The Empty SmartLink Solution: A Quality Improvement Initiative to Improve History and Physical Notes Documentation Using Clinical Decision Support

Sabrina E. Carro, MD; Sarah Milota, MD; Danita Hahn, MD; Amanda Rogers, MD; Sarah C. Bauer, MD

ABSTRACT

Introduction: The use of structured documentation via auto-populated discrete fields is important to facilitate medical decision-making, research, and quality improvement. If these fields are not filed properly, they will appear "empty," leaving behind incomplete documentation. Examples include past medical history (PMH), past surgical history (PSH), family history (FH), and active hospital problems (AHP).

Objectives: Our SMART aim was to decrease the incidence of "no PMH/PSH/FH/AHP on file" in history and physical notes (H&Ps) at our single children's hospital from 7.9%, 18.7%, 8.3%, and 17.0%, respectively, to less than 5% over 4 months.

Methods: A multidisciplinary team utilized quality improvement methodology. The population included all encounters admitted to pediatric hospital medicine. The outcome measure was percentage of H&Ps with "no PMH/PSH/FH/AHP on file." The process measure was percentage of H&Ps using the proper template. Interventions included a clinical decision support tool in H&P templates to display a hard stop if "no PMH/SH/FH/AHP on file" appears and documentation education. Statistical process control charts were used to analyze measures.

Results: "No PMH/PSH/FH/AHP on file" decreased from baseline to 1.2%, 2.2%, 2.9%, and 4.2%, respectively, showing special cause variation. H&P template use remained high at 87.2%.

Conclusions: The creation of a simple clinical decision support tool was associated with a decreased incidence of "no PMH/PSH/FH/AHP on file," achieving our goal. Utilizing automatic clinical decision support reduced the need to rely on education to cause a change, an important element of our tool. Future steps include implementation of a hard stop in other required areas of discrete documentation and ongoing evaluation of sustained change.

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INTRODUCTION

Clinical documentation has changed significantly with the widespread implementation of the electronic health record (EHR) since the start of the 21st century, and it continues to remain an essential component of safe patient care.[1-4] The transition to EHRs has shown mixed results regarding documentation completeness, time spent, and note quality and length.[5-9] These differences are largely attributed to heterogeneity in the degree of standardized, structured documentation.[10]

Standardized, structured documentation can refer to standardized templated notes on a larger scale, as well as discrete fields that display information obtained via clinician entry to capture key data elements (eg, drop-down lists) or auto-population from elsewhere in a patient's chart. Discrete field structured documentation facilitates real-time clinical care decision-making and promotes future research and quality improvement (QI) initiatives.[8,10,11] On the other hand, unstructured documentation, such as free text, is difficult to extract without natural language processing or artificial intelligence, limiting its potential.

Many parts of the history and physical (H&P) notes can be auto-populated via these discrete fields. However, if a piece of information is not filed to the chart as discrete structured data, the SmartLink will appear as "empty." In the case of a patient's past medical history, when there is no information in the history section, the SmartLink populates "no past medical history on file" (Figure 1A). While the use of SmartLinks does reduce documenta-

tion burden by auto-populating standard parts of a note, if not used properly, documentation can be incomplete.

Clinical decision support (CDS) is one avenue that can support clinician efficiency, documentation, and standard of care, and it typically falls into 4 categories: data entry, data review, assessment and understanding, and triggered by user task.[7] There are 5 "rights" that need to be considered when implementing CDS: (1) the right information, (2) to the right person, (3) in the right intervention format, (4) through the right channel, (5) at the right time in workflow.[12,13]

Our aim was to decrease the percent of encounters with H&P notes at our institution that contained "no past medical history on file," "no past surgical history on file," "no family history on file," or "no active hospital problem on file" (PMH/PSH/FH/AHP) to less than 5% in 4 months. We followed the Standards for Quality Improvement Reporting Excellence (SQUIRE) 2.0 guidelines.[14]

METHODS

This QI study took place at 1 tertiary care pediatric hospital with approximately 5300 pediatric hospital medicine (PHM) admissions in 2021. The institution's EHR vendor, Epic (Epic Corp, Verona, Wisconsin), is used in all patient-facing clinical care settings. The PHM service at the time had 33 hospitalists, 4 hospital medicine fellows, about 95 residents (including categorical pediatrics, medicine-pediatrics, preliminary pediatrics, pediatrics-anesthesiology, and child neurology, as well as emergency medicine and family medicine residents completing a pediatric rotation), and 10 advanced practice providers (APPs). Each child admitted to the hospital has an H&P note for their encounter written by a resident or an APP. The PHM service has created multiple disease-specific H&P templates for common diagnoses such as asthma, bronchiolitis, croup, hyperbilirubinemia, febrile neonates, and teen H&Ps. These disease-based templates are kept updated with local clinical practice guidelines. The H&P note templates, including all disease-specific templates, contain SmartLinks to auto-populate the PMH/PSH/FH/AHP from other areas in the EHR. Residents are able to use and share individual SmartPhrases for disease-specific H&Ps instead of the PHM disease-specific H&P templates.

Inclusion criteria included H&P notes written by a resident for admissions to the PHM service during March through June 2021. The APP notes were excluded from this study as APPs use separate note templates and do not attend the same meetings used for interventions in this project.

We chose 5% as our goal as it was below the previous average of empty documentation, which ranged from 7.8% to 18.2% for each of the different documentation components. While we strive for complete documentation every time, we acknowledge that there will always be room for further improvement. We began data collection 4 months before the end of the academic year and did not want to include new residents in July in this study given the significant learning curve in the beginning of residency.

Figure 1. History and Physical Notes Template (A) Before and (B) After Intervention of the Clinical Decision Support (CDS) Hard-Stop Tool

A. Empty SmartLinks when the History section has incomplete documentation.
B. CDS hard-stop tool prompting providers to document patient history.

At the time of project conception, we chose to focus on decreasing the incidence of "empty" auto-populated SmartLinks because billing was focused on the presence or absence of PMH/PSH/FH discrete data elements. In this context, we considered any documentation other than an "empty" SmartLink to be successful.

Interventions

A multidisciplinary team consisting of 2 pediatric residents, 3 pediatric hospitalists, and 1 Epic analyst used quality improvement methodology,[15] and developed a key driver diagram to understand the factors that led to having "empty" SmartLinks in completed H&Ps (Figure 2). As the key driver diagram was created, the 5 "rights" ofider CDS were consed when designing the interventions: the right information, to the right person, in the right intervention format, through the right channel, at the right time in workflow.[12,13] Three interventions were evaluated using QI methodology of plan, do, study, act cycles.

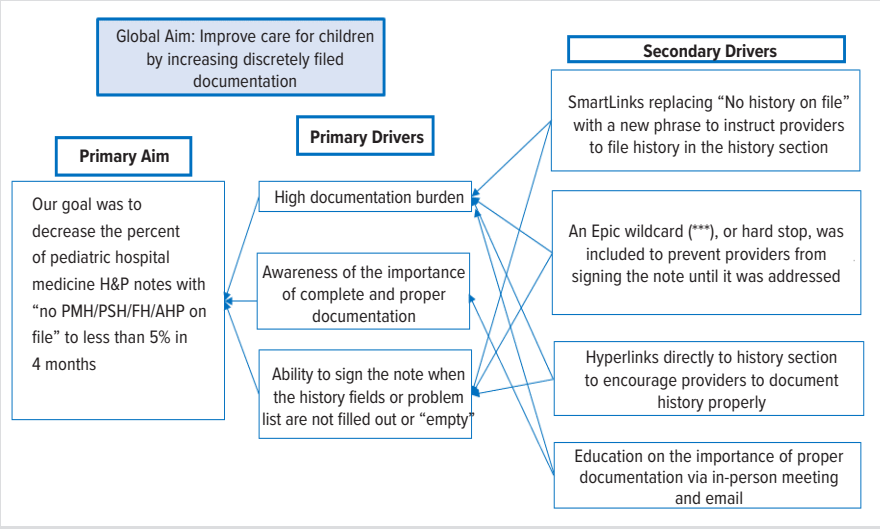
Intervention 1: We created a documentation-focused automatic hard-stop CDS tool that was built into all the PHM H&P templates to address empty SmartLinks for a patient's PMH/PSH/

FH/AHP. Using Epic's criteria-based rule function—referred to as CER—if there was no PMH/PSH/FH/AHP filed, then a new, separate SmartLink would appear prompting and instructing the user to use the appropriate history/problem section in Epic to enter the discrete information (Figure 3). This SmartLink included (1) an Epic wildcard (***) or hard stop that must be addressed before the note can be signed and (2) a link (like a hyperlink) to the appropriate history sections to encourage efficient documentation of history components. The clinician then refreshes the SmartLink in the note and the entered information appears within the H&P in the appropriate section (Figure 1B).

Intervention 2: Education on the new H&P note template with the hard-stop CDS tool was presented during a weekly resident meeting. This included education on pertinent components of an H&P, including information on the general templates, disease-specific templates, proper documentation phrasing, and impact on billing. Residents were then walked through the familiar components of the template followed by introduction of the new hard-stop CDS tool. We stressed the importance and requirement of using the PHM H&P note templates over individual SmartPhrases, as SmartPhrases would not contain the new hard-stop CDS tool or updated clinical practice guideline information.

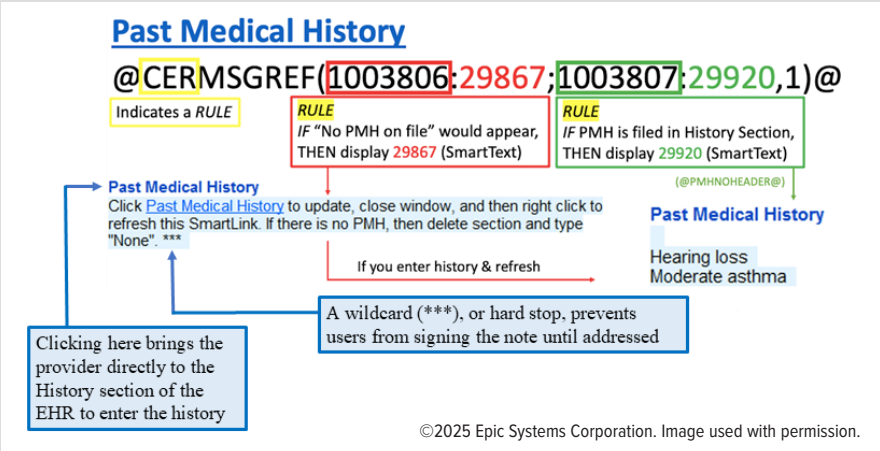
Intervention 3: An email was sent to the residents with a reminder to use the PHM H&P note templates, again stressing the importance of the note build for optimal documentation.

Figure 2. Key Driver Diagram



Abbreviations: H&P, history and physical notes; PMH, primary medical history; PSH, primary surgical history; FH, family history; AHP, active hospital problems.

Figure 3. EPIC Build Code of Clinical Decision Support Hard-Stop Tool



The rules indicate what would be shown to the user in the note documentation. The red arrow walks user through steps when the SmartLink is "empty" and how to address it to complete documentation.

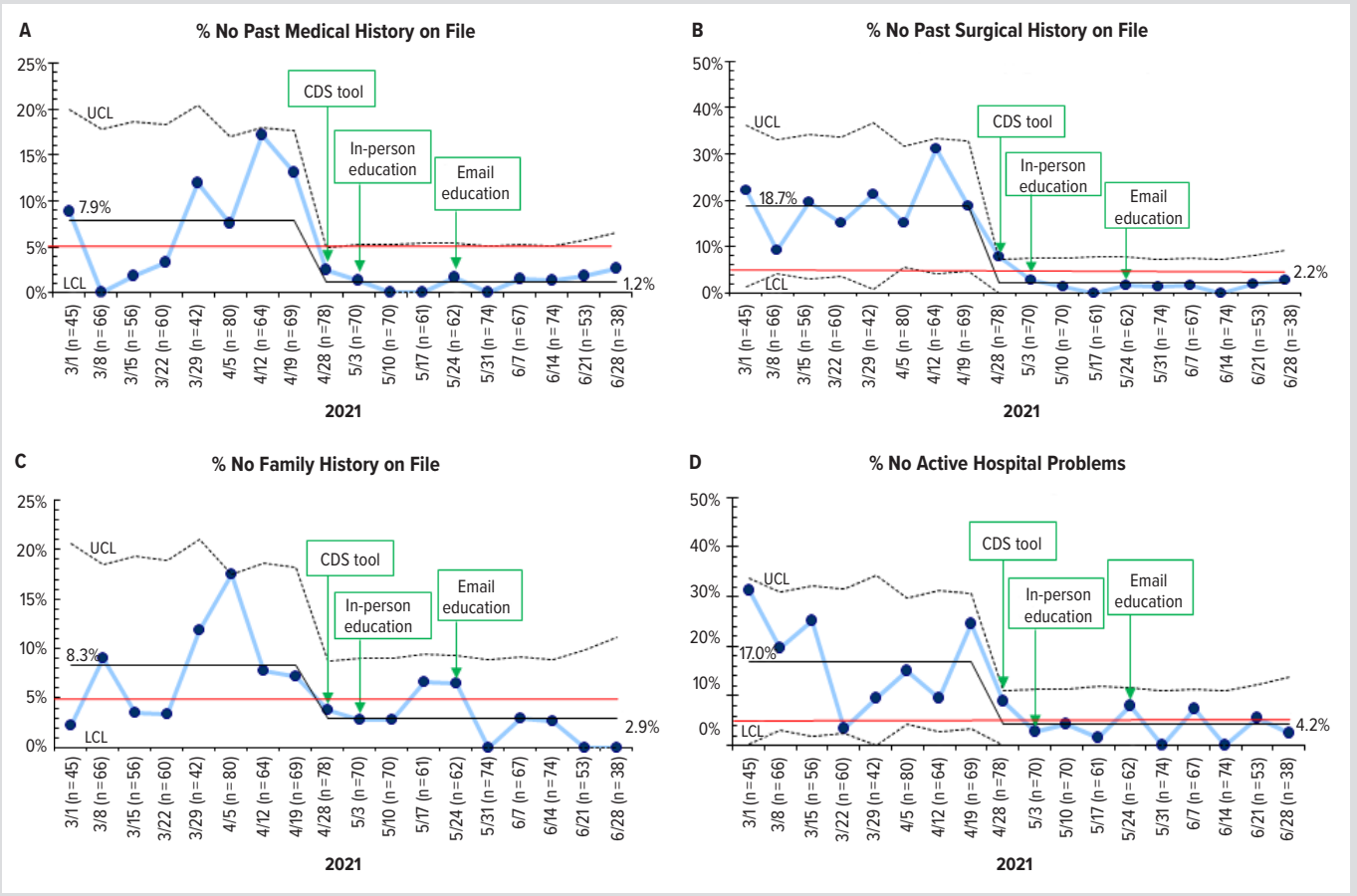
Study of the Interventions

Data collection occurred via Epic data reports on all H&Ps during the specified timeframe and data then were filtered by admission service and note writer. Each H&P was reviewed manually for the presence of auto-populated or free text PMH/PSH/FH/AHP, which is determined using a native Epic hover function. Manual chart review was performed by 2 members of the QI team (SC and SM). Each H&P was reviewed by 1 reviewer. If a note was missing any aspect of the patient's history or was left blank, it was considered "not on file." If the method of documentation (auto-populated vs free text) could not be identified with certainty by the first reviewer, the second reviewer would review the note. If there was still no conclusion, a third member (SB) of the study team would review to determine the documentation method. Template use was quantified by the same method as PMH/PSH/FH/AHP documentation. Data from March 2021 through April 2021 were used to establish a baseline. Data from May 2021 through June 2021—10 weeks after implementation of the hard-stop CDS tool—were used to assess the interventions. One-week intervals were used to analyze the data.

Quality Improvement Measures

The primary outcome measure was the percentage of PHM H&P notes written that included empty SmartLinks for PMH/PSH/

Figure 4. Outcomes Measures



Statistical process control charts by week showing the percent of history and personal notes with "no PMH/PSH/FH on file" and "no active hospital problems." Red line is the goal line.

Abbreviations: UCL, upper control limit; LCL, lower control limit; CDS, clinical decision support.

FH/AHP, stating these components were "not on file." The process measure was the percentage of PHM H&P notes written that used the PHM H&P template that contained the hard-stop CDS tool. The balancing measure was the percentage of PHM H&P notes written where "none" was free texted for family history instead of entering pertinent positive or negative medical history. Balancing measures can help quantify if the changes being made to one part of a system are resulting in new problems in other parts of the system.[16] This was chosen because all children should have medical family history, even if it is only pertinent negative history related to their admission problem. If the hard-stop CDS tool implementation led to note writers deleting the tool and typing "none" instead entering the data, it was expected that the number of charts with "none" typed for family history would increase. Although this was used for our balancing measure, we considered "none" as adequate documentation for family history for our outcome measure as it still aligned with the original aim of reducing "no history on file."

This project was deemed exempt from review by the Institutional Review Board.

Analysis

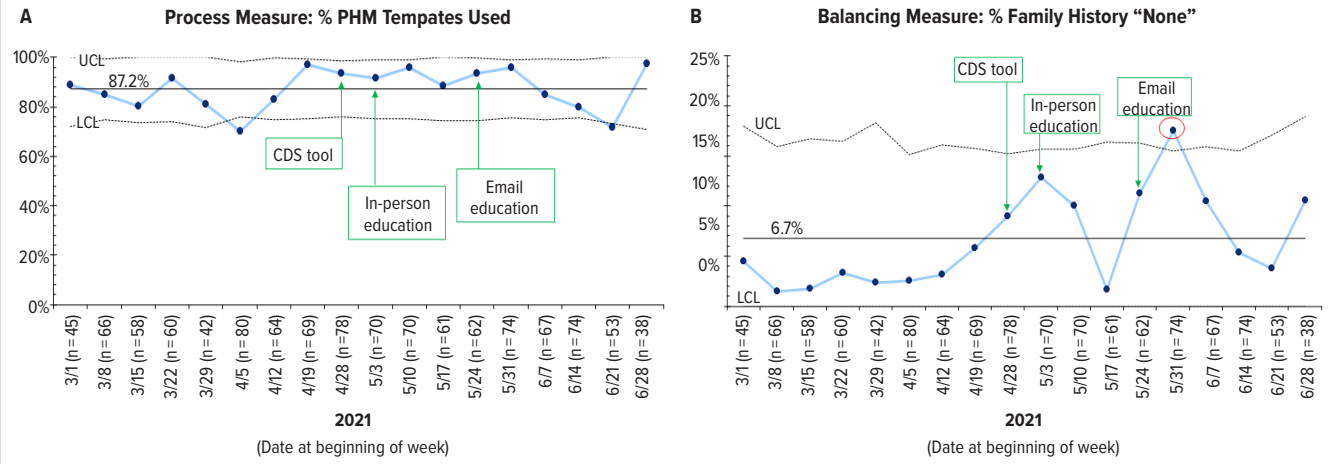
Statistical process control charts (P charts) were created using QI Charts for Microsoft Excel to assess for changes in measures. Standard tests were applied to distinguish special cause variation from common cause variation, including shifts when 8 or more consecutive points above or below the center line or points outside upper and lower control limits occurred?.[17] Control limits corresponding to ± 3 σ limits from the mean were included.

RESULTS

From March 2021 through June 2021, 1129 admission H&P notes were reviewed manually and met inclusion criteria. Each H&P note was assessed for the documentation of PMH, PSH, FH, and AHP.

For the primary outcome measure, the percentage of H&P's with past medical history "not on file" decreased from a baseline mean of 7.9% to 1.2% after interventions. Past surgical history "not on file" decreased from 18.7% to 2.2%. Family history "not on file" decreased from 8.3% to 2.9%. The percentage of H&P's with "no active medical problems" decreased from 17.0%

Figure 5. Process Measure (A) and Balancing Measure (B)



Process control charts by week.
Abbreviations: UCL, upper control limit; LCL, lower control limit; CDS, clinical decision support.

to 4.2% (Figure 4). There was special cause variation, based on standard QI methodology, for each of these outcomes given that each had at least 8 consecutive points below the respective baseline mean.[16]

Our process measure of the percentage of H&P notes written using the PHM H&P note template was consistent throughout the project at 82.7% with no special cause variation seen (Figure 5A). Lastly, our balancing measure, the percentage of family history listed as "none" remained unchanged at a mean of 6.7% throughout the project despite interventions. The week of May 31, 2021 does show special cause variation with 1 point above the upper control limit, but this was not sustained in subsequent weeks (Figure 5B).

DISCUSSION

After our interventions, the percent of PHM H&P notes with PMH/PSH/FH/AHP "not on file" decreased, achieving our goal of less than 5% for each piece of documentation. An important aspect of achieving our goal was the implementation of the hard-stop CDS tool, a high reliability intervention that we aligned as closely as possible with the 5 rights of CDS.

In the literature, there have been a variety of CDS tools that have shown improvement in documentation of discrete data across multiple settings.[10,18-21] The tool we created primarily addresses data entry as it prompts clinicians to complete important aspects of documentation that may affect patient care. By creating a hard-stop CDS tool for empty SmartLinks within the H&P note, it prompted the clinician to address data entry prior to signing the note, an example of a tool that applied the 5 CDS rights. The right person is given the right information through the right format at the right time to encourage the clinician to do the right thing: properly document a patient's history. Instructions were built into our tool that guided the clinician on the optimal use of the tool, encouraging use of structured fields in the EHR to file the information.

While the SmartLink hard-stop CDS tool intervention coincided with the initial decrease in "empty" documentation, educational interventions did not produce further change. A systematic review of interventions to improve inpatient EHR documentation found that user education was one of the most widely used interventions that demonstrated improvement;[21] however, educational interventions require individuals to remember changes and implement them in real time, ultimately relying on individuals to alter their workflow. We did not find that education interventions further improved documentation, which points toward an important aspect of the CDS tool: automaticity. Utilizing automatic or involuntary CDS reduces the need to rely on the individual to implement change—an important benefit of implementing the widespread tool.

Regarding the special cause variation seen in 1 week when evaluating family history, a possible explanation is that new rotating residents started that week and did not learn how to use the tool until later in the rotation. We have since edited the family history hard stop to state "document positive and/or negative family history" to discourage the use of "none."

We were fortunate that our H&P template use started high and remained high. Although H&P templates can improve documentation, the use of templates are sporadic and often are replaced by individual user SmartPhrases.[22-25] Illness-specific H&P templates are for common admission diagnoses, and their use can increase targeted documentation.[26] However, illness-specific templates are most successful at institutions whose documentation culture does not include many individual user

SmartPhrases. Influencer SmartPhrases, or an individual's commonly used SmartPhrases, can be edited to contain the desired documentation phrases. This then allows leverage to counteract low template use.[25]

Limitations

Our study did have a few limitations, including generalizability to other members of the health care team, measuring changes in documentation stored in the history tab, ability to measure time to complete, and accuracy of H&P documentation.

The exclusion of hospitalist APPs and subspecialty patients decreases the generalizability of our intervention. PHM APPs were excluded because they use a different PHM H&P template that they have adapted to their workflow, which is different from a resident learner. Subspecialty groups were excluded as they use their own separate H&P templates. However, similar principles can be applied in these other scenarios.

During the manual review process, we observed that some clinicians would insert the new PHM H&P template but replace sections with their own individually created phrases. This was evident from specific wording used that matched an outdated and retired template. Due to the method of chart review, we were unable to quantify the degree to which the templates were changed.

While we saw a decrease in the incidence of PMH/PSH/FH/AHP "not on file," it is important to acknowledge that we did not audit change in documentation in the History section, only the presence or absence of empty SmartLinks. In other words, free typed medical history was not considered "empty." If we wanted to investigate the use of the embedded hyperlink as a change documentation workflow, a more thorough audit of date and time each new piece of information was added to the history section would be needed. Lastly, we were not able to measure the accuracy of the information documented in patient's H&P as that would require follow-up confirmation from the family for each patient and is out of the scope of this QI study.

At the time of these interventions, billing was focused on the presence or absence of PMH/PSH/FH discrete data elements. Since completion of this project, billing regulations have changed such that the presence of a patient's history in the H&P note is not a required billing element. However, this work is still important as complete documentation is an important component for patient care.

CONCLUSIONS

Using a simple SmartLink, hard-stop CDS tool within the PHM H&P note templates, the percent of charts with PMH/PSH/FH/AHP "not on file" decreased, achieving our goal of less than 5%. Our interventions were simple and resulted in significant change to our documentation without negative consequences, such a maintained increase in "none" documented for family history. Our PHM H&P template use was high prior to our interventions, and we saw no change in template use after our interventions. This simple CDS tool can be implemented easily into many EHRs and demonstrates that you do not have to rely on individual education to achieve improved documentation. Future directions would include measurement of exclusively auto-populated fields and incorporating this hard-stop CDS tool into templates outside of PHM.

Financial Disclosure: None declared.

Funding/Support: None declared.

Acknowledgements: The authors would like to acknowledge the analyst, Jason Seidl, who helped build the clinical decision support tool.

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