

Safe Practices for Copy and Paste in the EHR

Systematic Review, Recommendations, and Novel Model for Health IT Collaboration

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Keywords

Copy and paste, electronic health records, information technology, health policy, patient safety, clinical documentation

Summary

Background: Copy and paste functionality can support efficiency during clinical documentation, but may promote inaccurate documentation with risks for patient safety. The Partnership for Health IT Patient Safety was formed to gather data, conduct analysis, educate, and disseminate safe practices for safer care using health information technology (IT).

Objective: To characterize copy and paste events in clinical care, identify safety risks, describe existing evidence, and develop implementable practice recommendations for safe reuse of information via copy and paste.

Methods: The Partnership 1) reviewed 12 reported safety events, 2) solicited expert input, and 3) performed a systematic literature review (2010 to January 2015) to identify publications addressing frequency, perceptions/attitudes, patient safety risks, existing guidance, and potential interventions and mitigation practices.

Results: The literature review identified 51 publications that were included. Overall, 66% to 90% of clinicians routinely use copy and paste. One study of diagnostic errors found that copy and paste led to 2.6% of errors in which a missed diagnosis required patients to seek additional unplanned care. Copy and paste can promote note bloat, internal inconsistencies, error propagation, and documentation in the wrong patient chart. Existing guidance identified specific responsibilities for authors, organizations, and electronic health record (EHR) developers. Analysis of 12 reported copy and paste safety events was congruent with problems identified from the literature review.

Conclusion: Despite regular copy and paste use, evidence regarding direct risk to patient safety remains sparse, with significant study limitations. Drawing on existing evidence, the Partnership developed four safe practice recommendations: 1) Provide a mechanism to make copy and paste material easily identifiable; 2) Ensure the provenance of copy and paste material is readily available; 3) Ensure adequate staff training and education; 4) Ensure copy and paste practices are regularly monitored, measured, and assessed.

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1. Introduction

Many clinicians use the copy and paste functionality provided by operating systems in electronic health records (EHRs) to improve usability by allowing providers to insert text with test results or exam information, maintain stable medication lists, and improve documentation efficiency, particularly when systems lack interoperability. However, copy and paste may also promote longer, poorly organized, and less accurate notes due to inclusion of redundant, outdated, or inconsistent information [1]. In a large physician survey, 25% agreed that copy and paste makes progress notes more likely to lead to a mistake in patient care [1]. Subsequently, professional organizations including the American Health Information Management Association, the Association of Medical Directors of Information Systems, and the Federation of State Medical Boards have formally addressed aspects of copy and paste use in position/guidance statements [2, 3]. Additionally, copy and paste may enable reimbursement fraud, allowing users to easily attest to care they have not provided. Nevertheless, a recent report by the U.S. Office of the Inspector General found that only 24% of organizations had a copy and paste policy in place [4].

The Partnership for Health IT Patient Safety (The Partnership) was formed to gather data, conduct analysis, provide education, and disseminate recommended practices with the goal of enabling safer care using health information technology (IT). The Partnership collectively decided to establish single-topic workgroups addressing particular patient safety issues; the first workgroup was established to address the practice of copy and paste. This workgroup was composed of a diverse group of stakeholders including vendors, providers, representatives from professional organizations, academicians, and safety experts. Although cognizant of the regulatory, legal, and compliance issues around reimbursement fraud, the workgroup intentionally focused on identifying clinical risks and possible interventions for safe copy and paste functionality to improve patient safety.

2. Objective

The workgroup was tasked with assessing the nature and scope of patient safety risks associated with copy and paste, identifying potential solutions, developing practice recommendations and implementation strategies to facilitate safe reuse of information via copy and paste. To inform the recommendation development process, submitted copy and paste events were analyzed. To ensure development of recommendations informed by up-to-date evidence, we also performed a systematic review of the literature addressing the following key questions:

1. What is the prevalence of copy and paste in the EHR?
2. How can copy and paste lead to adverse events?
3. What are the associations between copy and paste and adverse patient events?
4. What best practices or recommendations exist to address proper use of copy and paste?

3. Methods

3.1 Overview of The Partnership for Health IT Patient Safety workgroup process

The Partnership's multi-stakeholder workgroup convened in February 2015 and met monthly for six months. During this time the workgroup reviewed copy and paste events, discussed results from the systematic literature review, and solicited presentations from topic experts across different stakeholder groups. Based on these deliberations and drawing on the eight-part sociotechnical model [5], the workgroup developed recommendations and implementation strategies for the safe use of copy and paste.

The Partnership also collected data under the protection of a patient safety organization (ECRI Institute PSO). Data from adverse events and hazards were submitted by providers and provider organizations using the Agency for Healthcare Research and Quality (AHRQ) Common Formats and HIT Hazard Manager taxonomies. Events reported from 2013 to 2015 were de-identified and de-

scribed for analysis. Two experienced patient safety analysts from ECRI Institute Patient Safety Organization (PSO) performed this analysis. Although the ECRI Institute PSO also collects data from alerts, root-cause analyses, and help desk logs, no copy and paste events were reported through those sources.

3.2 Characterization of copy and paste functionality

For this work, the workgroup used the following definition of copy and paste: *Selecting data from an original or previous source to reproduce in another location; obtaining this data volitionally from another part of the record and reusing it without retyping any information. This action may be performed by keyboard command or mouse.* Other terms for copy and paste include copy functionality, cut and paste, cloning, whole note cloning, carry or copy forward, autofill, and autocomplete. These terms reflect differences in how information is obtained, reused or brought forward in a record. The workgroup did not address safe use of cut and paste functionality due to concerns about inadvertent removal of data from the EHR.

3.3 Literature Review

To identify existing evidence, we searched PubMed, MEDLINE, EMBASE, CINAHL, Journals@OVID, ScienceDirect, Scopus, PS Net, and the Agency for Healthcare Research and Quality Web Morbidity and Mortality for published studies and conference abstracts from January 2010 through January 2015 using a search strategy developed by a medical librarian (search strategy available in supplemental online material ► Appendix A). Bibliographies of identified studies were reviewed and relevant additional articles prior to the search dates were included. Gray literature was retrieved by searching the publications and websites of relevant vendors, professional organizations, private agencies, and government agencies. Study review and data extraction was performed by a single physician analyst. Studies primarily addressing use of copy and paste associated with reimbursement fraud were excluded. Otherwise, all studies which addressed a key question were included.

3.4 Workgroup deliberation and recommendation development

To ensure input from key stakeholders, the workgroup reviewed vendor alternatives to copy and paste, examples of practices that promoted safer use of copy and paste, and presentations from several professional organizations and subject matter experts. Workgroup members were then asked to prioritize a list of all potential identified solutions. Using the highest-ranked potential solutions, the workgroup drafted preliminary recommendations, which were ranked according to feasibility, importance, and impact. Recommendations were also categorized based on means of implementation (e.g., through regulation, technology, education, or policy and procedures) and effect on each stakeholder group (providers, provider organizations, vendors, professional organizations, and patients). To promote feasibility and completeness, each recommendation was assessed using Sittig and Singh's sociotechnical model [5].

4. Results

4.1 Systematic Literature Review

To inform the workgroup's deliberation, a comprehensive literature search was performed which identified 233 potentially relevant studies, articles, and reports. Of these, we included 51 articles addressing prevalence, patient safety outcomes, and guidance for copy and paste use. Detailed descriptions of all included articles can be found in supplementary online ► Appendices B and C. Below we summarize key findings from the literature.

4.1.1 Prevalence

Thirteen studies and two conference abstracts described the prevalence of copy and paste (▶ Table 1). In published studies, 66 to 90% of medical students, residents, and attending physicians reported using copy and paste for documentation, with one large physician survey reporting that 78% used copy and paste “almost always” or “most of the time” for inpatient documentation. Notably, one survey of 143 dermatology residents, found that 83% reported copying a prior author’s past medical history, social history, or family history without confirming the information’s accuracy.[6] Study definitions of copy and paste varied widely, and in some cases, were not provided (▶ Table 2).

Retrospective chart reviews identified highly variable rates of copy and paste use, depending on clinical context. For instance, Edwards et al. reviewed a random sample of 239 outpatient primary care, cardiology, and endocrinology notes and found that 10.8% contained copied material (although a definition of copy and paste was not provided) [7]. Conversely, another study of ICU notes (A/P section) found that 82% of resident and 74% of attending notes contained copied elements (defined as $\geq 20\%$ copied text from another document) [8].

Thielke et al. (2006) [9] evaluated how often mental status, podiatry and general physical exams appeared to be copied. After excluding text from discharge summaries, 25% of charts contained ≥ 1 copied exam and 11% contained >1 exam copied from another author. Notably, most copying (more than 80%) was performed by only a small fraction of authors (4.2%). Another small review of 60 randomly selected charts from admitted patients found that nearly 20% of all inpatient notes (372 of 1,891) contained copied material, and physicians were responsible for a substantial proportion of copied notes (50%) [10]. Most copying (nearly 90%) was found to include substantial edits; only 1.6% (6 of 372) of notes were copied forward without changes, and only 1 note (0.3%) was copied from another provider without modification.

4.1.2 Adverse Events

4.1.2.1 Clinical Harms

Our search identified two studies reporting a relationship between copy and paste use and clinical outcomes. An analysis of Veteran’s Health Administration (VA) medical records by Singh et al. (2013) found that copy and paste contributed to clinical diagnostic errors [11]. The study identified all cases in which a patient’s primary care visit was followed by unplanned further medical care within 14 days (e.g. return primary care, urgent care, emergency room visit, or unplanned hospital admission). Physician reviewers then considered each case to determine if a diagnostic error (e.g. adequate information suggesting the correct diagnosis was already available at initial visit) was responsible. Within 212,165 visits over a 1-year span at 2 large urban medical centers they detected 190 diagnostic errors (when adequate information or information which should have prompted a workup was available to make the correct diagnosis). In 7.4% of these errors, a practitioner had copied and pasted prior notes into the progress note; of these cases, copy and pasting mistakes contributed to 35.7% of errors (2.6% of total errors identified). No details regarding the nature of these copy and paste mistakes or resultant adverse patient outcomes were provided.

A second study by Turchin et al. found that copied lifestyle counseling statements were associated with *less* effective glucose control for diabetic patients. Compared to copied and pasted statements of lifestyle counseling, noncopied or “distinct” statements were associated with a significant improvement in HgbA1c among patients with diabetes: an increase of 1 monthly counseling episode was associated with a hazard ratio of 4.35 ($p < 0.001$) for reaching HgbA1c target. In contrast, copied/duplicate counseling or absent statements had no effect on glucose control [12].

We also identified several case reports of clinical harm related to copy and paste. In one case, a chemotherapy patient with a history of pulmonary embolus was admitted for diarrhea and dehydration. The admission note specified that the patient should receive heparin for venous thromboembolism prophylaxis, but heparin was never ordered. On transfer to another service, this statement was copied and pasted for five days, with authors presumably assuming standard venous thromboembolism prophylaxis with heparin was administered, although the accuracy of information in the admission note was never verified, and heparin was neither ordered nor administered.

Shortly after discharge, the patient developed a pulmonary embolus and required readmission [13–15].

In another case, a patient was discharged from the emergency room after a new diagnosis of atrial fibrillation and potential heart disease; he was instructed to follow up with his primary care physician (PCP) for a stress test [16]. However, the PCP failed to diagnose cardiac disease and copied and pasted the A/P over 12 office visits during the next 2 years. The patient died from a heart attack and the physician was found liable in the death [16]. In another case, an infant was seen for fever, rash, and fussiness. The initial EHR note documented no history of tuberculosis (TB) exposure, despite the infant's recent travel to a TB endemic country. Successive office visits propagated this erroneous negative exposure to TB using copy and paste for two weeks until the child was diagnosed with TB meningitis in the emergency room and left with significant residual deficits [17].

4.1.2.2 Other Harms

We also identified reports of chart inaccuracies propagated by copy and paste resulting in non-clinical harm [13, 14, 18, 19]. For instance, one physician began a conversation with the family of a comatose patient by mistakenly stating that the patient had recently undergone surgery, when in fact, the patient's description as postoperative day 2 had been copied daily in the progress notes for 5 and half weeks [20]. This mistake created mistrust between the family and physician which could not be repaired. Other cases resulted in problems with insurance coverage and delayed discharge [21, 22].

4.1.3 How does copy and paste lead to adverse patient events?

Review of existing guidance, reviews, and opinion pieces indicated four major ways in which copy and paste could compromise the quality of clinical information and impair good clinical care (► Table 3), namely:

1. Facilitating introduction of new inaccuracies,
2. Accelerating propagation of inaccurate information,
3. Promoting creation of internally inconsistent notes, and
4. Generating lengthy notes that may obscure important clinical information (“note bloat”).

4.1.4 Responsibilities for authors, organizations, and EHR developers

Existing guidance from a wide variety of professional organizations (summarized in supplementary online ► Appendix C) suggested specific responsibilities for authors, organizations, and suggestions for EHR developers. Authors are responsible for verifying the accuracy of all copied content *regardless of the source* [23, 24], and the *original source* of copied text should always be acknowledged, particularly if copying from another provider [18, 23, 25]. Also, authors should strive for brevity and avoid propagating irrelevant/redundant text that might obscure new or important information [23, 26]. Finally, in particular contexts, copy and pasting should never be allowed (e.g., a physician copying a medical student's exam [27]).

Organizations were urged to provide clarity for documentation standards (e.g., what information is permissible to copy) and specify consequences for violations [2, 25, 28]. Additionally, healthcare organizations were urged to provide ongoing education and feedback to medical personnel after these standards are established [2, 18, 23, 29].

Several suggestions for EHR modifications to potentially address these problems were identified (► Table 4). There was widespread consensus that EHRs should develop functionalities to allow easy identification of copied material, potentially through altering font color, highlighting copied text, or linking between different documents [18, 30, 31]. Other suggestions attempted to address “note bloat” due to copy and pasting [2, 3]. Several suggestions were aimed at improving display of data, including using toggles to decrease information overload [3], separating sections requiring frequent updates from more stable sections [32], and a “Wiki” design in which multiple authors could contribute [26]. Finally, several authors suggested standard incorporation of audit or tracking capability into EHR design to allow ongoing monitoring of copy and paste, and timely feedback to users regarding proper and improper use [18, 33].

4.1.5 Benefits of copy and paste

Many articles acknowledged important benefits of copy and paste when properly used [23, 30, 34]. Nearly 80% of physicians agreed that copy and paste has improved documentation of the entire hospital course, and 82% agreed that copy and paste use should continue [1]. In fact, forcing providers to retype information may lead to *more* errors [34]. Although copy and paste may promote note bloat, it may also promote more timely documentation. At one institution, residents kept extraneous test results within the patient's daily note to facilitate easy conversion into a discharge summary [35]. One study found that compared to dictated surgical discharge summaries, electronic summaries were completed significantly faster and were shorter in length [36]. Other potential benefits of copy and paste include higher continuity in medical decision-making, more complete documentation of clinical encounters, and systematized tracking of patient problem lists [23].

4.2 Exploration of Patient Safety Data

In addition to the literature review, the workgroup also considered 12 cases of events and hazards submitted to ECRI Institute Patient Safety Organization (PSO) between 2013 and 2015 (► Table 5). These events were organized first by the system involved as well as standardized tagging taxonomies (AHRQ, HM, Magrabi) [37–39]. Overall, these events were consistent with copy and paste use and associated problems described in the literature. No sentinel or serious events were reported; instead, events described instances in which copy and paste created potential hazards that *could* cause a diagnostic error if undetected. In one case, two separate pathology specimens received the same label because information was copied and pasted. Other events reported copying of lab and X-ray results into the wrong patient charts, and in another, pharmacy directions were copied to facilitate label printing, but were discovered to be inaccurate.

Taken together, cases illustrated that copy and paste errors

1. occur across a wide variety of clinical settings,
2. have the potential to cause patient harm and delay diagnosis, and
3. have associated risks that can be mitigated with improved detection.

Providers are only recently recognizing and reporting the contributing role of copy and paste in hazards and events.

4.3 Additional insights from key stakeholder experts

Input from key stakeholder experts generally concurred with the concerns expressed in the literature. There was widespread agreement about the importance of copy and paste for promoting EHR usability and documentation efficiency. However, experts agreed that information should *never* be copied in certain contexts, including signature lines, copying between different charts, and any information that has not been read and edited. Particular concerns not specifically addressed in detail in the literature are violations of HIPAA (Health Insurance Portability and Accountability Act), False Claims Act (due to inappropriate billing), and privacy issues. This was best demonstrated through a submitted safety event evaluated by the workgroup, where one patient noticed that another patient's information had been copy and pasted into the medical record and brought this to the attention of a health care provider (► Table 5).

4.4 Workgroup Deliberation

Utilizing input from the literature review, submitted events and hazards, input from various vendors, current organization practices, and topic experts, the Partnership workgroup identified key areas of focus for safe practice recommendations. Each of the potential recommendations was evaluated and prioritized using the sociotechnical model with a focus on patient safety.

4.5 Safe Practice Recommendations

Drawing on analysis of reported event data, results from the systematic literature review and input from a variety of stakeholders, the Partnership's workgroup arrived at the following conclusions and developed four safe practice recommendations for copy and paste which were released in February 2016 (► Table 6). Rationale and recommendations are presented below.

These recommendations are intended to support a provider's ability to easily assess whether information reused outside of its original context was correct, timely, and relevant. As these recommendations primarily focused on patient safety, organizations are encouraged to continue to evaluate the impact of implementation of specific approaches to the recommended safe practices on HIPAA compliance, billing practices, and regulatory implications.

Rationale for Recommendation A: To protect and enhance patient safety, clinical documentation (regardless of process of creation) must be accurate, reliable, and timely. Reusing information in the electronic environment through copy and paste to document complex medical conditions can ensure completeness of encounter documentation and generally produces fewer transcription errors. However, information that is inaccurate, out of date, or from an inappropriate source (e.g., copied into the wrong chart) can compromise clinical decision-making. To ensure accuracy, reliability, and appropriateness, copied and pasted information must be verified before final submission. To achieve this goal, copied and pasted information should be readily visible and recognizable as copied material so that it can be reviewed, confirmed, and validated.

Recommendation A

Provide a mechanism to make copy and paste material easily identifiable.

Rationale for Recommendation B: Authors — in addition to being able to easily recognize when text has been copied to verify the accuracy of charted material — may also need to know the source, context, author, time, and date of the source information. Without this information, authors may have difficulty verifying the accuracy, applicability, reliability, and timeliness of documentation.

Recommendation B

Ensure that the provenance of copy and paste material is readily available.

Rationale for Recommendation C: Improper use of copy and paste information can jeopardize patient safety and may cause inaccurate, inappropriate, or outdated information to be used in clinical decision making. Outlining proper procedures for copying and pasting information can standardize the process to ensure staff is following appropriate and best practice guidelines, facilitate regulatory compliance, and ensure that the record will be useful in the event of litigation.

Recommendation C

Ensure adequate staff training and education regarding the appropriate and safe use of copy and paste.

Rationale for Recommendation D: Audit trails identify key activities necessary to detect improper or unsafe use of copy and paste. Implementation of an audit policy will allow organizations and providers to monitor how copy and paste is used to identify safety issues and offer physicians and staff alternative ways to reuse correct and current information, when applicable, to make patient care safer. Monitoring will help ensure that the identified solutions are appropriate and effective.

Recommendation D

Ensure that copy and paste practices are regularly monitored, measured and assessed.

4.6. Implementation Tools and Resources

Recognizing the challenge of translating recommendations into individual contexts, the Partnership also developed a publically available toolkit (<https://www.ecri.org/resource-center/Pages/HIT-Safe->

Practices.aspx) with resources for clinical leadership, professional organizations as well as the vendor and developers. The toolkit contains implementation aids for organizations including a training checklist, educational presentations, risk identification assessments (tailored for various stakeholders), and self-assessment checklists. Also included are templates for policies and procedures and implementation plans and strategies for each of the stakeholder groups, along with audit and assessment tools which can be used to assess successful implementation.

5. Discussion

As demonstrated by the literature and reported safety events, evidence around the important health IT patient safety issue of copy and paste remains limited both in quantity and quality. Several studies failed to even provide basic definitions of copy and paste. Adverse patient events due to copy and paste are multifactorial and involve several missed opportunities for detection. Nevertheless, the literature clearly suggests a majority of physicians use copy and paste regularly with potential deleterious effects on the accuracy and usability of data within the EHR and with risks to patient safety. We identified one study demonstrating a causative link between copy and paste and errors resulting in the need for urgent unplanned care (Singh et al. demonstrated that copy and paste errors contributed to 2.6% of overall errors). Furthermore, reported events, while few, confirm that copy and paste occur in multiple areas of clinical care, and that although alternatives to copy and paste (such as vendor supplied functionalities) are available, they remain infrequently used and inadequate to address all the ways information is reused.

5.1 Recommendation implementation and potential impact

A detailed description of the work group's recommendations, their anticipated impact, and how they fit into the sociotechnical model is provided in ►Table 6 and ►Figure 1. The sociotechnical model provided a vehicle to evaluate key factors impacting the recommendations [5]. This model also provided a framework to ensure all aspects of the healthcare process were taken into account during development of implementation strategies. Additionally, the sociotechnical model can facilitate monitoring and assessment of potential changes in care resulting from implementation of the safe practice recommendations. With consideration of the sociotechnical model in mind, we highlight key aspects and implementation considerations below.

Recommendation A suggests providing a mechanism to make copy and paste material easily identifiable. This implementation will require new software functionality. Since such features are currently not widely available, implementation may prove expensive and may slow systems with the potential result of being disabled by users. Anecdotally, several organizations reported to the workgroup that they experienced significant system slowing after introducing this feature. Altering the display of copied material may also pose additional readability challenges: the use of varying fonts, colors, or hover notifications may clutter the note, particularly if documents contain blocks of information from a variety of sources. Despite these obstacles, vendors have made progress towards allowing easy identification of documentation source — a key first step to allow readers the ability to assess the source, veracity, and relevance of information in the EHR.

Recommendation B states that the provenance (or original source) of copied material should be readily available. Given time constraints, authors cannot re-confirm all information in the chart and necessarily rely on prior information within the record. However, to determine if information is up-to-date and accurate, providers could benefit from knowing when the information was obtained and by whom. Such information could be displayed in a variety of ways including hover notification, a split screen, hypertext, or separate log files, which authors could access, but would not necessarily be displayed by default. In addition to clinical utility, tracking this information could allow for better monitoring of clinical compliance and more nuanced claims in cases of medical liability. Again, potential obstacles to providing such functionality are largely technical and vendor involvement in the workgroup during the development of these recommendations provides an indication of the implementability of these recommendations.

The workgroup's third recommendation regarding staff training and education should reflect organizational awareness of copy and paste associated issues, and should also be reflected in local policies and culture. Staff training should improve awareness of good documentation practices, knowledge of material that is appropriate to copy, and alternative functions for inserting material into the note (e.g. auto-populating text via macros). Educational initiatives should also encourage users to avoid using workarounds to bypass policy and technological limits placed on copy and paste functionality. While education plays a prominent role in implementing these safe practices for copy and paste, it is just the beginning. Those participating in the Partnership felt that they could readily implement this recommendation and adopt associated policies and processes given that only a limited number of organizations have these in place.

Finally, the workgroup's fourth recommendation pertains to the ability to monitor and assess copy and paste practices. As with prior recommendations, such capabilities are not yet widely available and are likely to require software and potentially hardware modifications. However, the creation of audit capacity and policies on how feedback to users should be provided represent a crucial part of addressing the problems associated with copy and paste. Without monitoring and feedback, assessing the impact of staff training and occurrence of unsafe documentation practices would not be feasible. In addition to promoting better documentation, audit trails may also help to ensure that authors are compliant with various regulatory requirements. Pointing organizations to their own documentation practices and highlighting the potential for patient safety risks associated with improper copying and pasting may encourage those organizations to implement these recommendations. Finally, monitoring copy and paste practices may allow identification of workflows with high copy and paste use, for which a technical solution could decrease reliance.

5.2 The Partnership for Health IT Patient Safety workgroup as a novel model

We believe the formation of The Partnership for Health IT Patient Safety and subsequent efforts of the Partnership copy and paste workgroup represent a unique and valuable model for meeting the important and complex challenges facing health IT. First, the complexity and scale of health IT patient safety risks, such as those derived from copy and paste involve multiple key stakeholders, ranging from individual EHR users, patient safety experts, researchers, healthcare organizations and obviously EHR vendors. As a collaborative group comprised of key stakeholders with varied expertise, the copy and paste workgroup was uniquely positioned to understand, analyze, vet potential solutions, and craft implementable recommendations to address unsafe copy and paste use and promote patient safety.

Another unique aspect of the Partnership copy and paste workgroup's process was a decision to perform a systematic literature search to inform the recommendation development process. The 2011 Institute of Medicine report (now National Academy of Medicine) stipulated the importance of performing a systematic review as the foundation for clinical guideline development [40]. Although the Partnership copy and paste workgroup's output is not intended as a clinical guideline, efforts to make the process evidence-based represent a unique strength of the Partnership's process. Finally, in the future, the Partnership may serve as a forum from which to design and pilot test potential health informatics interventions. We believe the Partnership's process represents a novel collaborative model for addressing not only safe use of copy and paste, but other patient health IT safety issues that will arise with widespread EHR adoption, and ultimately inform the national strategy for HIT patient safety.

The Partnership's safe practice recommendations are designed to serve as a foundation for safe reuse of information moving forward, and are intended to enable stakeholders to identify ways to address copy and paste associated issues and risk.

6. Conclusion

The reuse of information is important for efficient, accurate, and complete clinical documentation. Although copy and paste has facilitated the reuse of information, the copy and paste function also presents inherent safety risks for documentation including propagation of inaccurate information, “note bloat” and has been demonstrated to contribute towards adverse events such as diagnostic errors and need for unplanned urgent care. Current evidence regarding copy and paste remains limited and requires further study both to understand the relationship between copy and paste and adverse events and to investigate the benefits of copy and paste. We believe incorporating the Partnership’s safe practice recommendations into daily workflow is an important step towards mitigating safety risks and promoting the safe and effective reuse of information.

Clinical Relevance Statement

The information identified from the literature review provides insight into the frequency of copy and paste use in the U.S. healthcare system. The Partnership copy and paste workgroup’s four safe practice recommendations outline strategies that may assist various healthcare stakeholders (e.g., providers, providing organizations, vendors) in ensuring that copy and paste is used carefully in order to protect patient safety and realize benefits of copy and paste. The associated toolkit provides instructional materials to help stakeholders implement the safe practice recommendations.

Conflict of Interest

The authors declare that they have no conflicts of interest in the research.

Human Subjects Protections

No human or animal subjects were included in this project.

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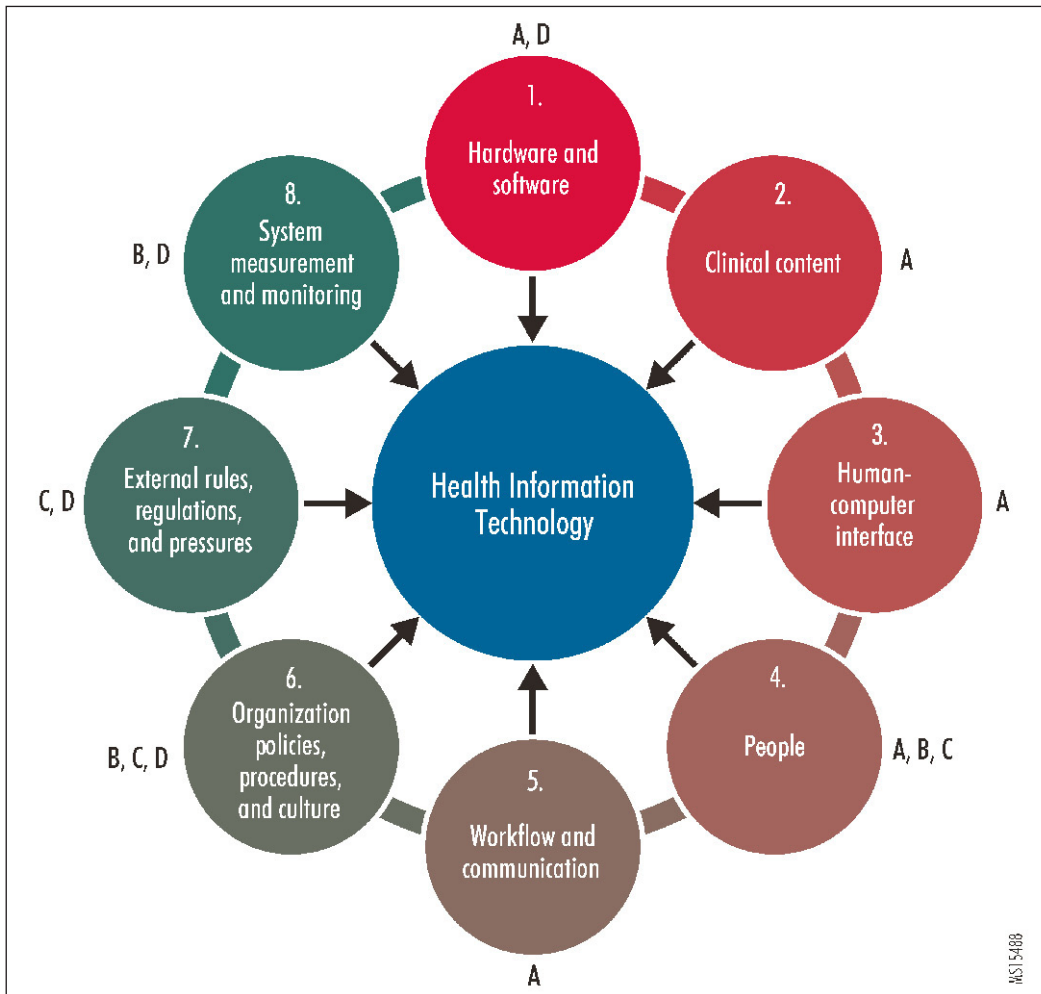


Fig. 1 Copy and Paste Best Practice Recommendations and Associated Sociotechnical Model Components. The different components of the model are keyed to recommendations A, B, C, and D.

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Table 1 Prevalence of Copy and Paste

Reference	Prevalence, Context
Self-reported Use of Copy and paste	
O'Donnell et al. (2008) [1]	90% of physicians (residents and attendings) using electronic notes reported the use of copy and paste to write daily inpatient progress notes. 78% used copy and paste almost always or most of the time. 81% of copy and paste users frequently copied notes from other physicians or prior admissions.
Heiman et al. (2014) [41]	66% of Northwestern medical students reported copying their own notes frequently or nearly always.
Swary et al. (2014) [6]	83% of dermatology residents reported using copy and paste to insert a prior author's past medical history, family, or social history.
Tilstra et al. (2014) [42]*	13% of residents and 7% of University of Pittsburgh Medical Center faculty copied from their own prior notes to document outpatient clinic visits at a large academic center.
Chart-based Studies	
Edwards et al. (2014) [7]	10.8% of outpatient primary care, cardiology, and endocrinology notes contained copied and pasted material.
Turchin et al. (2011) [12]	5% of diet counseling, 5.1% of exercise counseling, and 5.2% of weight-loss counseling documentation by primary care physicians for adult patients with diabetes was copied.
Zhang et al. (2013) [31]	12.3% of primary care notes documenting lifestyle counseling were considered copied from prior notes (by the same author).
Thornton et al. (2013) [8]	82% of residents' and 74% of attendings' notes in the intensive care unit contained copied text ($\geq 20\%$ copied text from another document).
Chang et al. (2012) [43]*	77% (229 of 299) inpatient medicine progress notes contained copied material.
Hammond et al. (2003) [44]	9% of all notes (VA Health System) contained copied text, and 63% of these "copy events" were due to human copying.
Thielke et al. (2006) [9]	25% of patient charts in a Veterans Affairs (VA) health system contained at least 1 copied exam, with the majority of copying performed by a relatively small fraction of authors. For 11% of patients, charts contained an exam copied from another author.
Weir et al. (2003) [10]	Nearly 20% of inpatient notes for 60 randomly selected patients (at a VA hospital) were found to contain copied material and 43 out of 60 patient charts contained at least 1 copied note.
Reinke et al. (2012) [36]	8% of electronic surgical discharge summaries were found contain copied and pasted material.
Shah et al. (2013) [45]	7% of all radiology referrals over 3 days at a tertiary care children's hospital contained copied ("cloned") clinical histories.
Observational Studies	
Mamykina et al. (2012) [46]	On average, residents were observed to use copy and paste 0.8 times per note when writing inpatient progress notes.

*Only published as conference abstracts

Table 2 Study definitions of copy and paste

Reference	Definition
O'Donnell et al. (2008) [1]	Copy-forward functionality was considered copying. However, automatic insertion of vital signs and results was not classified as copying.
Turchin et al. (2011) [12]	A duplicated or copied documentation of lifestyle counseling was defined as "using a sentence identical to the sentence used to document the same type of counseling in the previous note by the same health care provider."*
Zhang et al. (2013) [31]	Two notes from the same author containing identical sentences to describe lifestyle counseling.*
Thornton et al. (2013) [8]	Copying was defined as: matching phrases >4 words and 20 total characters. A progress note was considered to contain copying if it contained $\geq 20\%$ copied text from another document.
Thielke et al. (2006) [9] Hammond et al. (2003) [44]	A copy-event was defined as ≥ 40 identical consecutive words between 2 documents.
Weir et al. (2003) [10]	Phrasing, content, or form >50% identical; assessors then categorized degree of copying subjectively.

*We recognize this definition of copying could also represent other EHR functionalities aside from copy and pasting; however, this definition was used by these studies

Table 3 Copy and paste associated problems that may impair good clinical documentation

Problem	Description
Creation of new inaccuracies	Copy and paste can be used to transfer any data. If the source data or the source of the data is incorrectly copied this could result in a new error within a patient's chart. One mechanism that may lead to a new inaccuracy could be copying a snippet of a sentence. The snippet, out of context could have a different meaning than the original text. Copying between sections of the chart can also lead to new inaccuracies. This has been reported with a family history of cancer erroneously copied as cancer into a patient's active problem list, ultimately resulting in medical insurers to accuse a patient of withholding information [21]. This is also relevant for clinicians working with multiple charts simultaneously. Frequent copy and pasting (particularly between notes for different patients) could increase the risk of depositing text into the wrong chart, resulting in inaccuracies.
Rapid Propagation of Errors	Copy and paste also enables rapid propagation of errors, once they exist in the medical record. In one case, an emergency room physician discovered a patient was listed as having a history of "PE" or pulmonary embolism, although the patient denied this. After reviewing the chart, the physician found "PE" had originally been used for "physical exam," but was mistakenly listed under medical history and propagated throughout the chart for years [18].
Internal inconsistencies	Failure to curate text may lead to internally inconsistencies in the note [23, 30, 47]. Copy and pasting review of systems (ROS) or history of present illness may result in contradictory statements in which ROS is documented as normal, although the history of present illness explicitly details it is not [48]. Additionally, a fever might be noted in a patient's updated vitals, while a copied physical exam states "afebrile, vital signs stable". Such inconsistencies create dilemmas for clinical personnel who must decide whether to trust the recorded physical exam [48].
Note bloat	Inclusion of redundant, clinically irrelevant, or outdated information over successive encounters can result in a note so long that new or clinically important information is challenging to identify [1, 23, 25, 49]. This "note bloat" may lead to lengthy charts which compromise clinical efficiency.

Table 4 Continued

Features of EHR (References)	Benefits	Implementation Considerations
To increase efficiency of workflow and decrease copy/pasting of redundant information – sections likely to remain stable over time (i.e., past medical history) should be displayed separately from sections that should require frequent update (i.e., History of Present Illness) (Senathirajah et al. [32])	<ul style="list-style-type: none"> • Decreased information overload • Avoidance of “note bloat” • Supports a shared patient record 	<ul style="list-style-type: none"> • Separating relatively stable sections (e.g., past medical history) could allow users to overlook its clinical importance. • Information in separated sections could change. However, if no version was inserted into the note at original documentation, subsequent readers could misinterpret reasons behind care from original authors. For example, if a patient received a new diagnosis, a subsequent reader could find it challenging to determine which diagnosis a clinician was working with when a note was written. • If patients requested copies of their note, it could be difficult to present an accurate representation for older notes. • Additional clicks could be required to access/edit separated information. This functionality does not exist within many EHR systems; implementation would require creation of de novo functionality for many systems.
To promote succinct presentation of information and decrease copy/pasting between provider notes, the chart should be redesigned to allow for editing by multiple authors (Berkowitz [26])	<ul style="list-style-type: none"> • Supports a shared patient record • Potential to eliminate redundancy: would not require multiple authors to repeatedly edit past medical history changes; 1 author could make the change, and future authors could simply confirm • Potential for increased accuracy; topic “experts” assume responsibility for documenting topic specific sections (neurologists describe location and cause of stroke; surgeons describe particular procedure) 	<ul style="list-style-type: none"> • Authors may inadvertently remove important material entered by other authors; could create medico-legal concerns. • Authors may overwrite each other to describe the truth from their point of view, which could create medico-legal concerns. • Would require accounting for simultaneous data entry or for users being “locked out” of portions of the note; could create inefficiencies. • This functionality does not exist within many EHR systems; implementation would require creation of de novo functionality for many systems.
To allow tracking of copy and paste use over time and identify “high utilizers,” EHR should include functionality to allow regular audits (Koppel [33])	Supports organization oversight of copy and paste and copy-forward activities	<ul style="list-style-type: none"> • Certain specialties may be more likely to appear as “high utilizers” due to patient stability.

Table 4 Selected potential EHR modifications from the literature and implementation considerations

Features of EHR (References)	Benefits	Implementation Considerations
To allow easy identification, display of copied material should be altered (i.e., different font, different color text) (Zhang et al. [31]; ED Legal Letter et al. [18])	<ul style="list-style-type: none"> • Easy identification of copied text • May facilitate author attribution • Potential deterrent to copying text 	<ul style="list-style-type: none"> • Altered text (i.e., multiple fonts, conflicting colors) could be more challenging to read • Recopied text may become challenging to differentiate • Compatibility issues (not all systems use the same fonts) • If users are required to manually alter text, documentation efficiency would decrease
To promote acknowledging outside information by reference instead of reentering information in the body of a note, EHRs should create links between the referenced text and the referring note (American Health Information Management Association et al. [2], Shoolin et al. [3]. Association of Medical Directors of information Systems)	<ul style="list-style-type: none"> • Avoid "note bloat" • Decrease the need to copy by providing an alternative method for maintaining timeliness of information • Automatic attribution of authorship • Allows users quick access to original report/note without searching through other records or accessing through separate menu • May allow users to review original information and form impressions for themselves 	<ul style="list-style-type: none"> • Information at the link target could change with potential clinical and medical legal implications (e.g., if test results are amended) • Degradation of links over time could affect the permanence of the document artifact; future users reviewing a record with broken links could lack access to complete record. • Inserting links instead of complete information could make it more challenging to quickly provide patients with copies of their note. • As this functionality does not exist within many EHR systems, implementation would require creation of de novo functionality
To facilitate succinct data display, allow parts of the note to be hidden with a toggle function (Shoolin et al. [3] Association of Medical Directors of information Systems)	<ul style="list-style-type: none"> • Decreased information overload • Allows users to "customize" display of information for their own clinical context • Intuitive data display already widely used; likely easy for users to learn • Each note would still contain a "complete" record of data (even if hidden). 	<ul style="list-style-type: none"> • If clinically important information is hidden by default, critical information for patient care could be missed • Additional clicks could be required to access certain information • Would require consensus regarding what should be hidden on a system level, although, preferences could be tailored for groups of users (i.e., surgeons, nurses, pediatricians). • As this functionality does not exist within many EHR systems; implementation would require creation of de novo functionality for many systems

Table 5 Copy and Paste Events Submitted to the ECRI Institute PSO

Reports, Hazards, and Events associated with Copy and Paste	System	Analysis Categories					
		Data Entry or Selection	Data Does Not Match Patient	Incorrect Test Results	Magrabi Tagging 1.2.1	Magrabi Tagging 1.2.3	Magrabi Tagging 1.2.4
Correct rate for IV medication—under the comments section there [were] an incorrect dose and medication information; the pharmacist forgot to copy and paste new comments into RX comments so that correct label could be printed. Incorrect label was printed.	Pharmacy	X				Failure to update data	
[The patient] had bilateral surgical biopsy. Sample 1 was marked left and sample 2 was also marked left. Nurse routinely copies information from one order to the next but forgot to change the specimen designation in the description.	CPOE	X			Wrong input		
Antibiotics ordered twice a day to be given at 9:00 a.m. and 9:00 p.m. The a.m. dose was not showing in [patient's] record. An audit revealed that the [patient] received 3 doses the previous day because staff administered the next upcoming dose early. The order as written was cancelled and a new order was copied and pasted into the record.	CPOE	X			Wrong input		
[The patient] was registered and blood was drawn correctly as ordered in one application; the order was then incorrectly copied into another application, resulting in tests being run under an incorrect account.	CPOE	X	X				Failure to communicate or carry out task
A report of a vascular study showed the wrong age and much more severe disease than was anticipated for the patient. Investigation discovered that the report was pulled from transcription and copied into the incorrect chart.	Clinical documentation	X	X		Wrong input		
Lab information was identified but copied into the incorrect chart.	Lab information system	X	X	X	Wrong input		

Table 5 Continued

Reports, Hazards, and Events associated with Copy	System	Analysis Categories			
		X	X	Wrong test results	
X-ray report copied and pasted into the correct record after order was mistakenly written on the wrong patient chart, but correct patient xrayed.	Radiology/emergency department		X		
Physician copies and pastes admissions information, imaging study reports, and labs from previous day's notes into progress notes, making note "difficult to follow and interpret."	Clinical documentation	X			
Note not completed in timely fashion; discrepancies noted; note contains information that appears to be copied and pasted from previous visits.	Clinical documentation	X			
Consultant copies and pastes information from primary team notes. Inaccurate documentation included in the copied materials combined with new information then changes the diagnosis and management of the [patient].	Clinical documentation	X			
Communication by email in [patient] portal contains information pasted from another patient's chart.	Patient portal	X			
Vital signs copied and pasted from previous visits into history and physical exams.	Clinical documentation	X			

The events are derived from materials submitted to the ECRI Institute PSO and may reflect areas and processes where copy and paste are used as well as the consequences of the use of copy and paste in the clinical setting. Taxonomy groupings are based on Agency for Healthcare Research and Quality Common formats (<https://www.pso.ahrq.gov/common>) and on Magrabi et al.'s work.

Table 6 Safe Practice Recommendations, Rationale, and Implementation Considerations

Recommendation and Rationale	Potential Implementation Actions	Target Audience	Examples of Solutions	Sociotechnical Model Categories Addressed by This Recommendation
<p>Recommendation A: Provide a mechanism to make copy and paste material easily identifiable.</p> <p>Information that is copied should be easily identified to allow for verification of accuracy and to facilitate review for edits.</p>	<p>Create policy and procedures and monitor compliance.</p> <p>Make the record of copy and paste actions easily identifiable to facilitate review and editing of copied text.</p> <p>Identify areas (if any) that should be locked from copying (e.g., signature block of a completed note into a new note).</p> <p>The system needs to accurately recognize copy and paste activities (e.g., reports have shown that dictated notes may be flagged as notes that have been copied and pasted).</p>	<ul style="list-style-type: none"> • Provider organization • Vendor • Provider • Provider organization • Vendor • Provider organization • Vendor 	<p>Copied material is:</p> <ul style="list-style-type: none"> • Visible in a split screen • Visible by hovering so that the screen is not cluttered • In a different format (e.g., italics, different color, other method) • Distinct from presently entered content 	<p>1, 2, 3, 4, 5 (▲ Figure 1)</p>
<p>Recommendation B: Ensure that the provenance of copy and paste material is readily available.</p> <p>Being able to trace the provenance of copied and pasted material can help verify that the information is appropriate and accurate; this may also increase the potential to defend the record and achieve billing compliance.</p>	<p>Identify the original source (date, time, record, and author) of the information to verify accuracy, applicability, reliability, and timeliness.</p> <p>Track authors of copied text to facilitate regulatory compliance.</p>	<ul style="list-style-type: none"> • Vendor • Provider organization • Vendor • Provider organization 	<p>Have a log available of when the note is changed, who changed it, and how it was changed.</p> <p>Information about copied material appears on demand in a separate window.</p> <p>Hover to identify the source of the copied information.</p> <p>Metatagging pasted information with original identifiers (e.g., author, care setting, original date, time).</p>	<p>4, 6, 8 (▲ Figure 1)</p>

Table 6 Continued

Recommendation and Rationale	Potential Implementation Actions	Target Audience	Examples of Solutions	Sociotechnical Model Categories Addressed by This Recommendation
<p>Recommendation C: Ensure adequate staff training and education regarding the appropriate and safe use of copy and paste.</p> <p>Providers are responsible for the content and accuracy of documentation. Training about copy and paste should include information about the patient safety risks and benefits and should comply with all regulatory, legal, and compliance guidelines.</p>	<p>Provide competency-based, hands-on training upon hiring and on regular basis.</p> <p>Make available new technology to safely reuse information.</p> <p>Provide feedback to those using this functionality.</p> <p>Identify methods to verify correct and current information.</p>	<ul style="list-style-type: none"> ● Provider organization ● Vendor ● Provider ● Provider organization 	<p>Provide regular training and feedback on performance.</p> <p>Encourage providers to “act with volition” by identifying what was intended to be copied and determining that the copied material is appropriate for inclusion.</p> <p>Use alternative models of documentation by recognizing which parts of a previous encounter are brought into a new encounter.</p>	<p>4, 6, 7 (▲ Figure 1)</p>
<p>Recommendation D: Ensure that copy and paste practices are regularly monitored, measured and assessed.</p> <p>To ensure the integrity of the clinical record, the quality and safety of care rendered, and compliance with state and federal regulations.</p>	<p>Create an audit policy, monitoring copy and paste by provider, and reporting audit findings internally.</p> <p>Create audit tools.</p> <p>Create an auditing policy.</p>	<ul style="list-style-type: none"> ● Provider organization ● Vendor ● Provider organization 	<p>Identify what type of data is tracked.</p> <p>Identify who is able to visualize the tracking log for copied material.</p> <p>Identify who is able to see copied information.</p> <p>Provide new opportunities for interoperability, negating the need to rely on copied information.</p> <p>Determine if there should be a time limit on the ability to see copied information.</p> <p>Identify a governance and feedback process.</p>	<p>1, 6, 7, 8 (▲ Figure 1)</p>

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