Copy and paste in the electronic medical record: A scoping review
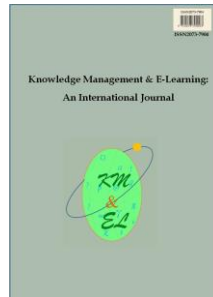
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Abstract: Copy and paste (CPF) can be defined as the act of duplicating medical documentation from one section of the electronic medical record (EMR) and placing it verbatim in another section. The objective of this scoping review is to: 1) describe the prevalence of copy and paste usage in EMR documentation, 2) detail the known measurable safety hazards associated with its use, and 3) identify potential solutions and/or strategies that can be used to mitigate the negative consequences of the CPF while preserving its essential role in documentation efficiency. The Joanna Briggs Institute guidelines were used to identify, screen, and assess the text of articles for final inclusion in CPF article review. The primary search strategy for copy-paste articles was developed in PubMed® and then translated to CINAHL®, ScienceDirect®, and IEEExplore® to extract additional articles. Identified copy-paste articles were imported into Covidence®. Two reviewers determined the final articles that were included in the review. The search retrieved 63 publications of which 17 were identified for final inclusion. The scoping review revealed CPF of medical text is a common occurrence that cuts across all clinician types (e.g., physicians and nurses). The scoping review revealed that automated methods for finding duplication in electronic documentation had emerged. A limited number of studies with quantifiable harms associated with CPF were found. Clinicians stated that CPF: 1) had a negative impact on critical thinking, 2) led to medical complications being more likely to be overlooked, and 3) led to safety issues being missed with copy-paste content. A few different approaches were tested by researchers as alternatives to CPF. They included dictation systems, practice guidelines, note templates, highlighting of copied information, note splitting, and text insertion. CPF is long overdue for innovative approaches to minimizing patient risk and maximizing provider efficiency.

Keywords: Copy and paste; Electronic medical record; Health information technology; Patient safety; Note writing; Technology induced-error

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1. Introduction

Copy and paste is a common software shortcut that is used to move text from one location to another without the need to re-transcribe the same information. The copy and paste function (CPF) is embedded in word processing software and can be accessed using the shortcut hotkeys of "ctrl-c", "ctrl-v", which are well known even by the least technology savvy user. CPF is often used as a time saving technique and it has found its way into the electronic medical record (EMR), especially as busy clinicians are limited in terms of their time and the need to see multiple patients in the context of a regular workday. Copy and paste can be defined as the act of duplicating medical documentation from one section of the EMR and placing it verbatim into another section (Tsou et al., 2017). The duplicated content may or may not be modified after insertion in the new section. CPF terminology can take on numerous forms including cut and paste, cloning, and copy-forward (Tsou et al., 2017; Weiss & Levy, 2014). All these terms essentially refer to the same action of importing existing text during documentation and are interchangeable, when reviewing the broader literature on the topic. There is a need to understand the current state of the research literature focused on CPF. Therefore, the aim of this scoping review is to describe the prevalence of copy and paste usage in the context of EMR documentation. The scoping review also seeks to identify the known measurable safety hazards that are increasingly being identified as a concern in the health informatics literature (Borycki et al., 2016). Safety hazards associated with the use of the CPF need to be identified in order to develop solutions and/or strategies that can be used to mitigate negative outcomes (Beuscart-Zéphir et al., 2013; Borycki et al., 2016) while simultaneously preserving clinician efficiencies during medical documentation.

2. Background

Hirschtick (2006) in an early discussion of copy and paste pointed out the ease with which notes can be inserted and how quickly notes can become convoluted, confusing, and inaccurate. The art of note writing, and the patient narrative is lost because of copy and paste (when used as an EMR documentation time saving measure). The key is to understand the benefits and harms that come from this time-saving technique and to update approaches for preserving the integrity of progress notes, clinical histories and other narrative documentation. CPF is a much-needed area of further research because it lacks a universal consensus about how the action should be addressed. Clinicians rely on the CPF when patient information remains stable over time. CPF eliminates the need to recall the details of the previous clinical encounter and can communicate important information such as medical histories, demographic information, medication lists, allergies, and lab results (Wilson, 2014). CPF could also potentially prevent medical error since forcing clinicians to retype information leads to transcription errors (Healthcare

Risk Management, 2014). However, the benefits associated with the CPF are not well studied in the published literature (Weiss & Levy, 2014).

Organizations may also encounter medico-legal risks that come with the overuse of the CPF. CPF may lead to adverse patient events and fraudulent billing (Gaffey, 2009). Overreliance on CPF may lead to mindless cloning of patient records that do not take into account the changing nature of underlying patient conditions or situations. The resulting billing codes from the CPF are possibly non-compliant (Tamburello, 2013) or could decrease reimbursement, when applied to lifestyle counselling notes (Zhang et al., 2013).

Anecdotal evidence from case studies highlights the risks of direct patient harm from copy and paste; for example, an admission note specified that heparin should be given for venous thromboembolism prevention for a chemotherapy patient with a history of pulmonary embolus. The heparin was never ordered, but the note was copied by others without verifying or noting the order status. The patient was readmitted for a pulmonary embolus after discharge (O'Reilly, 2013). In another example, a patient was discharged from the emergency room with atrial fibrillation and potential heart disease and told to follow up with his primary care doctor. The primary care doctor copied and pasted the anatomy and physiology assessment of the patient for two years without noting the required follow up to check for heart disease. The patient died of a heart attack and the primary care doctor was held liable (Samaritan, 2010).

A scoping review helps clarify the prevalence of copy and paste in EMR documentation, what is known about measurable safety hazards from its use and potential solutions or strategies to mitigate the negative consequences of the CPF while allowing for its continued use in supporting documentation efficiency. The literature on the CPF lacks this type of review to highlight research gaps and the review helps to inform future directions for innovation in the automation and auditing of inserted clinical text.

3. Methods

3.1. Methodological framework

The Joanna Briggs Institute (JBI) guidelines for conducting scoping reviews was used for the identification, screening, full-text assessment, and final inclusion of CPF articles (Peters et al., 2015). The JBI framework was helpful in identifying the breadth of research on CPF and narrowing down the articles. The literature on copy and paste in particular is filled with editorial commentary, expert opinion, working group guidelines, and case studies. Therefore, identifying more rigorous published empirical research to clarify the evidence-based on the CPF is a critical part of the Preferred Reporting Items for Systematic Review and Analysis (PRISMA) process.

3.2. Identifying the research questions

The primary purpose of the scoping review is to answer three questions: 1) How often is CPF used in EMR documentation? 2) What is known about safety hazards resulting from the use of CPF? and 3) What solutions or strategies can be used as an alternative to the CPF for the insertion of existing text into medical documentation?

3.3. Identifying relevant studies

The primary search strategy was developed in PubMed and then translated to CINAHL®, ScienceDirect®, and IEEExplore® to extract additional articles. Search results were exported to Covidence® (i.e., software used to support the review of abstracts by two reviewers). Articles without abstracts were excluded. Table 1 outlines the PubMed search strategy.

Table 1
PubMed search strategy

Search Strategy	Criteria
Shortcut Function:	(copy and paste* OR cut and paste* OR cloned notes* OR copy forward*)
Health Information Technology Medium:	AND (Electronic Medical Record* OR Health Record*)
Date Restrictions:	2006-2020

A second round of reviews examined full-text articles to determine their final inclusion based on study design, purpose, and research rigor by the two reviewers. All disagreements between the reviewers were addressed and resolved through consensus during the first and second rounds of screening. Studies included in the CPF scoping review were those focused on documentation in the EMR. The research also had to focus on copied content in medical notes rather than other kinds of documentation such as assignments or administrative forms. Lastly, the review was limited to English language journals and studies published from 2006 onwards. Reviewed studies took place in any clinical setting. Table 2 summarizes the inclusion and exclusion criteria of the review.

Table 2
Inclusion/exclusion criteria

Inclusion	Exclusion
Documentation in EMR	Documentation outside EMR
Copied medical notes (included nursing and allied health)	Copying or cloning outside medical documentation (e.g., assignments)
English-language journals	Foreign-language journals
Any study type published from 2006	Studies published before 2006

4. Results

A total of 63 articles were retrieved using the search strategy. A total of 28 articles met the inclusion criteria from the abstract review and were selected for a full-text reading. Seventeen studies were included in the scoping review after removing those articles without a research design or that did not have a direct or significant indirect findings on CPF use. Summaries of the 17 articles included in the scoping review are found in Appendix I. The PRISMA flowchart for study inclusion can be found in Fig. 1.

Most CPF studies took place in academic medical centres (n = 8). Community hospitals served as the study location for three articles and health systems for two articles. Literature reviews coupled with expert opinion or stakeholder analysis were the focus of two articles. The remaining studies took place in a medical school and with individual physicians in a clinic context. Studies at academic medical centres included all physicians in the medical training hierarchy (i.e., interns, residents and attending physicians). Primary and specialty care physicians were also included in the studies. Medical students, nurses, and physician assistants were the least likely to be participants in the published research. Automated note reviews took place in three studies. The most common study designs were retrospective record reviews with five, followed by surveys at four. Mixed methods were used in three studies, retrospective cohort studies were used twice while a prospective intervention study, retrospective intervention study, and simulation were only used in one study each.
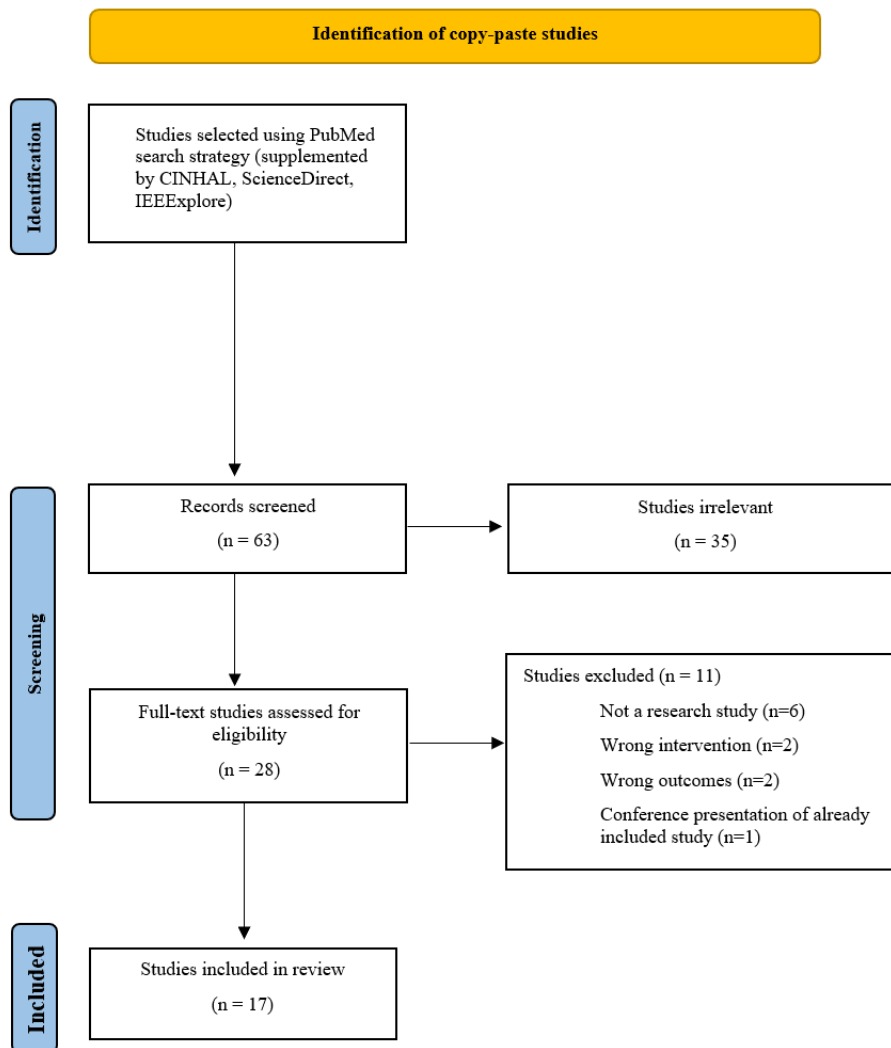

Fig. 1. PRISMA flowchart for CPF scoping review

4.1. Prevalence of copy and paste

Copy-paste of medical text is a common occurrence. In a physician survey 90% of clinicians writing electronic notes used the CPF, 81% of CPF users frequently copied notes of other physicians, and 82% wanted to continue using the CPF (O'Donnell et al., 2009). Simulation training of 31 internal medicine interns found 48% of notes contained copy-paste elements (March et al., 2016). A survey of medical students reported that 95% of respondents copied their own notes with 66% of participants copying frequently or always, 22% copied residents' notes at least sometimes, and 13% copied from other attendings sometimes or frequently. Additionally, 86% reported observing residents sometimes copying other providers' notes and 60% reported observing attending physicians sometimes copying another provider (Heiman et al., 2014).

A review of notes for adult patients with coronary artery disease or diabetes found significant copy-paste material in 10.5% of these notes (Edwards et al., 2014). A study of an intensive care unit (ICU) at an academic medical centre found that 82% of notes from residents and 74% of notes from attending physicians contained equal to or greater than 20% copied information (Thornton et al., 2013). An automated text categorization algorithm of 167, 076 records at the United States Department of Veteran's Health Affairs found exam copying in 3% of all exams or in 25% of patient charts (Thielke et al., 2007). The Partnership for Health Information Technology Patient Safety as part of their review on the CPF included a highly inclusive systematic review of the literature. They noted that studies identified that 66% to 90% of clinicians use copy and paste routinely (Tsou et al., 2017).

More automated methods of finding duplication in electronic documentation reported similarly frequent amounts of copied material. A retrospective medical record review of chronic kidney disease patients using a text-mining algorithm observed redundancy of 29% in notes of a medical record of the same patient and 3% redundancy for same note type across two distinct patients (Cohen et al., 2013). A document review in a French hospital of more than 666,000 records using automated scripts found an average rate of duplications within records of 33% with 20% of documents containing at least one drug mentioned only in duplicate zones (Digan et al., 2019).

4.2. Safety, hazards and implications

There were a limited number of studies with quantifiable harms from the practice of copy and paste. A cross-sectional survey noted that 16% of interns, 22% of residents, and 55% of attendings reported that copy forward had a "somewhat negative" or "very negative" impact on critical thinking (Stewart et al., 2015). A retrospective review of medical records at a level 1 trauma centre evaluated the use of the CPF in daily progress notes of orthopaedic patients with injuries and those at high risk of complications. The overall average of copied data in progress notes was 85%. Out of 15 medical complications, 30% did not have notes that reflected the complication and four of seven or 57% of complications related to injuries were not reflected in the electronic record the following day after the complication. The authors concluded that the CPF may lead clinicians to overlook complications (Winn et al., 2017). In March et al's (2016) study all 31 interns who participated in a simulation missed at least one safety issue with average recognition at 47% of safety issues. An included study in the Tsou et al's (2017) review found that within 190 detected diagnostic errors 7.4% contained copy-paste of prior notes and within those errors, copy-paste was a contributing factor 36% of the time.

There is conflicting research about the overall impact of CPF on clinician burnout. A retrospective cohort study found clinicians with a higher usage of CPF had a lower likelihood of burnout (Hilliard et al., 2020) while a survey study reported high clinician stress associated with note bloat (i.e., the presence of too much non-essential information in the EMR) due to the CPF (Kroth et al., 2019). Therefore, while the efficiency of copy-paste may lower the burden of EMR documentation on note writers these gains are potentially lost due to higher burdens placed on note readers.

4.3. Solutions

A few different approaches were tested in the literature as alternatives to the CPF. They include dictation systems, practice guidelines, note templates, highlighting copied information, note splitting, and text insertion. A dictation system in a residency program showed promise in decreasing the use of copy-paste and significantly reducing or eliminating documentation errors. The three-month pre- and post-intervention study saw a drop in copied notes from 93% to 50% after the introduction of a dictation system. Of copied notes, 58% of the copied notes with documentation errors pre-intervention had 0% errors post-intervention (Al Hadidi et al., 2017).

In contrast, a bundled intervention of best practice guidelines, note templates, and training did not impact the use of CPF by clinicians even as it reduced clutter within notes. The study findings were limited by a small sample size and short duration as the pre/post intervention involved only 25 progress notes of pediatric residents (Dean et al., 2015). A multi-method review of a similar function of copy forward in nursing flowsheets aligned closely with the Partnership for Health IT Patient Safety findings described by Tsou et al. (2017). The review espouses a thoughtful and measured approach to CPF in nursing flowsheets to improve efficiency of documentation and accurate information, including making copy-forward easily recognizable and regularly monitoring, measuring, and assessing its use (Patterson et al., 2017).

Two approaches to mitigate CPF safety issues, without eliminating CPF, are note splitting and text insertion. Note splitting allows clinicians to have background information and active issues listed separately in the EMR. Text insertion allows text blocks to be entered using widgets to reflect content and context. A mixed methods approach including a think-aloud protocol demonstrated the efficient and usable creation of EMR notes utilizing splitting or insertion (Senathirajah et al., 2014).

Other tools include text mining algorithms and automated scripts to highlight duplication and parse notes. Specific text-mining algorithms can extract a non-redundant or a less redundant subset of the record, but can lead to lost information (Cohen et al., 2013). Automated scripts can also help with the identification and annotation of duplicated zones that can help identify information not relevant to the most recent patient visit (Digan et al., 2019).

4.4. Limitations

The scoping review does not evaluate the quality of the literature, but rather it provides a summary of the relevant research on the topic as identified by the researchers. The extent of the included literature is limited to the database outputs from the search term strategy.

5. Discussion and conclusion

The use of CPF as a shortcut in EMR note writing is a common practice that cuts across all clinician types, whether in the hierarchy of an academic medical centre amongst interns, residents, and attendings or in the clinical practice of physicians and nurses. Furthermore, not only do clinicians frequently copy their own notes to populate documentation screens in EMRs, but the evidence suggests it is a common practice to copy-paste from other providers (Heiman et al., 2014; O'Donnell et al., 2009). The consensus around the CPF is that eliminating the action is not an option. Clinicians are skilled enough at creating workarounds and there are benefits to having copy-paste available. The literature instead points to organizational policies and procedures along with technological solutions built directly into the EMR to highlight new material and action items from the historical information that remains static.

A macro-view of copy-paste is necessary to fully gauge its impact on clinicians and patients. The context of copy-paste should account for the needs of the EMR note-writer and also the note-reader having to discern the most critical information for continuity of care that is sometimes obscured by bloated documentation (Hilliard et al., 2020; Kroth et al., 2019). A review of randomly selected documentation associates large word counts and information density with an unfavourable readability rating. The findings from this research suggests that the use of structured headings and formatted text may make it easier to find the required details (Shen et al., 2012). The identification of downstream impacts to note readers extends to the demands for streamlined documentation necessary for accurate abstraction and text-analytics.

The copy-paste literature also lacks a large-scale estimation of patient safety risks. More comprehensive studies are needed to specifically attribute patient safety harms to the use of CPF and to accurately assess where the activity lies on the spectrum of safety hazards emerging from health information technology. In a short research letter, a retrospective study of over 5,000 patients with diabetes examined the relationship between copied lifestyle counselling and glucose control as measured by an HbA1c. The study findings indicated copied lifestyle counselling statements are associated with less effective glucose control for patients with diabetes (Turchin et al., 2011). Studies such as these need to be expanded to provide specific examples of poor outcomes related to the CPF.

This scoping review also identified the need for medical education regarding copy-paste practices. The authors found one CPF study took place in a medical school setting. Here, the researchers attempted to gauge the attitudes of medical students on the CPF (Heiman et al., 2014). Further medical education research is needed to address copy-paste and determine practice standards for clinicians. A more expansive view of documentation practices in medical education would be revealing for understanding how rounds or case reviews can be used to teach students about copy-paste safety incidents, when they arise. Prior research on smartphone integration into medical education provided insights about best practices for incorporating such devices into the curricula (Chang & Hwang, 2018). Similarly, the literature on the use of the CPF in medical documentation can be used to construct clinical examples in medical education.

There is a need for more research aimed at examining the role of training for reviewing and discussing copy-paste issues that occur. It is important to extend this type of training to medical students, residents, and fellows. Innovative training programs incorporating regular documentation review should also be embedded in medical rounds and case discussions to highlight the importance of understanding the implications of

CPF on practice. One such innovative approach is using a teaching EMR in simulated education for health professional students (Joe et al., 2011). Case studies around copy-paste or highlighted patient safety problems stemming from its use can be illustrated in such simulated EMR environments.

There is also a need for additional automated tools that can address copied material or separate it from patient assessments that are being created during a physician visit. Such tools could be embedded in EMRs and could be made a standard EMR function as CPF activities become more sophisticated. Copied material can be highlighted or separated through note splitting. The use of smart text technology and tracking of copied material are a rich source for chart auditing information and can be used to build metrics for regular review. Data on the use of copy and paste can feed into dashboards, if there is a committee to review the dashboard information regularly and take action (i.e. create policies or educational opportunities surrounding CPF). Incident reports are another potential rich source of information on adverse patient events or near-misses that can be traced to the CPF missing in the included articles. Incident reporting on patient safety events with root cause analysis can be embedded in dashboards highlighting documentation practices such as copy-paste. The integration of incident reporting and use of the CPF can help provide a template for the regular review of documentation practice patterns among clinicians. Studies are needed to highlight transparent practices of data review related to the CPF.

The Partnership for Health IT Patient Safety has both an organizational strategy and technological approaches for mitigating patient safety risks from the use of CPF in the EMR. Recommendations A and B focus more on using information technology functions in the EMR to make copied text distinct. Recommendation A suggests there is a need to make copied text easily identifiable and Recommendation B identified the need to list the source, author, time, and date of the copied material. Recommendations C and D focus on organizational policies to address the use of copy and paste. Recommendation C highlights the need to have adequate training and education surrounding the safe use of copy and paste. Recommendation D focused on regular monitoring, measurement, and assessment of CPF practices (Tsou et al., 2017).

More recently, the Association of Medical Directors of Information Systems (AMDIS) launched guidelines to facilitate interdisciplinary discussion about the right balance between ease of use in EMR note-writing and thoughtless documentation. AMDIS recommended modifying the note structure from SOAP (subjective, objective, assessment, plan) to APSO (assessment, plan, subjective, objective) to place the most relevant clinical information up front. AMDIS recommends electronic documentation should allow data use by other authors via reference and not copied information. Another recommendation was to limit copy-paste to the prior episode of patient care and to never import information from one patient record into another patient record. Such use of CPF is high risk and may lead to erroneous information being transferred to another patient record (Shen et al., 2012).

Copy-paste is a still a nascent subject in the health informatics literature and more rigorous research is needed to test alternative methods for efficiently moving around relevant clinical information. There is still an overreliance on editorial commentary, personal experiences, and case studies in the published CPF literature. Furthermore, the available research is often limited by small sample sizes or limited scope. There is much room for innovation to replace CPF with other electronic tools or to introduce alternative methods for documenting patient care activities; for example, physicians could dictate directly into the electronic record. Copy-paste has existed since the dawn of EMR

documentation and is long overdue for more innovative approaches that minimize patient risk and maximize provider efficiency (i.e., by reducing documentation burden). Modern EMRs facilitate the operationalizing of innovative text insertion and documentation practices alongside the existing use of CPF. Retrospective review utilizing case-control studies with propensity score matching to account for confounding variables among clinicians using the different functionalities can help assess whether alternatives to the CPF are viable to place into practice.

Future research on the most effective organizational policies and procedures can help expand best practices for ensuring the appropriate use of copy and paste. An interview study, for example, can clarify differences associated with instituting guidelines or identifying the role of culture surrounding the use of copy and paste. A survey study can help correlate organizational culture or compliance procedures with identified disciplinary actions or patient incident reviews taken for inappropriate use of CPF. Lastly, additional research should expand upon the use of natural language processing (NLP) for condensing narrative text and eliminating redundancies. The use of NLP to streamline notes and improve their brevity has the potential to be directly built into EMRs. NLP integration into EMR documentation is certainly within the technological capabilities of the large vendors, can improve the safety of their products, and enhance patient care quality.

Author Statement

The authors declare that there is no conflict of interest.

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Appendix I

Summary of the articles included in the scoping review

Author	Year	No. of Participants	Setting	Study Type	Intervention	Key Outcome measures	Implications for Copy-Paste
Al Hadidi et al.	2017	46 (residents)	Community Hospital	Prospective intervention	Dictation	Notes copied post-intervention decreased from 90% to 50%. Of copied notes, 58% with documentation errors pre-intervention and 0% post intervention.	Dictation systems show promise in decreasing the use of copy-paste and significantly reducing or eliminating documentation errors.
Cohen et al.	2013	22,564 notes from 1,604 patients	Academic Medical Center	Retrospective record review	NA	Observed redundancy of 29% in the notes of a medical record of the same patient and 3% redundancy for same note type across two distinct patients.	Key characteristic of electronic health record text is high level of redundancy attributed to copy-paste.
Dean et al.	2015	25 progress notes (residents)	Academic Medical Center	Retrospective intervention	Bundle of best practice guidelines, note template and training	No significant improvement in copy-paste due to bundle.	Bundled intervention did not impact the use of copy-paste.
Digan et al.	2019	666,956 documents reviewed	Community Hospital	Retrospective record review	NA	Average rate of duplication within records of 33%. 20% of document contained drugs mentioned only in duplicated zones.	Rate of duplication similar to other studies. Suggests identification and annotation of duplicated zones can help identify information not relevant to the most recent visit.
Edwards et al.	2014	111 physicians writing 239 notes	Academic Medical Center	Retrospective record review	NA	Significant copy-paste material found in 10.5% of notes. Reason for visit absent in 10% of notes, medication list missing in 20% of notes, timing for follow-up absent in 18% of notes.	Copy-paste is frequently used in clinical notes.
Heiman et al.	2014	123 (medical students)	Medical School	Survey	NA	95% responded they copy their own notes occasionally with 66% copying frequently or always; 22% copy resident notes at least sometimes and 13% copy their attendings sometimes or frequently; 86% reported observing residents sometimes copying from other providers' and 60% reported observing attending physicians sometimes copying other providers' notes; 42% were aware of the medical school policy on copy-paste.	Copy-paste is used frequently by medical students and other clinicians, especially of their own notes. Copying from other providers is also a common occurrence even with most students considering it unacceptable. A written policy on copy-paste is not sufficient to create awareness on the practice.
Hilliard et al.	2020	422 (physicians, advanced practice nurses, physician assistants)	Health System	Retrospective cohort	NA	Clinicians with a higher usage of copy-paste had a lower likelihood of burnout (OR = 0.44).	Copy and paste may be an effective tool for efficient documentation capture that lowers burnout, especially compared to other efficiency tools.
Kroth et al.	2019	282 (primary and specialty care physicians)	Individual physicians	Survey	NA	75% reported note bloat due to unnecessary long copy and paste. High clinician stress was associated with note bloat.	Excessively long notes due to copy and paste place added stress on the reader.
March et al.	2016	31 (internal medicine residents)	Academic Medical Center	Simulation	NA	48% of notes contained copy-paste elements. All interns missed at least one safety issue with average recognition at 47% of safety issues.	Copy-paste is commonly used to populate notes, and could lead to safety issues due to data omission.
O'Donnell et al.	2009	315 (physicians, of which 253 wrote electronic inpatient	Academic Medical Center	Survey	NA	90% of electronic note writers reported using copy-paste when writing daily progress notes. 81% of copy-paste users frequently copied notes of other physicians.	Copy-paste is frequently used by physicians when note writing. Most physicians want to retain the ability to use copy-paste.

		notes)				71% of surveyed participants felt copy-paste contained more outdated and inconsistent information. 82% agreed copy-paste should be continued. 91% agreed copy-paste education is needed. 38% agreed alerts should indicate when notes are too similar.	
Patterson et al.	2017	N/A	Literature review paired with stakeholder analysis	Mixed methods	NA	Four key recommendations: 1) Mechanism to make copy-forward easily recognizable; 2) Provenance of copied information is readily available; 3) Adequate staff training regarding the appropriate and safe use of copy-forward in flowsheet software; 4) Copy-forward regularly monitored, measured and assessed.	Thoughtful and measured approach to copy-forward in nursing flowsheets is expected to improve efficiency of documentation and accurate information.
Senathiraj ah et al.	2014	13 (residents, attending, physician assistant)	Academic Medical Center	Mixed methods	Note splitting and text insertion	Clinicians used sticky notes to organize text in the note during documentation both for insertion and splitting into sections. Note splitting allowed some clinicians to avoid some consequences of copy-paste.	There are promising alternatives to copy-paste such as note splitting and text insertion that mimic its efficiency but reduce potential safety pitfalls. Use of structured headings and formatted text may make it easier to find required text. Future work remains on human factors consideration for template design.
Stewart et al.	2015	407 (interns, residents, attendings)	Academic Medical Centers	Survey	NA	16% of interns, 22% of residents and 55% of attendings reported that copy forward had a "somewhat negative" or "very negative" impact on critical thinking.	Mitigation strategies should be considered with copy-paste to facilitate critical thinking. Attendings, who are more often the note readers, were more likely to view copy forward negatively.
Thielke et al.	2007	167,076 records	Health System	Retrospectiv e record review	NA	Exam copying took place in 3% of all exams or in 25% of patient charts.	Indicates copy and pasting of exams potentially degrades quality of medical record.
Thornton et al.	2013	73 (residents, attendings) with 2,086 progress notes	Academic Medical Center	Retrospectiv e cohort study	NA	82% of notes from residents and 74% of notes from attending physicians contained equal to or greater than 20% copied information.	Copying among residents and attendings was common in the intensive care unit.
Tsou et al.	2017	NA	Literature review with expert input and safety event review	Mixed methods	NA	Reported use of copy-paste in the literature ranging from 66% to 90% of medical students, residents and attending physicians. An included study of 190 detected diagnostic errors found 7.4% contained copy-paste of prior notes and within those errors, copy-paste was a contributing factor 36% of the time. Most reported harms in the literature or safety event reviews are from individual case studies rather than aggregated data or quantified from large data sets.	Copy-paste is a commonly used practice across all clinician types. There are instances of individual patient harm related to copy-paste.
Winn et al.	2017	38 patient charts containing 418 notes	Community Hospital	Retrospectiv e record review	NA	Overall average of copied data was 85% and 30% of patients with complications did not have notes reflecting the complication. 57% of complication (4 of 7) were not reflected the following day after the complication.	Copy-paste may be detrimental to the EMR. The copy-paste function may lead clinicians to overlook complications.