Clinical Content-Knowledge Management Systems: Evidence-Based Order Sets and Knowledge Management for the EMR

A number of vendors offer evidence-based content and powerful platforms that provider organizations can use to manage the lifecycle of clinical knowledge in their systems. We present an overview of their major features and functions. A subsequent report will review some of these vendors in more detail.

The Vendor Space

Clinical content vendors provide evidence-based, professionally vetted order sets and other content forms that can be implemented in the electronic medical record (EMR), complete with links to supporting evidence sources. Using such order sets may reduce the time required to develop and build these from scratch (or translate them from paper). By associating the content with well respected evidence sources, these products can also improve physician acceptance, a major task in EMR implementation and adoption. Perhaps most valuable, this category of content vendors provides a platform and a process for ongoing management of the knowledge built into the EMR. This note focuses specifically on characteristics of systems that provide physician-oriented content (especially order sets) and an integrated knowledge management function, and is meant as an overview of this space. Representative vendors at this time include Zynx, Wolters Kluwer, and BMJ Group. A future note will discuss some of the individual vendors in more specific detail.

Functions and Features

Content types. All of the vendors in this space offer pre-developed physician order sets with links to evidence, such as literature citations, expert review citations, and links to guidelines. Several also offer nursing care plans designed for specific conditions and situations. In addition, some vendors have built libraries of clinical decision support (CDS) elements—disease management reminders, alerts, and the like—that can be built into the customer’s EMR system and catalogued and managed in the content vendor’s knowledge management system. These CDS elements differ from the order set products: while the order sets can be configured on the content vendor side to at least approximate the version that will appear in the native EMR, alerts and reminders need to be built specifically to work with the vendor’s rule engine and other components of the transactional systems—a far harder task.

Order set review, collaboration, and editing view. Health care organizations (HCOs) usually oversee the content management process using some form of governance board for clinical content, which manages the following steps: Once a customer selects an order set from the vendor’s catalogue to bring into their EMR, the order set must be assigned to a local clinical owner, reviewed by the HCO’s subject matter experts for appropriateness, and customized to fit with local workflows and practices and the specific EMR’s order catalogue. The content vendors’ products provide an online collaboration tool that facilitates an asynchronous, blog-like review by multiple parties, and documents the discussion thread and changes to the content. This collaboration and editing process is critical to improving the likelihood of clinician adoption. Links to evidence are visible in this view, permitting order set reviewers to consider the evidence as they determine which elements of the content to include in the local version of the order set.

The order set build process. Building the local version of an order set requires mapping the order concepts from the content vendor’s order set to specific order
items in the local EMR. Content vendors are approaching this in several ways. In most cases, the general process is as follows: The customer’s order catalogue is imported in its entirety from the EMR into the content vendor’s order set build space. As the local version of the order set is constructed, the system matches the order elements to the appropriate order items in the catalogue and flags any potential discrepancies or gaps in mapping for review and manual resolution. Following this reconciliation process, the content vendor sends a file to the EMR (e.g., perhaps XML) that allows instantiation of the order set in the native EMR environment. Another approach is to use a service-oriented architecture (SOA) or “open API” (application program interface) model that facilitates more direct integration with those EMRs that can accommodate this, potentially eliminating the need for back-and-forth file exchange.

All of the content vendors are working with major EMR vendors attempting to standardize and simplify this integration process as much as possible, and content vendors are at different stages in the journey with the different EMR vendors. Provider organizations considering buying these products must examine carefully the vendor’s current capabilities and future plans for integration relative to the provider’s EMR. For example, BMJ Group entered into collaboration with Cerner early on and built their order set review and construction functions using the EMR’s build tools. As a result, customers who choose this content vendor-EMR combination may experience a simpler build and integration process than in some other cases. On the other hand, some EMR vendors do less to accommodate the integration process (for example, by not facilitating the export of the order catalogue from the EMR). Customers working with these vendors must send a file from the content vendor order set build environment to the EMR system representing the desired order set content, and EMR developers must code the order set manually in the EMR.

**Knowledge management functions.** A particularly valuable feature of this group of products is the platform they provide for clinical knowledge management for all order sets, and potentially other content types, in a single location independent of the EMR’s transactional systems. Clinical knowledge has a lifecycle; its stages include knowledge acquisition, incorporation into the EMR, review and update, and retirement (see Related Research). These products provide powerful tools to assist with all of these phases. The critical requirement for the successful use of these products as knowledge management systems is that all changes to relevant EMR content must originate in the content management system, thus preserving synchronicity between the knowledge catalogue and the content in the EMR. We believe that this is a best practice that will, over time, separate the most successful users of EMRs from the rest of the industry.

The use of these systems in the acquisition and incorporation stages has been discussed above. The greatest challenges in knowledge management are in the content update and maintenance process, which begins with being able to locate all of an organization’s EMR-embedded clinical knowledge in one place. The content management system can serve as a comprehensive catalogue of all order sets in the EMR. Each order set or CDS element catalogued is associated with key metadata that facilitate management (for example, type of CDS, subject matter expert owner, date of last review or revision, and date next due for review). The systems should be searchable by review date, permitting a knowledge management leader to see all order sets due for review in the coming month, and automatically sending an email notification to the corresponding owners instructing them to begin the review process. Review and discussion by multiple reviewers are done on line in the collaboration
view. The system keeps an audit log of the build process, making it possible to look back at the reasoning behind decisions that were made in the past.

All of the vendors provide regular updates to their customers in the form of modifications to order sets, FDA alerts about drugs, and other updates on recommended changes to medical practice. In addition, they then facilitate the next step in the revision process. Since in most cases, all orderable items are indexed in the content management system, it is possible to directly map recommended changes to the customer’s order sets as currently built. For example, when a drug is taken off the market, the vendor system can immediately identify all order sets that incorporate the drug in question, facilitating the process of removing all such orders from the system and replacing them with a suitable alternative. Some systems provide side-by-side views of current and revised order sets to facilitate the revision process. It is important that providers have a process to act promptly on such updates rather than having to retrospectively react in crisis mode.

In addition, most vendors have some degree of mapping of their order set concepts to standardized terminologies, usually including SNOMED, ICD-9 and ICD-10, RxNorm, and LOINC. This facilitates knowledge management and interoperability with other applications, and is needed to meet meaningful use criteria.

Provider organizations considering purchasing, or currently using these products should look closely at how the products fit with their overall approaches to order set development, CDS, and knowledge management:

- Most HCOs have preexisting, locally developed order sets for many common conditions and therapies. Organizations that have yet to implement an EMR and computerized practitioner order entry (CPOE) have an opportunity to consider whether their current content is optimal for building into the EMR, or whether to supplement or replace it with standardized content from a vendor. Arguments for the latter could include moving the organization toward more standardized, evidence-based practice and reduction in variation in care; putting in place a single platform designed for knowledge management; and facilitation of content upkeep through regular updates from the vendor.

- HCOs that have already implemented an EMR and have an existing catalogue of order sets with which they are content may find the knowledge management capabilities of these systems attractive, as building the order sets in the first place is only the beginning of the management challenge. One challenge will be changing the processes that have been in place for building order sets to ensure that all build occurs on the content vendor platform, not directly within the EMR; otherwise, the value of the knowledge management function (i.e., catalogue accuracy, comprehensiveness of order set metadata) is lost.

- Whether or not you choose to utilize a content vendor, do not neglect your responsibility to manage the clinical knowledge you have built into your EMR. At a minimum, you need a comprehensive catalogue of your content, preferably maintained externally to the EMR (so as not to require IT analyst assistance when clinical knowledge leaders wish to review the catalogue); and appropriate metadata need to be associated with each content element. Your content must be tracked and managed over time by one or more clinician leaders.