Integrating best evidence into patient care: a process facilitated by a seamless integration with informatics tools*

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The Vanderbilt University paper discusses how the Eskind Biomedical Library at Vanderbilt University Medical Center transitioned from a simplistic approach that linked resources to the institutional electronic medical record system, StarPanel, to a value-added service that is designed to deliver highly relevant information. Clinical teams formulate complex patient-specific questions via an evidence-based medicine literature request basket linked to individual patient records. The paper transitions into discussing how the StarPanel approach acted as a springboard for two additional projects that use highly trained knowledge management librarians with informatics expertise to integrate evidence into both order sets and a patient portal, MyHealth@Vanderbilt.

The Vanderbilt University Eskind Biomedical Library (EBL) has a long history of integrating evidence into clinical teams. More recently it has adapted this expertise into a more scalable approach that allows the integration of evidence into existing medical informatics tools. This paper discusses the institution's experiences in integrating librarian-filtered evidence into informatics tools and processes, using several examples to illustrate how its knowledge management (KM) team has proactively embedded evidence provision services into the clinical care environment.

THE PATH TO INTEGRATION WITH THE INSTITUTION'S MEDICAL RECORD SYSTEM

For over thirteen years, more than ten Vanderbilt information experts have provided filtered synthesized evidence at the point of care via the Clinical Informatics Consult Service (CICS) [1–3]. This service brings information specialists directly into the critical care setting to provide patient-specific information at the time and place where evidence-based practice can best influence clinical decision making. CICS information specialists provide searching, critical appraisal, and synthesis of the literature in response to complex questions received from rounding clinical teams. Evidence packets developed by the information specialist represent all viewpoints reported in the literature and provide concise, informative summaries of the findings as they relate to the patient case at hand. One of the key elements of the CICS program is that the information specialists are integrated members of the clinical team with which they round, equal in their unique skill set to the pharmacists, dietitians, and other ancillary team members. The information specialist is the team's expert information provider, with a knowledgebase in clinical medicine and study design as well as information-seeking skills [2].

The rounding experience achieved three fundamental goals. First, it allowed the information specialists to overcome what the team often refers to as the "fish is fish" phenomenon. *Fish Is Fish* is a children's book by Leo Lionni that describes how a fish that has never left its pond is visited by a companion frog that grew up in the pond and then left to see the world [4]. The frog describes to his friend, the fish, all the creatures he has encountered beyond the pond, but given the fish's limited experience, the fish can only picture these creatures in the context of his own world: cows as fish with udders, birds as fish with wings, and so on. Similarly, librarians can truly understand the urgency and complexity of clinical questions only when they immerse themselves in the clinical environment where the questions arise. By rounding, Vanderbilt's information specialists know and thoroughly understand the clinical setting and develop a true appreciation for the urgency of and complex nature inherent to this environment. The second goal of the rounding experience was to solidify the value brought to the clinical team by the information specialists' assistance in answering complex questions raised by clinicians, informing decision making, and establishing how critical the CICS service was to patient care. The third goal achieved was the increase in the information specialists' ability to understand the full context in which the question was asked, thus increasing the likelihood that the information delivered in response to the clinical team's question was well targeted and highly relevant.

As the CICS efforts were successfully adopted by many clinical departments at Vanderbilt, it became clear that the program required a mechanism for scaling to meet the increasing demand by clinicians. StarPanel, Vanderbilt's electronic medical record (EMR) system, was identified as the informatics tool that, because of its architecture and mode of use, could best support the scalability and integration of the CICS evidence-based medicine (EBM) service [5]. StarPanel was developed in-house and implemented at the institution in 2001. This EMR is a web-based application that allows health care providers across the institution to access an aggregate view of the

many components that contribute to the overall patient medical record. StarPanel is used throughout the medical center for both outpatient visits and inpatient care. The system had already successfully tested a secure information basket for communication in the clinical team. In 2004, the information experts of the KM team, aided by the StarPanel developer, leveraged the StarPanel functionality of the information basket to create what is currently called the ''EBM Literature Request'' basket [2, 3].

Clinicians with access to this EBM Literature Request basket can submit clinical questions to information professionals, have the option of linking the question directly to a patient's chart, and can specify the urgency of the request and the desired turnaround time for the response. A KM information specialist receives notification that a question has been submitted and can log in and view the details. All KM information specialists have completed the necessary Health Insurance Portability and Account-ability Act (HIPAA) requirements and adhere to the same stringent confidentiality guidelines as all clinical staff. When the request is linked to a specific patient, the information specialist accesses the patient chart to understand the context of the patient case. Completed evidence packets are sent back to the clinician via the StarPanel message basket. In many cases, clinicians elect to make these packets part of the official documentation in the patient's medical record.

The information specialists' ability to directly access the patient chart is parallel to the experience of being on the floor during clinical rounds and hearing firsthand the overall context of the patient case, such as comorbid conditions and current medication regimen. Like rounding, this access allows informa-tion specialists to better understand the medical situation, and it informs the retrieval and synthesis of the most highly relevant evidence.

Another advantage of the EBM Literature Request basket is that it enables information specialists to identify teaching opportunities that may otherwise be unmet. A significant characteristic of the evidence service is that it addresses complex questions, defined as questions that may require several hours of effort from a skilled information professional to answer. Identifying noncomplex questions enables informa-tion specialists to conduct online training or coaching that, as an academic teaching institution, is funda-mental for equipping clinicians for future success, especially because they may ultimately find them-selves in a setting where this type of support is not available.

Soon after the EBM Literature Request message basket was implemented, the medical center inde-pendently started a new program for advancing the use of EBM to guide order sets and for designing the patient portal. Because of their exposure to the success of the KM information specialists' efforts with CICS and StarPanel, the teams involved in these imple-mentation efforts quickly sought out the collaboration of the KM team.

EVIDENCE-BASED MEDICINE–GUIDED ORDER SETS

The KM team's second example of evidence integra-tion involves collaboration with medical center teams responsible for order set development. While the StarPanel approach to integrating evidence into medical records reflects a patient-specific approach, the KM team's initiative with the order set develop-ment teams enabled the exploration of embedding evidence into the institution's health care practices on a broader scale.

In 2004, the medical center set out to determine a mechanism to help doctors and clinical teams routinely apply more evidence-based clinical guidelines to inpa-tient—and, in some cases, outpatient—settings. Order sets are point-of-care actions (or orderables) usually grouped around a specific procedure (for example, asthma control). The order sets are then integrated into the institution's computerized physician order entry system for use at the bedside. These evidence-based order sets are intended to be a mechanism to reduce unwanted variability and improve the quality and safety of care, while also lowering costs.

In 2005, the KM team became systematically involved in maintaining order sets as evidence consultants to the nursing case managers who are charged with coordinating the order set revision and creation process. As part of the multidisciplinary order sets teams, the KM information specialists further extended the evidence filtering and synthesis model described above by providing order set teams with relevant, synthesized information from the primary literature that in turn is used to inform order set revision and creation. In addition to researching the evidence, KM information specialists continuous-ly help train and guide the case managers to locate accessible evidence on their own. While KM members work closely with case managers, the KM team maintains quality control for the evidence packets.

Another important aspect of this project is an online repository of completed evidence packets. By apply-ing metadata and knowledge management approach-es, the repository allows KM information specialists to harvest previously discovered knowledge of existing evidence to inform the creation of a new and more up-to-date evidence provision.

Since the inception of this collaboration, the KM team has created more than 225 evidence packets specifically for teams throughout the medical center as they develop and revise order sets, thereby increas-ingly impacting institution-wide patient care. It is not unusual for KM team members to receive accolades and comments on how useful their work is to the clinical teams and to the institution at large. It is often noted that the provision of evidence in clinical care can provide the institution with a great deal of benefit.

PATIENT PORTAL INVOLVEMENT

The StarPanel and order sets projects both demon-strated the KM information specialists' abilities to

integrate evidence into informatics tools and processes, thus making the team crucial to accomplishing the medical center's priorities for evidence integration and provision in patient care. In further recognition of the KM information specialists' value, the team charged with creating the MyHealthAtVanderbilt (MHAV) patient portal sought to recruit a KM information specialist at the early inception of the project.

MHAV is a web-based application available to Vanderbilt University Medical Center patients to view parts of their medical records. This portal was created as an effort to promote patients as more proactive partners in their care management and increase patient-provider communication. The portal offers a variety of interactive features including the ability to message a physician, schedule appointments, and request prescription refills. Patients can also view their billing and insurance records and set up third-party access to their own Vanderbilt medical records.

The KM team had already established skills in meeting information needs on a consumer level through the Patients Informatics Consult Service (PICS). Initiated in 1998, PICS applied the KM information prescription model, analogous to a medical prescription, to provide information packets customized to patient medical conditions [6]. The KM team's efforts in the MHAV project focus on integrating consumer health information via several mechanisms throughout the site [7].

Part of the approach that the KM team takes in providing information for patients through the portal is (1) developing descriptive condition-specific synopses and (2) compiling corresponding listings of vetted, authoritative links for specific "health topics." The health topics, developed in coordination with outpatient clinics, are collections of links to online consumer health resources based on currency, authority, and accuracy criteria. They may be disease specific, such as cystic fibrosis, or cover preventive health topics, such as colorectal cancer screening. The KM team maps each disease topic to relevant International Classification of Disease (ICD-9) codes. This mapping, in combination with patient demographic data such as age and gender, allows the topics to be automatically and dynamically displayed in each patient's record when they access the portal. When a patient logs into MHAV, the left side of the portal's real estate is reserved for displaying (1) health topics directly relevant to their health care conditions and (2) news stories into which the KM team has incorporated health information resource links as contextually appropriate. Health topics are dynamically matched to patients, but patients also have the option to access the entire library of KM-created health topics. Each topic begins with an overview of the included links and organizes the links by concepts pertinent to the issue.

The most popular part of KM's integration into MHAV is the links to explanatory information about lab test results. Patients can click on the name of most lab tests and link to consumer-level information explaining what the lab test means and how to interpret the results vis-à-vis standard values. Additionally, links are provided for explanatory information on vital signs and immunizations.

The KM team's work in MHAV has been successful, with about 30% of MHAV users taking advantage of the resources to which the library provides links in their patient records. Feedback from medical center health care providers, as well as patients, continues to indicate high levels of enthusiasm for this type of integrated evidence provision.

The examples cited above clearly demonstrate how the KM team has in the last decade fully integrated its services into informatics tools, thus allowing a true value-added scalable approach to the provision of evidence. Additionally, the examples show how an intelligent environment promoted this integration of services and created an integral partnership of skills and competencies.

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