

Using data to optimise the EHRs and performance

Received (in revised form): 19th January, 2020



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Abstract The use of data to improve the efficiency and the utilisation of the electronic health record has become an increasingly important topic in informatics. This paper looks briefly at why it is important to focus on the development of metrics and key indicators for provider and clinician utilisation and efficiency within the electronic health record. With the use of this data workflows can be developed within the electronic health record to decrease variation and provide a more efficient and value-driven approach to provide healthcare delivery. Workflow improvement and standardisation can also lead to improved clinical and financial performance.

KEYWORDS: provider burnout, EHR metrics, clinical decision support, reduced variation, optimisation

INTRODUCTION

Electronic healthcare records (EHRs) came of age in the early 2000s and have become the backbone of data collection in most healthcare organisations. EHRs were initially developed to be transactional and support a fee for service billing paradigm, helping to generate clinical revenue. They were not designed to assist in patient engagement or experience, reduce cost or improve quality, essentially the triple aim.¹ The EHR promises many opportunities to streamline and reduce variation in healthcare delivery, some of which has been realised.² Today's next generation electronic health records provide mechanisms for standardised clinical data entry, supporting value-based care, providing advanced decision support and improving patient engagement and experience through enhanced patient portals. As part of the Affordable Care Act, the US government invested heavily to encourage and incentivise the use of electronic medical records to improve overall healthcare delivery and the exchange of health information. This was part of the Meaningful Use Program, which began to focus not only on the use of the EHR but also on collecting data to help improve quality. Although the success of the programme is debatable, it certainly increased the use of the EHRs throughout the United States, with over 85 per cent of healthcare systems using some type of electronic health record.³ The programme continues to provide value as it is now focused on interoperability, which can help improve health outcomes by providing access and promoting the sharing of an individual's healthcare data.⁴ With the increased utilisation of the electronic record, significant improvements have been noted in medication errors and other metrics.^{5,6} It has, however, had the unintended consequence of shifting work to an already overloaded clinical workforce. This phenomenon, coupled with increasing regulatory burdens, has created an environment where provider burnout has become the perceived norm.

Although the electronic health record is largely effective in fixing this problem, it is not the only avenue for improvement and reduction of the burden on healthcare providers. We feel there are opportunities to improve the efficiency and utilisation of the electronic health record and have started to develop and utilise metrics to help clinicians improve not only the use of the technology but also more efficient and less variable workflows. Two areas have been the focus and catalyst of our move to develop improved processes and metrics — provider burnout and regulatory burden.

Provider burnout

Over the past several years emphasis has been placed on provider burnout and the fourth aim.⁷ Current data shows that while the rates have improved, a significant number of providers remain in jeopardy.⁸ Recent emphasis has been placed on the role of the EHR in physician burnout. Several papers show that while the EHR has been an easy target it is not the cause of provider burnout. A Harris Poll in 2018 showed that 66 per cent of primary care providers reported they are satisfied with their current EHR system. Over 60 per cent felt that the EHR had led to improved patient care.⁹ Recent KLAS research data shows that users who personalise the EMR and who have more training opportunities are more satisfied and less burned out.¹⁰ Provider burnout is a major issue within healthcare. EHRs, however, are not the only contributor to decreased clinician resiliency.^{11,12} Carilion Clinic has been leading the effort to battle burnout among our providers.¹³ We have continued to measure and assess clinician resiliency through regular surveys. We also work with an interdisciplinary team to assist with the technology components contributing to these issues. We have used the survey metrics to further refine areas in which we need to focus our work regarding the role of the EHR in provider burnout.

Regulatory burden

The administrative burden providers face is real.¹⁴ There are requirements for documentation from Centers for Medicare and Medicaid Services (CMS), The Joint Commission, payers and state regulations. Each of these rules is turned into a documentation requirement in the EHR. In many cases, work that in the past was done by ancillary staff is now pushed onto the provider for completion. The interpretation of these regulations also varies from state to state and in many cases health system to health system. Through EHR optimisation, the administrative burden may not be eliminated but can be reduced. Likewise, workflows can be optimised to produce efficient personalised systems. While these systems may not lead to provider happiness, they can reduce or remove the EHR as a source of burnout. Our informatics team has been working with clinical leadership and our system task force on provider burnout to make meaningful, data-driven changes to our EHR. This will allow the organisation to focus on the other areas contributing to decreased clinician resiliency. The development and monitoring of specific metrics to pinpoint areas of opportunity is critical to our approach to improving clinician well-being.

OUR APPROACH

Workflow versus content

Two important distinctions must be made in EHR use: what goes into the system (content) and how users interact with the system (functionality and workflow). System content, including note templates, clinical decision support advisories, patient education and data entry fields, should be based on the best evidence and updated routinely to stay current. Likewise, system functionality and users' workflows should be based on leading practices and updated as operational flows change or as the EHR functionality is updated. For high-functioning systems,

leveraging data, explicitly looking at the curation of content and use of workflows, can lead to a highly efficient system.

Focus on people and process

Eighty-five per cent of effective EHR use centres on people and process, while the remaining 15 per cent is governed by technology (Figure 1). As health systems look to optimise the EHR, administrators should look to people and process first, with analysis of opportunities for the EHR to support optimal workflows. Note that, while the EHR is not designed to fix a broken process or address poor provider behaviour, it can, with continuous improvement, support highly efficient workflows.

In one health system we interviewed, catheter-associated urinary tract infections (CAUTI) were significantly higher than the national average. The health system embarked on a technology solution to solve the problem. During the first iteration, a small group tried to overcome the problem by placing pop-up alerts notifying the physician that a catheter was in place and to remove it. The results of this attempt had little to no effect on the rates. Eventually, stakeholders from operational groups, clinical groups and education came together and, utilising system data, identified the workflows and users responsible for catheter insertion, removal and laboratory testing. Engaging these individuals enabled the health system to provide focused education on evidence-based practices around urinary

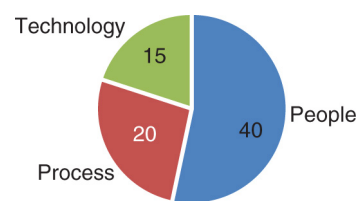


Figure 1: Contribution of people process and technology

catheters. Additionally, system content was enhanced to promote adherence to the new workflows. Furthermore, by reporting key metrics, users were given specific feedback on workflow adaptation. The combination of people, process and technology brought about a significant reduction in CAUTIs, bringing the system into alignment with national standards.

When optimising systems, administrators should plan on implementing changes that occur not only at the user level, but also at the department or speciality level as well as at the system level. Using data analytics, administrators can find patterns of system use and focus interventions on both workflow and content to impact specific users. In other cases, a single speciality or office may be involved. For example, at one health system, to increase pneumococcal vaccination rates in Medicare patients, analysis showed that, in addition to primary care offices, the health system had a high rate of unvaccinated Medicare patients in the community cardiology offices. This information gave system leaders the opportunity to decide to give these vaccines at the cardiology practice. Once leaders chose to embark on this initiative, office workflows offering an appropriate pneumococcal vaccine at the speciality area were implemented. In addition, to support the new workflow, appropriate clinical decision support was added to aid with reminders and appropriate timing of vaccines. The ability to analyse data at various levels in an organisation both facilitates focused decision-making and align organisational strategies. When combined with technology, these decisions not only lead to better care, but also help to reduce the cognitive burden for users. As David Blumenthal, President of the Commonwealth Fund, stated in a December 2018 paper, 'EHRs are a technology. Like most technologies, they can be used in a variety of ways for a variety of purposes. Their human masters decide'.¹⁵

Using external benchmarks

A recent collaborative effort provides an insight into areas on which the health systems should focus when optimising EHRs. The Arch Collaborative is an effort to examine and identify opportunities for EHR improvement on a national level. A multisystem survey of providers and other users sought to determine areas of opportunity for EHR optimisation to improve provider happiness. With over 150 provider organisations participating, information about training, usability and culture was gathered through standardised surveys. The data collected was aggregated to help identify important areas for provider satisfaction.

From the KLAS survey, collaborative participants learned that three vital areas contribute to provider satisfaction with EHRs: personalisation, training and shared ownership. The report allowed for benchmarking to help determine best practices. Armed with the data, system leaders can use this information to evaluate opportunities from within their system and look to national leading practices.

Our health system scored higher than expected in this survey. We have since used this data to help guide us in the development of an overall programme to improve the EHR experience for our users. Enhanced training, personalisation (not customisation) of workspaces and increased end-user involvement in how the EHR is configured and governed were our main takeaways from the survey and remain our focus as we embark on a two-year programme to optimise our EHR. We have also used this data to make more investments in our training staff, given the importance high-quality training in the EHR.¹⁶

EHR metrics

Healthcare leaders can leverage their EHR vendor and continue to increase opportunities to allow users to increase

customisation settings, including orderset, macros, documentation tools and general layout.

Given that EHR mastery is essential for provider satisfaction, EHR's now have built-in data collection to help analysts determine how well users are interacting with the system (proficiency). Providers who are more proficient leverage more tools, which in many cases leads to increased efficiency. Proficiency data covers areas such as use of macros, search tools and documentation shortcuts. As this data is collected, users can be benchmarked against other providers in their office, health system or country.

Additionally, the system information gives training staff and application builders the ability to target specific providers or groups that may have knowledge or skill gaps. With targeted proficiency training, users learn to master the EHR, including opportunities to personalise it to their needs, two of the three crucial elements in provider satisfaction.

As mentioned earlier, people and process are essential to optimised EHR use. Using system data to enhance workflows is fundamental to a highly optimised EHR. Similarly to capturing metrics on user proficiency, EHR systems also study user efficiency, or how users interact with the system.

Some examples of user-efficiency data include the number of messages received, time spent reviewing charts and afterwork hours users are working in the system. This data is captured and can be explored in detail. Furthermore, the information is benchmarked across health systems to help identify opportunities for optimisation at the user level.

At Carilion Clinic we are using data at both the user level and the system level to help drive insight and improvement. Our education and informatics teams used data from our EHR to target providers to increase their efficiency in the EMR (time spent in the system relative to workload)

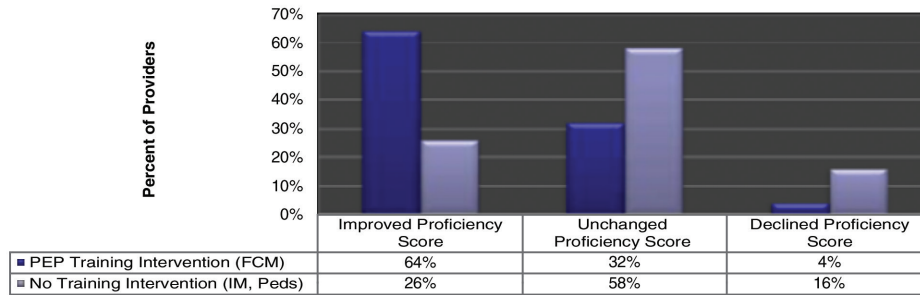
and proficiency (the frequency with which a user takes advantage of tools in the EMR). Utilising these reports, trainers identified physicians at risk and engaged them in additional support and efficiency training. The physician scores were monitored monthly for 4 months. Sixty-eight per cent of providers improved their efficiency, and 64 per cent improved their proficiency month over month. We have since continued to use this methodology to provide more targeted interventions within multiple physician groups in our organisation (Figure 2).

By determining outliers, deeper analysis can highlight issues with workflows that generate non-productive work for users. Additionally, workflows from the most efficient users are considered with the intent of continuous system improvement. Through data, leaders can identify and boost struggling users, while leveraging the attributes from leading users.

As with user data, information can be aggregated at the department or system level to help recognise larger opportunities for improvement. This data aggregation is especially important in identifying opportunities within multispeciality groups, where workflows in a speciality practice may be different from primary care. Information collected at the department level includes the use of speciality ordersets, number of messages received each day, documentation length and frequency of use of specific orders.

This data are important for two reasons. First, the data allows analysts to dive deeper and focus on areas that matter, optimising those high-impact areas first. For example, if a speciality department spends a great deal of time modifying medication orders, those orders can be configured to populate with the specialities' most common options. Next, when an education team is working with users, being able to objectively show providers how they rank among their peers is not only an impetus to change but also instils the belief that through change greater efficiency is achievable.

Proficiency Score Comparison with and without Training Intervention- October to February



Efficiency Score Comparison (PEP) with and without Training Intervention- October to February

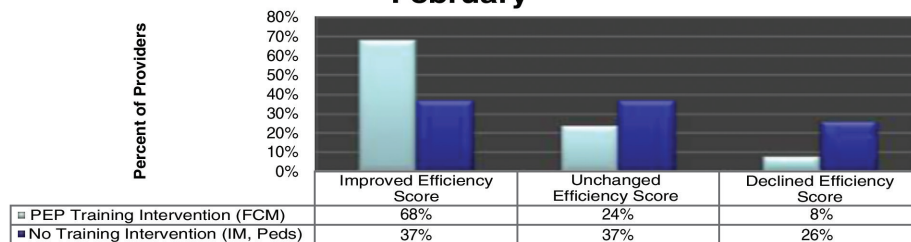


Figure 2: Improvement of proficiency and efficiency scores with enhanced/focused training

To effectively use the data, first look for outlying areas at the system level. By drilling down to the department, speciality or user level, analysts identify precisely where to focus changes to the system, or, more importantly, whether there is an aspect of the system that is not functioning as designed. Although we have focused on clinical workflows in this section, our training team applies these same principles within revenue cycle and patient access to monitor data collection and develop best practices based on EHR system data.

VENDOR BEST PRACTICES AND BENCHMARKS

In addition to the metrics that look at user and system proficiency, EHR vendors also report on system features customers have implemented. Our current EHR vendor has analytics reports that show the most common EHR features and number of

health systems that have implemented these features. Feature implementation data is arranged in a tiered approach, with the most common features at a lower level. High-functioning and efficient organisations have more features implemented. Interestingly, there seems to be a correlation between higher scores (more functionality) and better financial margins. Programmes like this help administrators develop a strategy for implementing new features by understanding those with the highest impact, learning from other organisations. As part of strategic planning, system leaders should be provided regular technology updates regarding new functionality or current unused functionality. As mentioned above, our organisation is starting a two-year programme to optimise and improve the usability of our EHR. Our finance leadership recognises the importance of improved processes, content and workflows within the EMR, not only in revenue cycle, but also

at the intersection of finance and clinical decision-making for clinicians. One example has been the development of a dashboard for clinicians to monitor professional billing denials. Although this has only recently been implemented, we have seen a reduction of denials by over 2 per cent during the first quarter of our fiscal year (October to January). The data is collected from our EHR and presented to clinicians on a regular basis for review. The information is further broken down by root cause, allowing targeted education for our clinicians. Furthermore, the dashboards can drill down to the individual provider and clinical case. This type of enhanced functionality adds to the overall value of the EHR beyond clinical improvement, helping to improve our overall bottom line (Figure 3).

OPTIMISING CONTENT

As mentioned previously, there is a balance between functionality and content. While it is important to have people and process optimised, there are opportunities for patient safety and increased efficiency by optimising content in the system. To illustrate this point, we will focus on ordersets as one example.

An excellent opportunity for leveraging data is when reviewing content with

ordersets. Ordersets allow a grouping of orders to be initiated as part of the patient care process. The use of ordersets leads to improved standardisation and reduced variability and, for users, results in increased efficiency. If the *content* is evidenced based and configured in a way that interacts efficiently with the system, even more efficiency is gained and higher quality achieved.

System content should be evidence based and reviewed regularly. While many organisations develop guidelines, pathways and protocols, incorporating these into the EHR is important. Using system reports, ordersets can be flagged for review at specific intervals. In areas where evidence is existing and long-standing, longer time frames may be appropriate between reviews. Conversely, in areas where protocols and workflows are changing, orderset content may need to be reviewed more frequently. As protocols change, the EHR must change as well. If users are forced to constantly adjust orders or clinical content because the system is not updated or has fallen behind, efficiency is lost, and the administrative and clinical burden increases.

In addition to helping with the timing and frequency of clinical reviews, EHR vendors and third-party systems can provide insights into clinical content use. These reporting tools

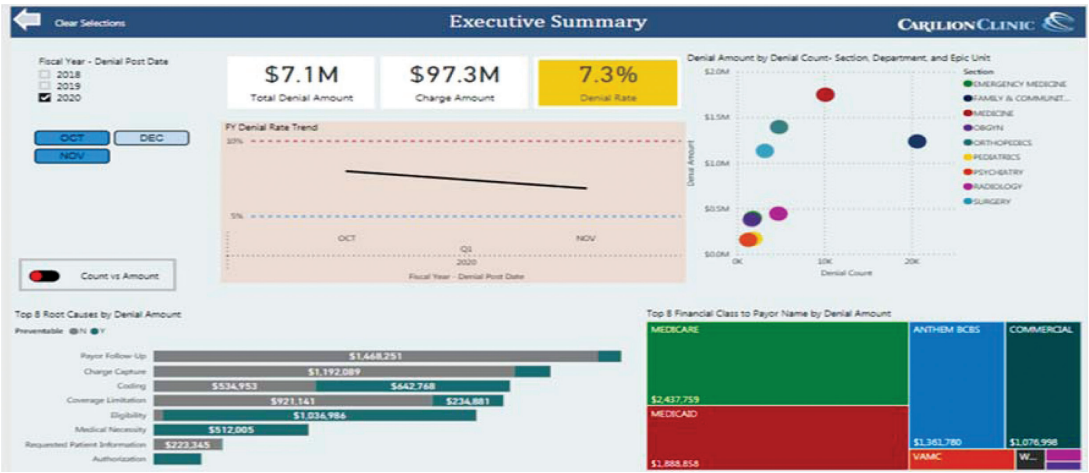


Figure 3: Example of a billing denial dashboard

Table 1: Data on orderset usage

how many times an order from an orderset is chosen compared with other orders
how often a user modifies order defaults
have users personalised the orderset
who uses the orderset
how many times has the orderset been used

can aggregate data and allow analysts to query content usage. When reviewing ordersets, data concerning order usage is obtainable (Table 1). Once analysts and subject matter experts have this usage data the orderset can be optimised, defaulting the most commonly used orders and order preferences, old orders removed, and, if needed, education about use and latest practices shared with specific users. As with ordersets, similar analysis and improvement is accomplished for user alerts, documentation templates and order preferences. As part of a project to reduce alert fatigue, we found that by suppressing five clinical alerts that were ineffective, the number of clinical interruptions dropped by over 1 million in a one-year time frame (table 2). At three seconds per interruption, that totals 830 hours of time saved over the course of a year. Routine updating of clinical content, integrating data insights with evidence-based content, can increase both user efficiency and system standardisation while providing better care.

Table 2: Ineffective clinical alerts and number of triggers over one year

Clinical Alert	Number of Triggers
BMI and treatment plan	500,000
Diabetes and elevated blood pressure	250,000
Asthma and controller medication	75,000
Falls risk	183,000
Atrial Fibrillation medication	75,000

Provider behaviour

As organisations seek to standardise workflow and decrease variation, data from EHR use can help change user behaviour. This is perhaps the most difficult change and requires the support of clinician leadership. Consider our first example with CAUTI, when having an alert did not seem to change behaviour. By targeting users and providing education, however, workflows were changed. Clinical decision support reports are a powerful analytic tool. Analysts can configure the EHR to trigger a pop-up at critical aspects of workflows. User responses are tracked and analysed. This analysis leads to several opportunities. Analysts may discover a more efficient place in the user workflow for the pop-up. At one organisation a reminder to order a screening test for hepatitis C was triggered when providers entered the chart. Most users acknowledged the alert but did not order the test. After the analysis, the pop-up was moved to a different place in the workflow, causing a pop-up when orders were signed if the provider had not ordered the screening test. Placing the pop-up in the correct place in the workflow changed provider behaviour and increased ordering rates significantly. We began utilising this approach in 2017 to address CAUTIs at Carilion Clinic. Our informatics and analytics teams provided clinicians with feedback on Best Practice Advisories (BPAs) involving ordering unnecessary urine cultures. We also monitored utilisation of standardised orders sets, education and documentation of catheter care, and reminders to remove a catheter after three days if not clinically indicated. This process improvement resulted in the elimination of CAUTIs at our organisation's largest hospital — from 3 cases in 2018 to 0 cases in 2019 (Figure 4).

Clinical decision support reports can help analysts determine specific user outliers and target educational interventions or in some cases behavioural interventions, if necessary.

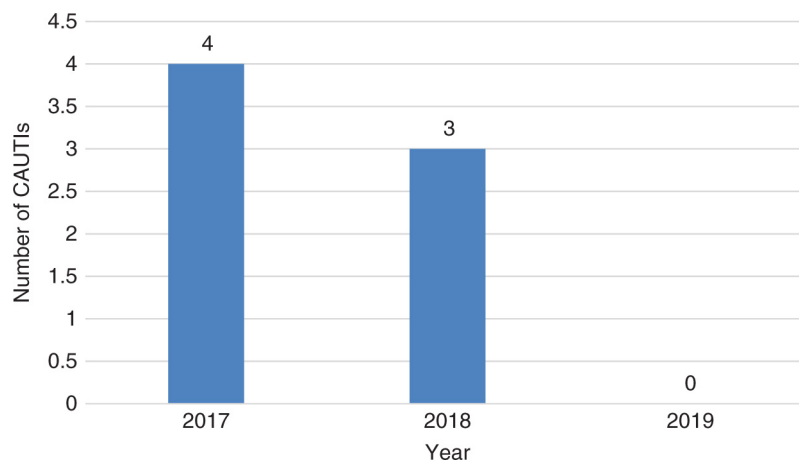


Figure 4: CAUTI reduction

Regular updates to system leadership on alert usage can aid in identifying these outliers and provide the opportunity for crucial conversations. Provider conversations with leadership, while difficult, can be supported with objective data regarding provider usage.

CONCLUSION

The EHR, although not perfect, remains the backbone for health system data management. We have shown that by using data and data analytics, the EHR can be optimised to promote user personalisation, enhance workflows and provide value beyond clinical outcomes. While not a direct cause of physician burnout, poorly implemented EHRs can contribute to provider dissatisfaction and decreased resilience. By optimising EHRs, health systems can reduce the negative impact on provider burnout and improve overall efficiency and discrete data capture. Likewise, focusing on the mastery of the EHR and allowing for increased personalisation leads to improved provider satisfaction. Removing unnecessary interruptions in workflows, such as non-value added clinical decision support, will also enhance the value of the overall EHR experience.

When optimising EHRs, the focus should be on people and process, with the aim of improving workflows and functionality.

Although technology aids in the functionality, the application of the functionality is crucial to success. The use of specific reports to highlight workflow adherence and system utilisation can help organisational leaders identify opportunities for continuous process improvement and allow for the measurement of implemented changes.

In addition to people and process, content optimisation can improve efficiency and lead to reduction in variation along with improved quality and patient safety. This is an area that we have had challenges in addressing since the content owners need to be those clinicians and operational team members closest to how work is performed. Health systems should ensure that content is reviewed regularly, and as part of these reviews, usage reports need to be made available to reviewers. This content also includes dashboards and data review to ensure relevancy and accuracy.

Optimisation of the EHR is an ongoing and continual process. While we have a long way to go towards making providers and end users happy with the use of EHRs, with data, health systems can identify, focus and measure ongoing progress and look for areas with the potential for continued improvement. By investing in improving the EHR functionality, workflows and education of end users, health systems will benefit not

only from improved quality outcomes but also from enhanced revenue opportunities and cost avoidance.

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