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.3 (4)</td>
<td>1.5 (4)</td>
<td></td>
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<tr>
<td>Miscellaneous</td>
<td>7.0 (21)</td>
<td>7.0 (20)</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>34.2 (100)</td>
<td>35.8 (100)</td>
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</tr>
</tbody>
</table>
PHYSICIAN PRACTICE

By Ming Tai-Seale, Cliff W. Olson, Jinnan Li, Albert S. Chan, Criss Morikawa, Meg Durbin, Wei Wang, and Harold S. Luft

THE PRACTICE OF MEDICINE

Electronic Health Record Logs Indicate That Physicians Split Time Evenly Between Seeing Patients And Desktop Medicine

ABSTRACT Time spent by physicians is a key resource in health care delivery. This study used data captured by the access time stamp functionality of an electronic health record (EHR) to examine physician work effort. This is a potentially powerful, yet unobtrusive, way to study physicians’ use of time. We used data on physicians’ time allocation patterns captured by over thirty-one million EHR transactions in the...
### EXHIBIT 1

**Ambulatory Care**

Average hours spent on various activities per physician per day, 2011–14

<table>
<thead>
<tr>
<th>Activity</th>
<th>In clinic and remote access</th>
<th>Desktop medicine, in clinic</th>
<th>Desktop medicine, remote access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>On day of visit Mean</td>
</tr>
<tr>
<td><strong>DESKTOP MEDICINE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Progress notes</td>
<td>2.10</td>
<td>1.14</td>
<td>1.33</td>
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<tr>
<td>Telephone encounters</td>
<td>0.58</td>
<td>0.44</td>
<td>0.05</td>
</tr>
<tr>
<td>Secure messages</td>
<td>0.20</td>
<td>0.25</td>
<td>0.01</td>
</tr>
<tr>
<td>Prescription refills</td>
<td>0.10</td>
<td>0.13</td>
<td>0.00</td>
</tr>
<tr>
<td>Other</td>
<td>0.18</td>
<td>0.23</td>
<td>0.02</td>
</tr>
<tr>
<td>Subtotal</td>
<td>3.17</td>
<td>1.36</td>
<td>1.42</td>
</tr>
<tr>
<td><strong>FACE-TO-FACE MEDICINE</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ambulatory care visits</td>
<td>3.08</td>
<td>1.65</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL TIME</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total logged time</td>
<td>6.25</td>
<td>2.15</td>
<td></td>
</tr>
<tr>
<td>Total scheduled time for visits</td>
<td>7.45</td>
<td>2.31</td>
<td></td>
</tr>
</tbody>
</table>

**Source**: Authors’ analysis of data from access logs embedded in the electronic health records of 471 physicians. **Notes**: See the text for descriptions of the desktop medicine activities. Total scheduled time for visits is the time between the beginning of the first scheduled face-to-face visit and the end of the last visit. Hours may not sum to total because of rounding. SD is standard deviation.
How much has changed?

But closer to 23 min/patient in 2017 versus 35 min/patient in 2001
When Physicians Spend Their Time in the EMR

Physician Timecard
Dr. Five - 11/11/13

Active Time: 6 hours 3 min
Patients Seen: 19
Time in EMR/Patient: 19 min 3 sec

Orders | Documentation | Chart Review | Patients
When Physicians Spend Their Time in the EMR

Physician Timecard
Dr. Nine - 11/11/13

Active Time: 9 hours 6 min
Patients Seen: 16
Time in EMR/Patient: 34 min 10 sec
Individual variation
Physician burnout is reaching crisis proportions in the United States (1). Studies have noted a rising prevalence of emotional fatigue. One study suggested that more than half of physicians in some disciplines are burned out and that this proportion is increasing. The number of clinicians leaving the workforce represents a major concern to health care professionals and to the health of the nation. Many factors contribute, but the physician’s interaction with electronic health records (EHRs) is especially important now that EHRs have been broadly adopted across the country.

Although EHRs have great potential to improve care, they may also have perverse effects. Some studies suggest that U.S. physicians now spend as much time on “desktop medicine” (interacting with the computer) as they do face to face with patients (2, 3). Providers must divide their attention between patients and the EHR, and many believe that this compromises patient-physician relationships (4). Although few physicians support reverting to paper, there is a growing sense within the medical community that the EHR is driving justify billing to such payers as the Centers for Medicare & Medicaid Services, physicians must specify diagnoses from long and confusing arrays of choices relating to each test or procedure and document a clinically irrelevant number of elements for the history of present illness, review of systems, and physical examination. Documentation requirements in the United States are a relic of fee-for-service and will make even less sense as we move to new payment mechanisms.

The movement toward a value-based payment system alone will not ameliorate the effect of documentation on physician workflow. Since the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted, U.S. clinical notes have doubled in length (Epic Systems. Unpublished data.). Meaningful use incentives have unintentionally created requirements for substantial, low-value documentation (8). Administrative tasks could grow even further as value-based payments increasingly demand documentation of comorbid conditions, quality process metrics, and clinical outcomes. Although the Merit-based Incen-
Average characters per ambulatory progress note

Downing et al, Physician Burnout in the Electronic Health Record Era: Are We Ignoring the Real Cause?, Ann Int Med 2018
But documentation length is not documentation time
Underlying issues in system usability
Usability is influenced by more than the software

- Software
- Configuration
- Deployment
- Training
- Practice Styles
- Staffing
- Process

- Regulation
- Quality Improvement
- Licensure
- Safety
- Reimbursement
A sampling of issues

• Growth of documentation requirements
• Heavy task shifting to physicians
• Relentless push toward more structure and more detailed coding
• Quality Measurement Forced March
• “Picky” interfaces
• Injudicious alerts
• Configuration matters
• Variability in understanding how to get things done
Two Experiences
Ordering CBC with Diff.
What to do about it?
Specific opportunities

• Organize the record by the clinician’s concerns and support the evolution of concern
• Summarize the data in a clinically meaningful way
  • Filter and highlight clinically relevant data
  • Link the story together
• Provide contextually relevant tools to manage the specific concern
• Provide contextually relevant data capture
• Facilitate collaboration/communication through visibility
• Derive documentations and summaries required for administrative uses rather than having them front and center
Exam Room Devices

- Array Microphone
- 3D sensor
- Bathroom Door
- RTLS
- RGB Camera
- Door
- Array Microphone
- 3D sensor
- EMR
- Exam Table
- Scale
Encounter Observer

Historical and contemporary patient data
+ Socio-demographics

Physician / system interaction metrics

Audio*
- Verbal interactions
- Speech to clinical concepts

3D sensor**
- Physical interactions
- Face time

Quantifying encounter to derive:
- E&M CPT code
- ICD-10 codes
- Activity-based costing

* Sentiment analysis, etc. may offer further refinement to the models in the future

** Biometric characterization may prevent fraud and feature recognition could support sentiment analysis
Depth camera for human activity
Well, Dr. Wox. I’ve been having this uh, earache on my right side, um, you know, it’s uh, it’s just -- yeah. Just been having it for the last couple of days and since yesterday really, um, and it seems to be getting worse. You know, I’ve taken some acetaminophen for it but, you know, it doesn’t do anything.

Well...

Well, your pain is right now?

Well...

Well, it’s just...
Otoscope Images
Otitis Media Image Accuracy
Predictive Model

- Complaint, Age, Temperature
- Provider’s hands near right ear
- Provider says “This ear looks infected”
- Image analysis returns erythema, [severe] TM bulge
Take home Points

• Usability has to be considered in the entire context
• There is probably more impact from practice design, implementation, etc than from the software itself
• Dramatically improving usability may require radical rethinking of processes (and knocking down barriers to doing so)
Questions
(and maybe even answers)