Leveraging Open Source to Advance Clinical Decision Support

HIMSS Media survey highlights how current CDS systems fall short, offers potential solutions

Electronic clinical decision support (CDS) systems have the potential to improve the quality, safety, efficiency and effectiveness of healthcare.[1] Yet, according to a 2018 HIMSS Media survey, sponsored by Red Hat, many existing CDS systems are falling short. Although 70 percent of respondents believe CDS is a "critical" or "high priority," only 40 percent are "extremely satisfied" or "very satisfied" with their current CDS tools.[2] The survey results shed light on the specific ways existing CDS tools are failing, in addition to the ways that open source can help CDS achieve its full potential.

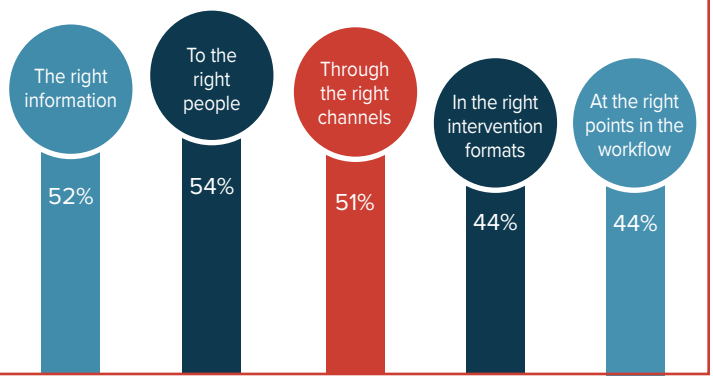
The "Five Rights"

The ubiquity and maturity of electronic health records (EHRs) means that clinicians have access to more data than ever before. In fact, the volume of data can be overwhelming. CDS systems have a significant role to play only if they can cut through the noise of the almost infinite amount of patient information, clinical guidelines and related data and provide the clinician with the specific data they need, at the precise time they need it.

This is where the "Five Rights of CDS" come into play. The Five Rights of CDS refers to the ability of a CDS system to get the right information, to the right people, through the right channels, and in the right intervention formats, at the right points in the workflow. The survey results show that existing CDS systems are not consistently delivering on the Five Rights (Figure 1).

Slightly more than half of all respondents reported their current CDS tools were "extremely successful" or "very successful" at getting the right information, to the right people, through the right channels. Only 44 percent reported their current CDS tools were "extremely successful" or "very successful" at presenting information in the right intervention formats and at the right points in the workflow.

FIGURE 1. **Effectiveness of CDS tools at delivering on the "Five Rights"**



The importance of workflow

Among all respondents, "workflow concerns" were the most frequently cited barrier (53 percent) to adoption of a CDS system. "Workflow is really critical," said Joyce Sensmeier, Vice President of Informatics for HIMSS. "If CDS information is presented too early, clinicians aren't going to circle back and incorporate it. If the

information is presented too late, well, then it's too late. You have to present the decision-making support at the point where the clinician can assimilate and act on it. Otherwise it's disruptive, rather than helpful."

One of the challenges of effectively incorporating CDS into an organization's workflow is the way most CDS tools are designed. Many CDS tools are proprietary software solutions designed to align with a hypothetical, standardized workflow that doesn't accommodate the nuances of workflow in individual organizations.

Many different variables affect workflow. For example, where is the intervention happening? In an acute-care setting, operating theater or outpatient clinic? Who is executing the intervention? A physician? A nurse? A therapist? Each of these variables impacts workflow. In addition, "every organization prides itself on operational excellence by developing workflows and procedures that support patient outcomes at their facility," said Atif Chaughtai, Chief Technologist, Healthcare, North America, Red Hat.

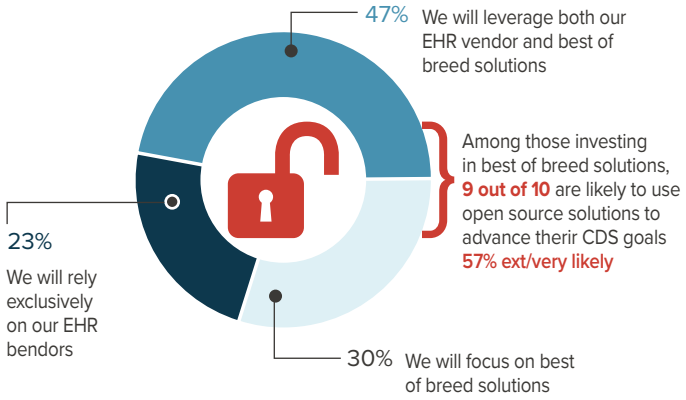
"Because of all of these variables, no single workflow will fit everyone," said Chaughtai. For CDS to work effectively, it must be integrated into how each individual organization operates, rather than trying to change the organization's workflow to accommodate the CDS solution. "One-size-fits-all solutions don't work for CDS," he said.

The promise of open source

The survey results illustrated the different approaches healthcare organizations are using to advance their CDS goals (Figure 2). Less than one in four (23 percent) are relying exclusively on their EHR vendor for CDS. About one in three (30 percent) are using best-of-breed solutions. Just under half (47 percent) are using a hybrid approach, i.e., leveraging both their EHR vendor and best-of-breed solutions.

Of the 77 percent investing in best-of-breed solutions, nine in 10 indicated they are likely to use open-source solutions to advance their CDS goals. Of those, nearly six in 10 reported they were "extremely likely" or "very likely" to use open-source solutions to advance their CDS goals.

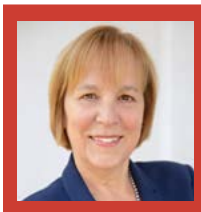
FIGURE 2. **Providers are using best-of-breed and open source to achieve CDS goals**



Using open source to advance CDS makes sense for a number of reasons. By its very nature, an open-source solution is easier to modify. Because the source code is accessible, clinicians and informaticists working together can design a CDS system that integrates organically with an organization's clinical workflow. Modifications are more difficult with proprietary systems, since the source code is not accessible and the organization must hire the vendor to execute changes.

In addition to the flexibility of open-source solutions, open source has the advantage of benefitting from the input of many contributing physicians and organizations, as opposed to being developed by a single vendor team. For example, OpenCDS, a widely known open-source CDS solution, boasts a collaborative community of more than 900 individuals and more than 500 organizations.[3]

"Open source uses a collaborative development model, just like the medical profession does," said Craig Klein, Director, Healthcare, North America, Red Hat. "If you are



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Vice President of Informatics
HIMSS

trying to solve a particular disease, you are not going to get very far if you have just one doctor working on it. You typically have a lot of people working together. Even when you are treating patients, there is not just one person making all of the decisions. There is a team of people involved.

"When you compare that to the open-source development model in software, it's the same thing," Klein said. "A lot of the unhappiness with current CDS systems is because they have been developed by a small number of people in a proprietary environment, rather than in an open environment."

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The importance of a feedback loop

In addition to the flexibility and adaptability of a CDS solution, another factor that makes a big difference in CDS effectiveness is the existence of a feedback loop. Whether an organization is using an open-source CDS or a proprietary one, it is vital to be able to incorporate ongoing feedback into the CDS process.

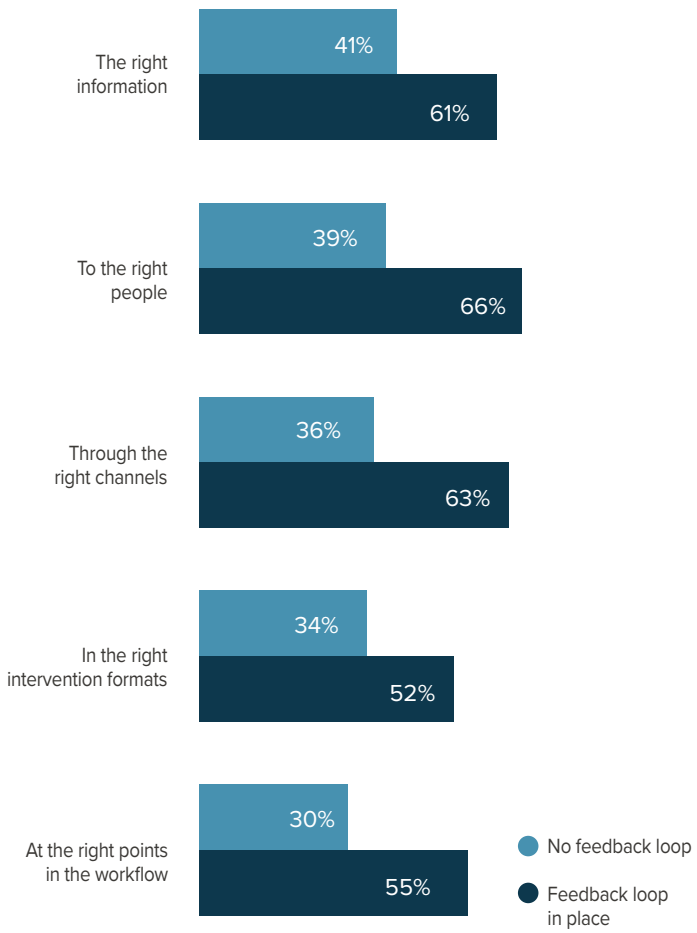
"You have to be able to ask and answer questions about the CDS system," said Sensmeier. "Is the system working? Is it improving care? Is it improving quality? Is it improving patient safety? That feedback loop is really important."

Just over half (56 percent) of respondents reported having a feedback loop in place for continuous improvement of CDS applications. For those organizations that did report having a feedback loop in place, the presence of a feedback loop made a big difference in the perceived efficacy of their CDS solution. Seventy-eight percent of organizations with a feedback loop in place reported they were "highly satisfied" with their existing CDS tools.

In addition, those organizations that reported having a feedback loop in place reported more success in achieving the Five Rights of CDS than those who don't have a feedback loop in place (Figure 3). For each of the Five Rights, there was at least a 20 percentage point increase in perceived effectiveness in delivering each Right for those respondents with a feedback loop in place.

The same adaptability that allows open-source CDS solutions to accommodate differences in workflow also facilitates operationalizing feedback loops in CDS systems. "Having the flexibility to customize the CDS to your system is a big differentiator," said Sensmeier. "It makes the case for open source very compelling."

FIGURE 3. **Effectiveness of CDS tools – with and without a feedback loop in place**

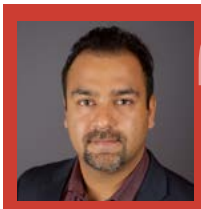


Other barriers to CDS implementation

Besides workflow concerns, respondents identified the expense of implementing new systems (48 percent) and integration/interoperability concerns (38 percent) as top barriers to CDS usage. As with the workflow concerns, use of an open-source solution can help an organization overcome these obstacles.

"Open source can help you reduce the cost of implementing a new CDS system," said Chaughtai. For proprietary solutions, costs typically include the cost to purchase the software and implementation costs. "Because open-source solutions are typically a fraction of the cost, you eliminate a large part of the costs typically associated with purchasing the software. In addition, there are a lot of resources available, including a large supply of developers familiar with open source technology, which drives down your implementation cost," he said.

With respect to integration and interoperability, the same flexibility that helps open-source CDS solutions align with organizational workflows makes it ideal for integration. "Linking systems together and getting different systems and applications to talk to each other is what open source does best," said Klein. "I call open source the Switzerland of technology environments, because it makes integration and interoperability so much easier."



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Poised for the future

In addition to helping increase the usability and efficiency of CDS systems, Chaughtai believes that implementing an open-source platform can help healthcare organizations prepare for the future. "We are in a world now where technology is changing at an exponential rate," said Chaughtai. "The fact that the entire open-source community is actively and continuously contributing feedback to the system makes the solution very strong and poised for success. No matter where technology moves – virtualization, containers, completely serverless or something we haven't yet imagined – an open-source platform ensures that an organization will be flexible enough to adapt to the next iteration of technology that comes along."

[1] "Clinical decision support promotes patient safety," HealthIT.gov, retrieved from https://www.healthit.gov/topic/safety/clinical-decision-support
[2] Advancing Clinical Decision Support, HIMSS Media Research Report, sponsored by Red Hat, July 2018.
[3] "OpenCDS Collaborator Highlights," opencds.org, retrieved from http://www.opencds.org/Home.aspx