The Role of Copying and Pasting in Electronic Clinical Documentation

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Abstract

Clinical documentation by physicians and nurses has struggled to evolve with advancing technology and societal requirements. Originally designed as a physician's personal notes for a patient, the modern medical record functions as a patient record, communication tool between providers, and instrument for financial reimbursement. Technology has played a pivotal part in advancing the role of the medical record. Advantages and disadvantages inherent in the introduction of each new technology have prompted much debate, but none more than the introduction of electronic documentation systems within electronic medical records. Electronic systems provide clear advantages of information exchange as well as decision and diagnostic support. They have also proven quite controversial, particularly in the initial implementation stages. One aspect of electronic documentation, electronic copying and pasting, provides a tool for the clinician that is not clearly beneficial or detrimental, with proponents on each side. In this paper we explore the social, economic, and legal issues surrounding electronic copying and pasting in clinical documentation, review the literature on this subject, and propose a model for future research in this topic to help shape how clinicians use and process patient information from multiple sources.

Introduction

Every time you visit the doctor, he or she creates a note documenting the visit. This note includes the reason for the visit, pertinent history, a physical exam, a diagnosis, and a treatment plan. The collection of these notes makes up your medical record.

The medical record was originally used in the 19th century as a tool for physicians to keep personal notes on a patient for follow-up visits[1]. These handwritten notes served as individual reminders of patient details. The medical record of today has evolved in an effort to meet new and complex demands of modern healthcare, barely resembling its original form.

Modern medical records serve many purposes. They continue to be an ongoing history of a patient through sickness and health and serve as a method for physicians to remember the details of a patient's life. The medical record also provides communication between multiple medical providers – primary care doctors and subspecialists, or outpatient and inpatient doctors – as care for more complex patients is often shared by multiple clinicians[1, 2]. Additionally, Medicare, the largest insurance carrier in the United States, released guidelines for physician reimbursement based, in part, on what physicians document in the medical record for particular visits.

New demands have also been placed on modern physicians affecting documentation. Several federally mandated safety measures require physicians to track specific types of information. One example is medication reconciliation, the tracking of medications taken before and during a hospitalization to ensure that all

medications are accounted for at the time of discharge. Medication reconciliation became a requirement for all hospitals by the Joint Commission starting in January 2006 after studies showed patient confusion, on discharge, as to which medications they should take, especially if medication doses were changed in the hospital or new medications were added[3]. Such confusion frequently led to error and injury due to drug over- or under-dosing. In addition, medication errors due to illegible handwriting or difficult abbreviations have resulted in mandates regarding specific abbreviations and recommendations for use of electronic prescribing – sending a typed prescription by fax or computer directly from to a pharmacy[4]. Physician time has also become a priority as reimbursement levels drop, requiring doctors to see more patients in a day to maintain their income. In an effort to not reduce the time spent with patients, physicians have tried to find ways to speed up their documention.

Several efforts have been taken to advance medical records in response to the above challenges. Handwritten paper records are the standard for which modern medical records are measured. Handwritten records take some time to write, are not easily transferrable to another provider, can be difficult to read, and require large storage areas in each clinic/hospital to store the paper[2]. They are, however, easy to create and require very little training to use.

To address potential handwriting and time-management issues of handwritten records, many physicians began dictating their notes. This process involves speaking into a phone or recording device that is then typed by a transcriptionist and placed in the chart. Typically faster than writing notes, this

process presents a few unique issues. Physician accents or background noise can mask what was being said resulting in incomplete or inaccurate transcribed notes. Additionally, the physician has limited control over the formatting of the text on the page, which can result in problems discerning the importance of different information.

With the invention of microprocessors in the 1970s and the subsequent rise of person computers and the internet, electronic medical records are felt to be the next step in documentation efforts and have been promoted heavily as a method for increased communication and decreased medical error[5, 6, 7, 8]. Computerized records allow for easy entry and retrieval of information from any computer within a network. Typed notes alleviate handwriting issues and allow users to format information as they would write it by hand. Integrated electronic systems also allow for increased standards-based care and use of decision support modules -- programs that can provide assistance to clinicians as they are writing their notes and orders. An example of this might be checking a prescription order against a patient's medications to ensure medications are not ordered that are known to cause adverse effects. Integrated systems can also speed up documentation by providing key laboratory, medication, and vital sign data directly to the note while it is being written. Computerized notes are not without their problems. Surveys of physicians using electronic records reveal concerns about safety, usability, and reliability of the information in notes[15]. The completeness of information on computer systems may be questioned, especially if the computer is not the initial data entry point, or multiple disparate computer systems are set up. Nurses taking

vital signs might quickly jot down the information on a scrap of paper and then forget to add it to the computer. Hospital admission notes from one facility may also not be available at another institution. Computer systems require large, initial financial investments in equipment and training on the various programs. They also require good typing skills from clinicians to keep documentation times closer to those of handwriting or dictating.

One aspect of computerized documentation that provides both benefits and potential problems is electronic copying and pasting (EC&P). In this paper we will explore the issues surrounding EC&P, critically examine the available research, and recommend steps to further study this controversial topic.

History of Copying and Pasting

Copying and pasting derives from a practice in manuscript editing in which editors would use special editing scissors to physically cut text from one paper to another[10]. This practice continued into the 1960s, simplified by the advent of the copying machine. The transition of the concept to electronic form was the brain-child of 1973 by Larry Tesler while working at Xerox[9]. The computer interface now ubiquitous in modern operating systems started at Apple Computer, first with Lisa in 1981 then the Macintosh operating system in 1984. Apple was the first to map cutting, copying, and pasting actions to a modifier key plus the X, C, and V keys respectively allowing the user to perform these editing functions with one hand. In 1987 IBM released their Common User Interface (CUI) in which they suggested the commands for cut, copy, and paste be shift+delete, control+insert, and shift+insert respectively[11]. These key combinations were seen in DOS and OS/2 applications, however were largely overshadowed when Microsoft adopted commands consistent with the Apple standard for the Windows operating system.

The idea of copying and pasting in modern medical literature refers to several different concepts. In genetics, copying and pasting of genetic sequences is the basis of gene, replication, transposition, and amplification. In informatics, copying and pasting refers to the user-initiated task of transferring information from one electronic source to another -- typically text. This practice is often seen in clinical note writing.

Copying and Pasting in the Medical Field

Research into copying and pasting in medical documentation has paralleled the spread of electronic medical records (EMRs) especially as such systems grow to include computerized physician documentation (CPD). Copying information in clinical notes is not new to CPD[14]. The ease with which computers allow information to be transferred and the possibility of transferring information without first reading or processing it, however, has made copying and pasting a hot topic for the medical community in terms of ethics and quality.

There are many potential benefits to copying and pasting in CPD. It allows for information from potentially disparate sources to be collected. It reduces the time needed to compile and document a patient's history or current state[15]. It was also suggested, in early studies, to decrease errors created through transcription and provide a more complete documentation[16], although these benefits were not directly measured.

There are also many potential problems with electronic copying and pasting in CPD. Text that is pasted is not always reviewed and updated, introducing errors into the medical record[17, 23]. Medico-legally this potential for error raises questions as to the legitimacy of billing from notes that contain copied text. Pasting also generally creates longer and more similar notes which are harder for other clinicians to read[18, 19] and lead to distrust of identical information in a series of notes[20, 21, 19].

Definition of copying and pasting

For this paper we use the definition of copying and pasting that is generally accepted in the medical literature. Copying and pasting in CPD is a user-initiated task of selecting and transferring information, typically text, from one source to another. This task can be completed though the use of functions available from the computer operating system or though some built in mechanism in the EMR. Integrated computerized systems often allow for direct insertion of patient identifiers (e.g. name, medical record number, room number), vital signs, and lab results (as well as the current medication list for a patient in some EMRs that build these lists automatically from the current orders). Although this integration is conceptually copying data from one source to another it is not generally included in the definition of EC&P as this information is considered system data related to the current state of the patient[22].

Researching Copy and Paste

Research into copying and pasting in medical records is relatively new[25]. Although there is some standardization of terminology, the process of copying text from one area and pasting it to another goes by several names, including is also called "cloning", "copy forward", or "carrying forward" in different contexts[20, 24]. The terms "copy forward" and "carrying forward" most commonly refer to copying and pasting of information from the most recent note on a patient, typically in an outpatient system. The other terms appear to refer more generally to duplicating information from a previously written source.

To best assess the true scope of the field, an iterative search strategy was employed to help find articles in a variety of sources. Searching PubMed with the terms "copy" and "paste" was used as an initial strategy to cast a wide net with expectations of many false positive hits. The search yielded 49 articles – only 7 of which were related to copying and pasting in medical records with 40 studies of genetics, 1 study of cyber-plagiarism, and 1 duplicate article that was published in two settings. The number of articles returned seemed quite reasonable for manual sorting without additional limits or specifications of medical records or documentation. Noting that a keyword search for 'paste' would miss the term 'pasting', the search was repeated using the keywords 'copying' and 'pasting' which returned 5 articles, 2 of which were studies of EC&P in medical records that were not in the initial search results. Further keyword searches using alternate terminology including "carry forward", "copy forward", "clone", and "cloning" did not find additional studies, however 'clone' and 'cloning' had to be paired with 'medical record' to narrow the search results.

Feeling that the hierarchical structure of OVID MeSH terminology might produce a more relevant yield, the previous keyword terms were used in conjunction with the MeSH term "Medical Records Systems, Computerized". This search returned 6 documents, one of which was a previously undiscovered study, as well as a set of proposed policy toolkit for vendors and institutions to control copying and pasting.

The summative return of the above searches included 5 studies of EC&P, 3 of which analyzed electronic note data and two which surveyed EMR users about the

benefits and risks of CPD. The citations of each study were reviewed for new articles on EC&P. In addition, a citation index search using Google Scholar was performed. No additional studies of EC&P were found from these searches.

Studies in Copying and Pasting

One of the first, fully functional, and large scale electronic record systems in the US was the 'comprehensive electronic medical record system' at the Veteran's Administration (VA) known as CPRS. This system provided users an interface that allowed for unstructured text entry as well as the opportunity to create and share templates that could include set text or pull current information such as medications or vitals from the hospital information systems. The three major studies of copying and pasting in electronic records were performed at VA hospitals and are summarized below:

Direct Text Entry in Electronic Progress Notes[25]

An early study of note entry in CPRS was conducted by Charlene Weir and others to examine input errors that might disrupt information flow in the inpatient clinical setting. Reviewing just over 2000 notes from 60 unique patient admissions to the VA in Salt Lake City, the evaluation team discovered two types of error in the note – copying errors and non-copying errors. Copying was found in approximately 20% of all notes with users mostly copying their own previous notes and making changes to them. Ranking copied notes compared to previous notes as "No change", "Small Change", and "Large Change" the group found more errors when a user

copied his or her own note with a reduction in error relative to the amount of changes made after copying. Direct copying of a user's prior note without changes led to over 3 identifiable errors per note with the average note containing identifiable copying containing 1.01 errors. Error identification in this study was performed through rater consensus of chart review. Most identifiable errors from copying were temporally related, such as copying phrases like "performed yesterday". Non-copying errors identified in this study included errors arising from writing notes on the wrong patient, incomplete template use which resulted in notes with blanks in the text, outdated information imported from information systems (such as vitals from a prior admission), or problems with electronic signatures. Although these errors were not created through user initiated EC&P mechanisms, the ability to differentiate theses errors from copy and paste errors is vitally important.

Are Electronic Medical Records Trustworthy?[12]

Overlapping the research from the Weir et al. study, Kenric Hammond and others at the VA in Seattle looked specifically at errors generated by copying and pasting in 29,386 notes over a twelve year period (1990-2002). In this study a computer program identified 'copyevents' as 40 or more identical, consecutive words between two notes. The events were then coded, by manual review, as either artifact (computer) or human generated along with the level of risk (no risk, minimal risk, some risk, major risk). Artifact events were text entries from templates or other system entered data. Ultimately, however, given the number of

copyevents found, only 6322 copy events for 243 patients were evaluated, approximately 1.6% of a one month sampling cohort. The decision to not review all the copy events was two-fold: 1.) they did not have sufficient expert review resources to analyze all of the events, and the purpose of the study was for quality improvement for which their focus was on identifying a few patterns of behavior for improvement initiatives. These notes were regarded as a representative sample of notes over the time period. Of the 29,386 notes analyzed, 9% (2645) contained copied text of 40 consecutive words or more. Of those events, 1.2% were human created and judged as 'some' or 'major' risk (high risk), with 36.6% of patients having one of these high risk copyevents in their chart. The authors further analyzed the 44 notes with high risk copyevents to see what type of information was most commonly copied and found that 70% had copied physical exams, 20% copied history of present illness, 18% copied past medical history, and 11% copied assessment.

The authors recognized the discrepancy between their study and the Weir study and proposed that their 9% prevalence of copy events was due to inclusion of both inpatient and outpatient notes where the Weir study, which found 20% prevalence of copying and pasting, only looked at inpatient notes. No analysis, however, was reported in this study to differentiate the hospitalization status of the patient at the time of each note. Also interesting in this study, the authors eliminated inpatient discharge summaries as they felt that copying and pasting was justified in this context.

Copying and pasting of examinations within the electronic medical record[13]

As a follow up to the previous study Stephen Thiekle, Kenric Hammond, and Susan Helbig looked at a larger set of notes from the CPRS system, focusing mainly on the problem of copying and pasting in the physical exam. Because this portion of the note is a reflection of the individual doctor's assessment of the patient's state, copying of this section was felt to be at high risk for error in the prior study. Using the same criteria for identifying a copyevent (40 consecutive words) the authors of this study created an algorithm that identified copied exams (positive predictive value 81%, negative predictive value 99.9%) in a subset of notes that, on manual review, identified all copyevents that included at least 50% of the exam. Using that algorithm they processed 167,076 notes and found that approximately 37000 contained a physical exam with 1112 of these exams identified as copied (3% of all exams). The authors also noted that 1.6% of all exams were either copied from another author or were copied from a note > 3 months old. Podiatry notes included the most copied exams (26-41.9% of notes depending on author status) followed by Neurology notes (15.3%). 8.3-1.3% of inpatient internal medicine notes contained a copied exam with a generally decreasing trend by PGY year (8.3% of intern notes, 3.3% of resident notes, and 1.3% of attending notes). Less than 3% of outpatient primary care notes contained a copied exam. Overall, however, outpatient notes were more likely to contain a copied exam than inpatient notes (84% to 16% respectively).

Analysis of these studies

The three studies that evaluate notes for EC&P behaviors are clearly early explorations into the field. Their results show a high incidence of EC&P and show an alarming rate of error from this practice. As studies into quality and reliability of the electronic record, these studies highlight several problems with EC&P in CPD. Their results must be interpreted in context, however. All three studies evaluate a single CPD system and some of the particular results may be system specific. In addition all three were retrospective studies of notes that created surrogate markers of copying and pasting events – either group consensus or 40+ identical consecutive words. As such they likely under-reported true copy and paste behavior, but could not identify text that was pasted and subsequently changed, which limits our understanding of the scope and potentially appropriate use of such tools.

Potential avenues of study

Each of the issues brought up previously regarding error and misrepresentation from EC&P stem from an inattention to the text that was inserted into the document, either before or after it was copied and pasted. Prior to CPD copying and pasting was performed by hand, and as such, required the user to read and write text into the new note, a process that facilitated mental processing.

Although there are some that believe that copying and pasting should be prohibited in electronic medical records[17] this 'solution' poses several other problems. Users are familiar with copying and pasting in other computer applications and expect this feature to be present. Surveys suggest that physicians

who transition to electronic documentation do not want to go back to handwritten notes even after acknowledging the problems computerized systems pose[22]. Additionally, to provide the same capability as one would have without the computerized system, the EMR or CPD would need to be able to display the current note and prior notes together to allow the user to read and type simultaneously, a feature that is not present in most EMRs and which would require large computer screens to allow for sufficient text size to maintain readability.

A better solution would be to investigate methods to promote cognitive processing of the pasted text. This type of intervention study has not been attempted in the current literature and would represent the next step in understanding EC&P. Such an intervention would likely involve some decision support intervention after pasting the text that would encourage the user to read and or acknowledge the text prior to true insertion into the note.

As vendor EMR systems mature there appears to be a shift toward web front-ends, a process that could facilitate EC&P intervention studies, as the current major browsers support capture and manipulation of events required for copying and pasting actions. As such, the web interfaces could be designed to capture copy and paste actions by the user to map these actions and potentially trigger some intervention. Internet Explorer (IE), Safari, and Mozilla's Firefox (starting with version 3.0) can capture user initiated copying through the 'oncopy' function[26, 27] and pasting through the 'onpaste' function[28, 29]. To completely capture all such events, the 'oncut' function[30, 31], which is triggered when a user destructively copies text or an object, would need to be monitored with the 'oncopy' events. The 'ondrag'

function (built in IE but manageable in other browsers)[32] would also need to be monitored as modern browsers allow for a user to highlight text and then use the mouse to move that text to a new position, typically a textbox or textarea. This action mimics the 'oncopy' and 'onpaste' events. The cut and copy event capture can provide information about where the text is copied from. The paste event capture not only provides the destination information but also can allow a monitoring function to capture the text that was pasted.

Study design

The majority of the issues created through EC&P stem from decreased user vigilance in ensuring that text copied into a new document is accurate and meaningful. Studies to date have been surveys of user opinion about drawbacks and benefits of EC&P or retrospective analyses of completed notes. No study to date has measured the true incidence of EC&P or been able to monitor pasted text that is subsequently altered. In addition, no study has tried to intervene at the time text is pasted with a decision support tool in an attempt to influence EC&P behavior and potentially reduce documentation error.

Using the above structure to capture copy and paste events in a web front-end of a CPD system, I propose to 1.) accurately measure the incidence of EC&P, 2.) analyze differences in text that is and is not altered after pasting, and 3.) attempt to manipulate user EC&P behavior with the goal of increased user vigilance and decreased error. The number of EC&P events per note has not been reported in any studies but is likely low with the exception of discharge summaries. Because of the

low likely incidence per note, a more intrusive decision support tool may be tolerated if triggered after a user attempts to paste into a document. An example includes not allowing the user to continue writing the note until the pasted text is acknowledged in some way. I believe, however, that minimal necessary interventions are both better tolerated and more scientifically prudent. I propose tagging the pasted text in such a way that the author of the note can differentiate between unaltered, pasted text and text that is unique to the current note (i.e. user typed). A panel of 5 physicians charged with the task of finding a user interface convention that would be sufficient to indicate possible needed action of unaltered, pasted text with minimal interference to user attention and workflow, came to a consensus agreement of a light yellow background (hex color #ffffaa) on the at-risk text with some indication that this text was pasted and not altered (see figure 1 for an mock-up of this).

Using this convention, a three-phase trial could be conducted with each user acting as his or her own controls through the phases. Phase one would involve baseline data capture of EC&P events without any change in display. The second phase of the study would add the yellow background intervention with the same data capture. The third phase would remove the yellow background restoring the original interface as a temporal comparison to the original baseline.

Data capture throughout the study would include the source note where the text was copied, the destination note and note section, if possible, and the pasted text itself. In addition, by comparing of the final note with the segments of text that were pasted, text that was pasted and subsequently altered could be identified and

studied. One well-established approach to isolate this type of text utilizes a 'diff function' that compares two strings and returns their difference. In this way, analysis of pasted and altered text as well as pasted and altered text could be performed.

If the minimal intervention is sufficient to trigger increased user vigilance, we would expect to see either decreased EC&P events or increased alteration of pasted text in the intervention phase of the trial as compared with the other two phases. The initial phase and the final phase of the trial should have similar EC&P events as well as similar subsequent alterations of pasted text.

Summary

EC&P in EMR systems with CPD saves time for physicians in documenting patient encounters but creates potentially dangerous problems. These problems arise through the introduction of errors into the record due to poor user vigilance surrounding pasted text from outside sources. A thorough investigation of the current literature reveals editorials and studies that help to define the problems involved with EC&P but no studies to date that have attempted to intervene to reduce these problems. Using currently available technology, we proposed a framework by which such an intervention study could take place including methods for tracking EC&P events. Such a study would be the logical next step in researching methods to improve quality and safety in medical documentation.

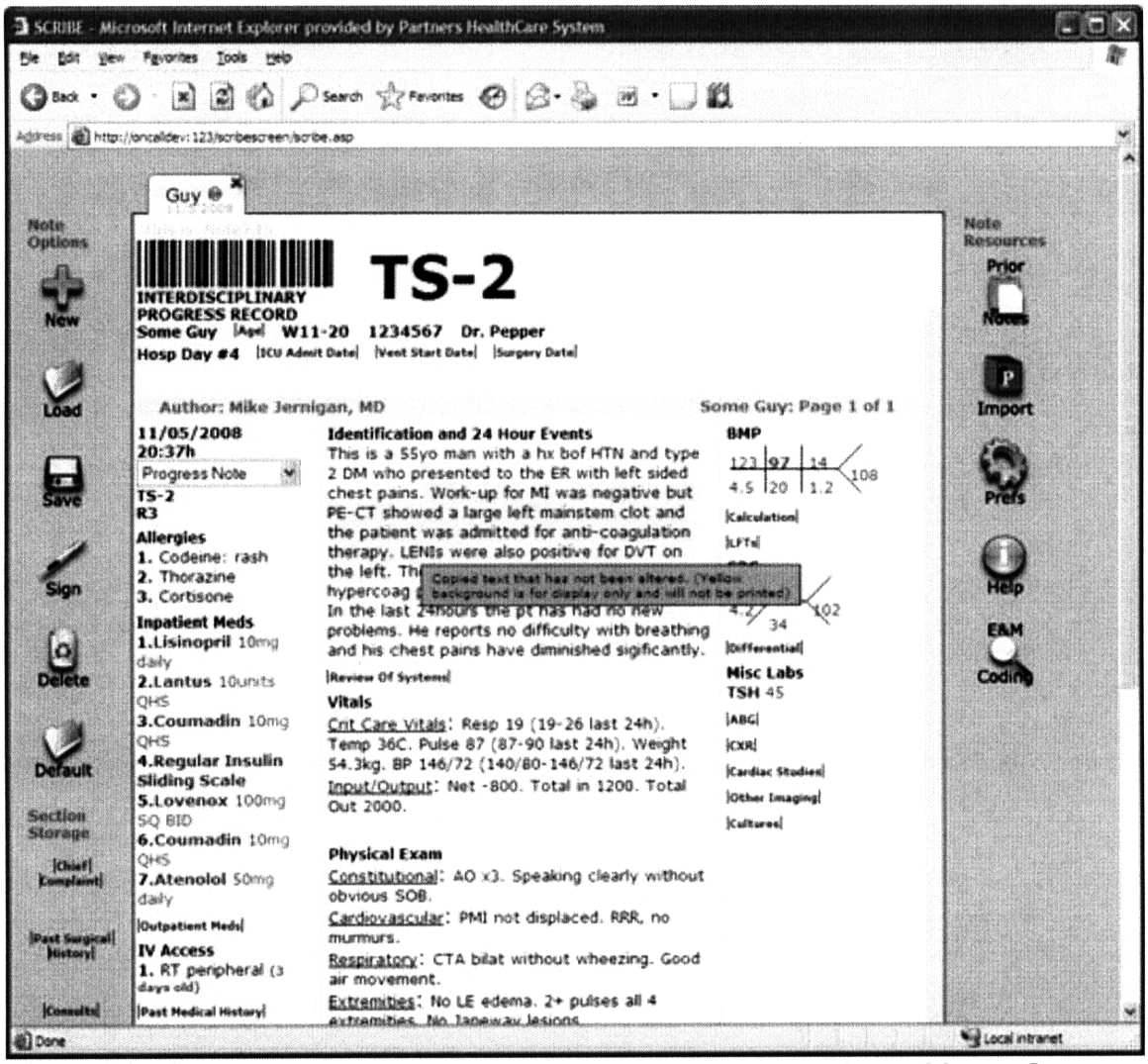

Figure 1: Mock-up of potential interface change to alert user of possible conflicts in unaltered, pasted text.

References

1. Shortliffe E. H. The evolution of electronic medical records. Academic medicine : Journal of the Association of American Medical Colleges. 1999;74:414-419.

2. Ginneken A. M.. The computerized patient record: balancing effort and benefit. International journal of medical informatics. 2002;65:97-119.

3. Sentinel Event Alert - Issue 35. Joint Commission. http://www.jointcommission.org/sentinelevents/sentineleventalert/sea_35.htm. Modified February 9, 2006. Accessed January 30, 2009.

4. Sentinel Event Alert – Issue 23. Joint Commission. http://www.jointcommission.org/SentinelEvents/SentinelEventAlert/sea_23.htm. Modified September 1, 2001. Accessed January 30, 2009.

5. Institute of Medicine. Crossing the quality chasm: a new health system for the 21st century. Washington, DC: National Academy Press. 2001.

6. Bates D. W., Ebell M., Gotlieb E., Zapp J., Mullins H. C.. A proposal for electronic medical records in U.S. primary care. Journal of the American Medical Informatics Association : JAMIA. 2003;10:1-10.

7. Bates D. W.. Using information technology to reduce rates of medication errors in hospitals. BMJ (Clinical research ed.). 2000;320:788-791.

8. Chaudhry B., Wang J., Wu S., et al. Systematic review: impact of health information technology on quality, efficiency, and costs of medical care. Ann Intern Med. 2006;144:742-752.

9. Tesler, L. Larry Tesler's resume. http://www.nomodes.com/tesler-resume.htm. Updated November 26, 2008. Accessed January 8, 2009.

10. Cut, copy, and paste. Wikipedia. http://en.wikipedia.org/wiki/Cut,_copy_and_paste. Modified January 3, 2009. Accessed January 8, 2009.

11. IBM Common User Access. Wikipedia. http://en.wikipedia.org/wiki/Common_User_Access. Modified January 12, 2009. Accessed January 18, 2009.

12. Hammond K. W., Helbig S. T., Benson C. C., Brathwaite-Sketoe B. M.. Are electronic medical records trustworthy? Observations on copying, pasting and duplication. AMIA Annu Symp Proc. 2003:269-273.

13. Thielke Stephen, Hammond Kenric, Helbig Susan. Copying and pasting of examinations within the electronic medical record International Journal of Medical Informatics. 2007;76:S122-S128.

14. Yackel T. R., Embi P. J.. Copy-and-paste-and-paste. JAMA : the journal of the American Medical Association. 2006;296.

15. Weir C. R., Nebeker J. R.. Critical issues in an electronic documentation system. AMIA ... Annual Symposium proceedings / AMIA Symposium. AMIA Symposium. 2007:786-790.

16. Gibby G. L., Lemeer G., Jackson K.. Use of data from a hospital online medical records system by physicians during preanesthetic evaluation. Journal of clinical monitoring. 1996;12:405-408.

17. AHIMA. "Auditing Copy and Paste" Journal of AHIMA 80, no.1: 26-29. Updated January 2009. Accessed January 20, 2009.

18. Hartzband Pamela, Groopman Jerome. Off the Record - Avoiding the Pitfalls of Going Electronic N Engl J Med. 2008;358:1656-1658.

19. Hirschtick R. E.. A piece of my mind. Copy-and-paste. Journal of the American Medical Association. 2006;296:2315.

20. Dimick C. Documentation bad habits. Shortcuts in electronic records pose risk. Journal of AHIMA / American Health Information Management Association. 2008;79.

21. Embi P. J., Yackel T. R., Logan J. R., Bowen J. L., Cooney T. G., Gorman P. N.. Impacts of computerized physician documentation in a teaching hospital: perceptions of faculty and resident physicians. J Am Med Inform Assoc. 2004;11:300-309.

22. O'donnell Heather, Kaushal Rainu, Barrón Yolanda, Callahan Mark, Adelman Ronald, Siegler Eugenia. Physicians' Attitudes Towards Copy and Pasting in Electronic Note Writing Journal of General Internal Medicine. 2008;24:63-68.

23. Kossman S. P., Scheidenhelm S. L.. Nurses' perceptions of the impact of electronic health records on work and patient outcomes. Computers, informatics, nursing : CIN. 2008;26:69-77.

24. Payne T. H., Perkins M., Kalus R., Reilly D.. The transition to electronic documentation on a teaching hospital medical service. AMIA ... Annual Symposium proceedings / AMIA Symposium. AMIA Symposium. 2006:629-633.

25. Weir C. R., Hurdle J. F., Felgar M. A., Hoffman J. M., Roth B., Nebeker J. R.. Direct text entry in electronic progress notes. An evaluation of input errors. Methods Inf Med. 2003;42:61-67.

26. Oncopy Event. Microsoft Developer Network. http://msdn.microsoft.com/en-us/library/ms536916(VS.85).aspx. Accessed January 15, 2009.

27. Element.copy. Mozilla Development Center. https://developer.mozilla.org/en/DOM/element.oncopy. Updated March 15, 2008. Accessed Jan 15, 2009.

28. Oncut Event. Microsoft Developer Network. http://msdn.microsoft.com/en-us/library/ms536917(VS.85).aspx. Accessed January 15, 2009.

29. Element.cut. Mozilla Development Center. https://developer.mozilla.org/en/DOM/element.oncut. Updated March 15, 2008. Accessed January 15, 2009.

30. Onpaste Event. Microsoft Developer Network. http://msdn.microsoft.com/en-us/library/ms536955(VS.85).aspx. Accessed January 15, 2009.

31. Element.paste. Mozilla Development Center. https://developer.mozilla.org/en/DOM/element.onpaste. Updated March 15, 2008. Accessed Jan 15, 2009.

32. Ondrag Event. Microsoft Developer Network. http://msdn.microsoft.com/en-us/library/ms536923(VS.85).aspx. Accessed January 30, 2009.