Measure Effects and Refine CDS Interventions

Measuring the Effects of your CDS is a Key to Success
To ensure that CDS is truly improving care processes and outcomes, its effects must be measured. Measuring CDS impact is the only way to know if and how the CDS is being used, if clinical goals and objectives are being met, if end-users feel that CDS-related work processes are effective and not disruptive, and can help your organization assess the benefits of CDS. Moreover, measuring and reporting these effects may be required for both federal and state programs.

Understanding whether CDS implementation is having its expected impact gives organizations the confidence to move ahead with CDS, relying upon end-user feedback and performance to refine and improve CDS interventions.

This how-to guide will help your organization:
- Build in mechanisms to gauge end-user feedback
- Ensure that data is being recorded properly for quality reporting purposes
- Track effectiveness of CDS interventions overall
- Refine and improve CDS interventions

Indicators of Effective CDS Measurement
✓ Data on use and impact is being gathered and assessed regularly
✓ Clinical Quality Measures are reported to the appropriate agencies and accompanying financial incentives are received
✓ End-user feedback is used to drive and design enhancements to interventions

Key Steps to Measuring the Effects of CDS Intervention

The following steps will help your organization to track CDS use and its effects on measures of impact (defined in CDS "How-To" Guide #3). Within each step, tools and links to other resources are provided that can guide your activities.
It will be helpful early in CDS planning to work with your EHR vendor to understand the mechanisms you can use to capture key measurement data. Your organization may also need to enlist measurement experts including consultants to help in collecting and analyzing CDS impact data.

Examples of measures commonly captured to measure the effects of CDS interventions include:

Measure	Examples (most comparisons before and after CDS implementation)
CDS satisfaction, usage, usability	- usability assessments from end-users, end-user feedback, use of CDS from logs

Much of the material in this "How-To" guide was based on the collaborative development of and use of content in a 2011 book published by the Healthcare Information and Management Systems Society (HIMSS) entitled "Improving Outcomes with Clinical Decision Support: An Implementer's Guide, Second Edition."

Measure	Examples (most comparisons before and after CDS implementation)
Workflow impact, efficiency	• time to complete work tasks before and after CDS, e.g., direct order entry, medication turn-around time
CDS use by clinicians	• alert use, rate of alerts firing, alert overrides, feedback from clinicians
Clinical objectives addressed with CDS	
o Care processes, adherence to guidelines	• adherence to clinical guidelines; time to ordering of important medications
o Patient safety	• error reports, adverse events, transfers to ICU, death, medication prescribing errors
o Patient Outcomes	• disease management related to adoption of guidelines (e.g., blood pressure control, lipid levels, H1ac levels), hospital lengths of stay, re-hospitalizations
Healthcare services utilization and efficiencies	• reductions in unnecessary or inappropriate laboratory test orders
Costs	• resource management, provider medication (number, type, class) and laboratory test costs
Unintended consequences (includes all measure types above)	• alert fatigue, overrides of serious alerts, adverse events due to CDS

Step 1: Assess CDS use and usability on an ongoing basis

Capturing clinician feedback on CDS interventions is important to its success. By gauging end-user experience and satisfaction with CDS, organizations help to ensure that interventions work as intended and that workflow remains efficient. Poor screen design, unclear guidance, inconsistent navigation, and slow system performance can result in low or inconsistent use of CDS. Without consistent monitoring and assessment, workarounds to CDS interventions can arise and offset intended benefits to patients, clinicians, and the organization.

Soon after implementation, organizations should begin to assess end-user satisfaction with new CDS-enabled processes. End-user feedback gathered through support structures during roll out should serve to identify initial challenges and lessons learned with the intervention. Formal and informal means of gathering end-user feedback – from short satisfaction questionnaires, email based assessment forms, to hallway and lunchroom conversations – may be used to assess end-user experiences. Consider using anonymous means of feedback as well; a suggestion box may serve to help collect input from otherwise silent end-users.

As part of gathering feedback, organizations should assess whether, how frequently and how clinicians use a CDS intervention. This is an important but potentially complex and time consuming task, and may differ by intervention and clinician. One simple means of determining overall CDS usage is to examine system logs to determine how frequently a CDS intervention – for instance, an alert or reminder – was followed or ignored/overruled. EHR system developers and vendors should be able to provide your organization with a means to query your system and report this form of system usage.

To-Do: Identify mechanisms to track how often each intervention is being used, who is using it, and how it is received by end-users.

Resources and Tools

Use and Usability Issues Log (Resource #33) – The Use and Usability issues log can serve to document the status of each intervention. The worksheet provides fields for the intervention, the issue, the date, and the party responsible for the given intervention.

Skeletal Outline of Different Stakeholders and Their Potential Evaluation Role (Resource # 31) – This tool may help to lay out the roles different stakeholders may play in the evaluation of CDS. The table, using medication management as an example, is set up with three columns: Who, What, and Why. The 'Why' column offers some key questions that might be helpful to considering the evaluation of interventions.

[AHRQ Health IT Evaluation Toolkit](#) – This toolkit provides guidance on how to evaluate health IT. Examples of measures relevant to quality, safety and efficiency are provided along with suggested data sources and the relative costs to collect the measures.

Key Attributes to Track for Deployed CDS Interventions (Resource #32) – This resource provides a list of items important to track for a given CDS intervention. The systems, end-user targets, and affected populations are some examples of the attributes that should be tracked.

Step 2: Collect and report intervention performance against clinical goals and objectives

By comparing measures before and after implementing CDS, your organization can determine whether or not CDS is having its desired affect. When preparing for implementing a CDS intervention, measures for clinical goals and objectives should be identified, and the level of performance on these measures prior to CDS implementation (baseline) should be assessed. At intervals determined by your implementation team and documented in your plan, performance data on these measures after CDS implementation should be collected and analyzed.

Resources and Tools

Worksheet: Performance against Objectives (Resource #34) – In this worksheet, the intervention, the clinical objective, the baseline data, and the performance data can all be documented. The fields for "Desired improvement" and "Other effects" can help to track how the intervention meets expectations.

Step 3: Use measurement results and feedback to refine CDS interventions

It is important to consider how user feedback and performance on CDS-related measures might promote refinements to CDS interventions. Often the two will be tied to one another. For example, if the intervention is a clinical reminder to give a foot and eye exam to a patient diagnosed with diabetes, then one would expect compliance with foot/eye exams to increase. If there is no increase, this may point to a usability issue for which end-user feedback may help solve. There are other cases where an

intervention may impact a clinical process as intended, or where clinicians find using the intervention too time consuming or frustrating.

Step 4: Involve end-users in CDS intervention enhancements; communicate changes back to end-users and ensure continued support

Users need to know that their feedback was received, assessed, and acted upon. If changes were not based up feedback, end-users need to know this, too, and why. In addition to making enhancements or not, communication with end-users and including them as part of the process is important.

Internal discussion about the intervention results will be valuable. Your organization should develop and follow a plan to communicate intervention effects. As with the communication plan for CDS roll-out, a communication plan for CDS impacts should address who will gather and share the results, with whom they be communicated, how often, and how decisions will be made about next steps. This communication and planning should be scaled to the intervention – that is, it should be robust for major new CDS intervention configurations tied to central practice drivers (such as pay for performance targets), but much less involved for more minor CDS enhancements such as a specific new problem-specific documentation form.

Keep in mind that residents and younger clinicians tend to be more open to adopting the use of CDS. Older physicians, who did not have the opportunity to learn about EMRs in medical school, are more likely to voice complaints. In particular, community-based physicians may be resistant to taking the time to learn the efficient use of CDS because they spend little time in the hospital. This is important to factor into your monitoring use of CDS and in your communication plan with end-users.

Example of how measurement can inform responses to problems and adjust the CDS

Organizations may face the problem of physicians routinely overriding alerts because an occasional inaccuracy can lead to a loss of trust. For example, prescription alerts may sometimes be misleading when dosages change or patients are not taking their medication. A measurement system can help determine if alerts are firing more or less often than expected. It can also determine if certain clinicians are not using the alerts. It is helpful to determine how to best work with these clinicians, who may in fact play a very positive role in early identification of issues or problems.

One example of the successful use of feedback from end users is when a clinical reminder indicated to a frustrated physician that a prescription needed to be refilled even though the patient still had half of the prescription remaining as a result of the dosage being lowered. The feedback went to the Clinical Applications Officer from the local Information Resources Management Office and the reminder was removed from the patient's record.

Small Practice/Outpatient Practice Considerations:

- Work with your EHR and CDS system developer or vendor to assess your system's capabilities to collect, store, and make available the data required to measure and monitor these three different aspects of specific CDS interventions:
    - whether the CDS system is functioning as expected (e.g., if the alert fires in the correct situations);

- o the effect of the interventions on clinician behavior (e.g., whether they change the order); and
- o the effect of these interventions on one, or more, intermediate process of care measures (e.g., whether the patient receives the medication that was contraindicated in the alert within a specified period).
- Internal discussion about the intervention results will be valuable to small practices. While a formal communication plan may not be necessary, small practices should nonetheless specify who will gather and share the results of CDS performance, when these will be reviewed and discussed, and how decisions will be made about next steps. This communication and subsequent planning should be scaled to the intervention as well.