Poor Data Quality or Poor Interface Design? A Review of the Literature on the Quality of Documentation within the Electronic Medical Record (EMR)

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Objectives

The audience will:

- Become familiar with the current research and articles on the quality of documentation in the EMR
- Define quality using the acronym CARAT
- State at least two implications of copying and pasting within the EMR in relation to quality, based on the current research
- State at least two unintended consequences of introducing Healthcare Information Technology
- State rationale for long term evaluations
Methods

- “Electronic Medical Records,” “accuracy,” “quality” and “usability”
- All studies were excluded if the EMR was not the sole source of documentation.
Results

- 18 Research articles
  (7 Qualitative studies from the VA)
- 3 literature reviews
- 6 scholarly articles
Quality

Quality was defined as data that is (CARAT):

- Complete
- Accurate (true state of the patient)
- Relevant (meeting end’s users needs)
- Accessible (easy to obtain information for intended purposes)
- Timely (current)

Definitions

Electronic Medical Record (EMR):
- Electronic
- Paper chart similarities
- Retrospective, concurrent and prospective data
- Accessed by multiple users
- During delivery of health care
Electronic Progress Notes

- The electronic progress notes contain unstructured text or structured text
- Payne & Graham’s Life Cycle of Electronic Progress Notes Model

Walsh, 2004; Payne & Graham, 2006
Complete?

Documentation practices equally incomplete for pediatricians and internists for smoking (38% vs. 20%) and allergies (62% vs. 50%)
Complete?

*Free text entries* (59-64%) were *less complete* than *prompted selections* (85-92%)
Accurate?

Nurses’ charting would be *limited and less accurate* if they relied too much on templates or point and click selections.
Accurate?

- Five studies examined the proliferation of copying and pasting behavior within VA facilities.
Figure 1. Marked-up progress note showing copied text (and rated "Human, clinically misleading, major risk").
Risk Ratings

- Artifact or Human
- Degree of deception

Hammond et al, 2003
Coded Risk rating

- 1 (Artifact, not misleading, no risk)
- 2 (Artifact, minimally misleading, min. risk)
- 3 (Human, not misleading, no risk)
- 4 (Human, minimally misleading, min. risk)
- 5 (Human, misleading, some risk)
- 6 (Human, clinically misleading, major risk)
Results

- Notes containing copied text: 9%
- Case prevalence of type 5: ~ 31%
- Case prevalence of type 6: 10%
- Highest risk copy event category: exams (physical & mental) = 31
- Risk distribution for billed visits- 16% no risk,
- Low rate of type 6 (highest risk) – 1 in 720 notes *
Who?

Copy by exam and method

Exam Type

Frequency

PE
ME
Pod

12% 4% 9.70% 1.10%

Copied at least 1 exam
Copied someone else's note

Thielke, Hammond & Helbig, 2007
Who?

Exam Copying by Role

- Students: Exam copying 6.40%, Copying of others 0.30%
- Interns: Exam copying 8.20%, Copying of others 0.70%
- Residents: Exam copying 3.30%, Copying of others 3.30%
- Attending: Exam copying 1.30%, Copying of others 0.40%

Thielke, Hammond & Helbig, 2007
Percentage of Copying of Exams by Setting

<table>
<thead>
<tr>
<th>Setting</th>
<th>All Copied Exams</th>
<th>Exams Copied from Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>In patient</td>
<td>16.00%</td>
<td>61.00%</td>
</tr>
<tr>
<td>Out patient</td>
<td>84.00%</td>
<td>39.00%</td>
</tr>
</tbody>
</table>

Thielke, Hammond & Helbig, 2007
Accurate?

The clinicians had a decreased confidence or trust in the ability of the notes to reflect the patient’s current condition thus “cut and pasted” labs, procedures and x-ray reports into notes.
Complete, Accurate, & Timely?

Copying errors by role:
Physicians
Nurses
Medical students
Complete, Accurate, & Timely? Non-copying errors

Documentation errors per note: 1.3

Sources of the errors:

- Incomplete text (61%)
- Incomplete templates (22%)
- Incorrect signature identifications (53%) and
- Outdated embedded objects such as vital signs (mean 29.5 days old)

Temporal arrangements of notes

Weir et al, 2003
Relevant? Accessible?

- Identified a decreased comprehension of the chart due to increased clutter
- Medical students education

Embi, Yackel, Logan, Bowen, Cooney & Gorman, 2004
Legalities

According to the American Health Information Management Association (2005),

- EMR is admissible evidence in a court of law;
- Author of copied note should be credited.
NO WAY! I'M NOT GONNA BE YOUR ACCOMPLICE IN A FELONY!
Summary

An inflexible and incompatible interface decreases the accuracy and completeness of documentation.

Concern for the integrity of the Electronic health record since copying/pasting behavior results in:

- **Complete** (over completeness)
- **Accurate**: Proliferation of misinformation
- **Relevant/Accessible**: Wealth of irrelevant, fragmented and inaccessible data (Poor readability)
- **Timely**: Outdated embedded text, date signed?
Copy and Pasting disabled?

- What if the copying and pasting functionality were disabled?
- Some IT report that the copying/pasting feature should be disabled.
- Two studies implied that many physicians do not want to lose this feature.

Johnson, Ravich & Cowan, 2004; Rosenbloom et al, 2007
In a study by Bormark and Lenert (2006) demonstrated a substantial amount of redundancy and overlap between the physicians and nurses’ progress notes.
Mismatch between technology & work flow

- 7 studies and 2 papers examine the unintended consequences of the introduction of IT into healthcare
Interactive Social-technical Analysis Model
(Harrison, Koppel, Bar-Lev, 2007)
Sequential processing vs. multi-tasking clinical work

- IT designed for one person working alone at one task at a time not group multi-tasking, if work flow does not adapt to new technology then new cognitive and communication errors occur
Cognitive

• Workload is the perceived amount of tasks to be completed in a specified amount of time within a particular environment. The natural tendency in humans is to decrease the workload to a perceived acceptable level.
Cognitive factors

5 themes identified

- Expressivity (94%)
- Accessibility (88%)
- Documentation technical quality (75%)
- Time efficiency (63%)
- Patient care quality (31%)

Rosenbloom et al, 2007
Unintended Consequences

- More work / new work for clinicians
- Unfavorable work flow issues
- Continuous system changes & upgrades
- New types of errors
Unintended Consequences

- Most frequent mini-case (15) was poor usability interface problems

Patterson, Cook & Render, 2002
Work arounds and poor interface

- According to Rose et al. (2005), when work arounds increase, it is a clue that there is a mismatch between the user and the computer technology.
Unintended consequences

“Errors in process of entering and retrieving information” (p.106)

- Too much over completeness & lack of cohesiveness
- Poor user interface design
- Too much structure decreases cognitive focus of clinician
- Too much fragmentation

Ash, Berg & Coiera, 2004
Unintended Consequences

- Paper persistence
- mistrust
- Poor work flow match?
Mismatch summary

The interaction of HIT with the Social system will:

- increase the work load (unavoidable)
- Change workflow unfavorably *
- Create new types of errors*
- Cognitive overload *

Work arounds are clues to mismatched or poorly designed interfaces which create:

- Paper persistence and mistrust
Usability heuristics

Must apply Nielsen’s usability heuristics:
Heuristic 2: Matching system to real world;
Heuristic 3: User control and freedom;
Heuristic 5: Error prevention;
Heuristic 6: Minimize memory load;
Heuristic 7: Flexibility and efficiency of user;
Heuristic 8: Aesthetic and minimalist design
Redesign

Results:
- “Navigation and system context” (H7)
- Screen presentation (H5)
- Customizations (H3)
- Ergonomics (H8)
- Training
Dear Ms. Oetest,

I have just received your test results and I would like to share them with you.
I have just received your test results and I would like to review them with you.

The Pap smear performed on 02/17/2004 detected a mild abnormality that should be further evaluated by a gynecologist. Please call your gynecologist to make an appointment as soon as possible. If you do not have a regular gynecologist, please make an appointment with me so that we can discuss further follow-up.
Redesign (H3)

- Users increased from 923 to 1,182 by 3rd year
- Yet some users wanted templates that better matched work flow, the ability to copy and edit a previous note and flat touch screens.
Limitations of studies

- Majority of studies had a small number of participants, chart reviews or unique characteristics such as VA facilities.
- Convenience samples or not representative of all types of health care workers.
- Inter-rater reliability (if used) not calculated.
- Specificity & sensitivity of software programs not assessed.
Conclusion

- More attention needs to be focused on customization to the health care workers’ work flow environment and user interface design.
- Must apply usability heuristics
- Improve trust and satisfaction
Vicious loop

Long term post implementation evaluations & Interface redesign

Inflexible system, not matched to work flow

Attempt to decrease work load and cognitive over load by behaviors*

Decrease quality (decreased completeness, accurateness, relevancy, accessibility & timeliness)

Increase Cognitive overload
Questions??