A New Paradigm for Information Retrieval:
InfoButton Access Delivers Knowledge for Point-of-Care Applications

Executive Summary

In the course of treating patients, a broad range of medical questions face clinicians. According to research, most of these clinical questions go unanswered, usually due to insufficient references being available, or time constraints in conducting the necessary research[1,2,3,4]. When questions go unanswered, the possibilities of practice variation, medical errors, preventable adverse events, and even patient death all exist.

Two reports by the Institute of Medicine heightened the need to bring clinical research to the point of care, and emphasized the need to improve the quality of healthcare and reduce medication errors[5,6]. With the requirements of accrediting bodies and the increased involvement of consumers, the pressure on clinicians is intensifying according to these reports. This creates a greater demand for the effective use of evidence-based medicine. A critical component to providing better care is access to clinical knowledge solutions in the patient care process – particularly the availability of up-to-date clinical research at the point of care.

Clinical references are widely available, but often are not integrated into the patient care process, making the process to consult them cumbersome and time consuming. Today, technology and medical content development have evolved to the point where it is possible to meet these demands much more effectively. The development of "infobuttons" is making it possible for clinicians to access up-to-date, context-specific information at the point of care from within their current workflow application software, which saves time and improves utilization of knowledge resources.

Thomson Micromedex® InfoButton Access delivers trusted clinical reference information directly from any electronic medical record (EMR), computerized physician order entry (CPOE), or other health information system (HIS) application with the simple click of a button. InfoButton Access improves clinical decisions by providing quick access to Micromedex drug, disease, and patient education information, along with links to more detailed supporting information as needed. This improved availability of answers to clinical questions is expected to help reduce medication errors, practice variation, serious adverse events, and even patient deaths.

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The Micromedex Solution

Micromedex InfoButton Access is the first commercially-available application that uses infobutton technology to integrate clinical reference information seamlessly into a host application, such as an electronic medical record application, computerized physician order entry system, or other health information systems.

Here's how InfoButton Access works:
A physician reviewing a patient's electronic medical record has a question about the correct dose of a medication, given the patient's compromised renal function. The physician clicks on an information icon, or infobutton, and a new window appears with information on that specific medication, including dosage for renal impairment.

Behind the scenes, here's what happens:
When a user clicks on the infobutton, the electronic medical record gathers pertinent information about the patient, such as the name or identifier for drugs on the medication list. This information is coded into a secure message to the Micromedex InfoButton Access application. InfoButton Access conducts a search within the Micromedex evidence-based clinical content, and returns a response matching the query parameters to the electronic medical record system. The response is then displayed to the end-user.

This message-based information retrieval allows for significant flexibility in designing and sending clinical questions. Each InfoButton Access message can contain a variety of message parameters to help refine the question that is being asked. Some of the available message parameters include:
   » The main topic of question, for example, a drug or disease name
   » The type of main topic, for example, an indicator for either Medication or Disease
   » The specific area of interest for the topic, for example, the dose adjustment information for renal insufficiency, or the type of test to order to confirm a disease diagnosis
   » An indication of whether the content of the response should be written to professionals (clinicians) or consumers (patients)
   » If the content response is for consumers, an indicator for either English or Spanish language

Combining these parameters allows many different questions to be asked, such as "What are the adverse effects I should be looking for with gentamicin?" or "Can you send me the patient education handout for acute myocardial infarction, in Spanish?" Thus, the electronic medical record, or other HIS system, can code for different, specific questions to be asked depending on the point in the patient care process or the HIS application that the clinician is using.

To support this functionality, InfoButton Access can search multiple Micromedex databases of clinical support content, including two clinical references, the DrugPoints® System and Disease Information Briefs, and two patient education databases, the CareNotes® and DrugNotes Systems. But the available information doesn't end there. The returned documents have active hypertext links to more in-depth information contained in the comprehensive DRUGDEX® and DISEASEDEX™ Systems, which are hosted online within the Micromedex® Healthcare Series portal. For example, if the clinical question isn't answered by the brief document on gentamicin dosage for renal failure, the clinician can click a second link and go directly to the monographic document on gentamicin, specifically to the dosage adjustments section to read more detailed information.

In summary, InfoButton Access provides clinicians with immediate access to brief, relevant information on disease states, treatment guidelines, medications, and standards of care as well as easy-to-understand materials to help educate patients about their health condition and encourage their participation in care. And clinicians have the security in knowing that if their question isn't answered immediately, there is drill-down capability to exhaustive evidence contained in more detailed Micromedex knowledge solutions.
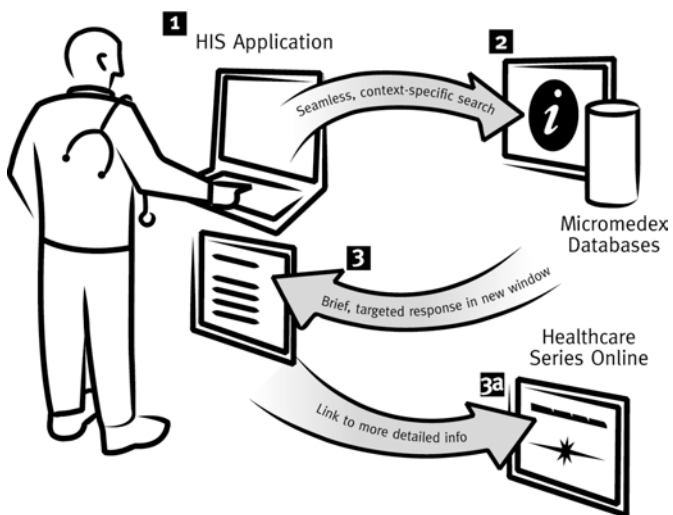
Just A Starting Point

The capabilities of InfoButton Access are extensive and flexible, but the vision for the full capabilities of InfoButton Access is even more comprehensive. Future releases of InfoButton Access will allow a greater array of parameters to be included with messages, thus providing more specific information results. The parameters slated for future releases include:

- » **Patient-specific parameters**, such as age, gender, allergies, test results, and co-morbidities, which will enable more patient-specific treatment or medication recommendations to be returned.
- » **User-specific parameters**, such as clinical role, specialty, or user-defined preferences, which will enable responses to be tailored according to user demographics. The use of these parameters could help reduce "noise" and just provide information relevant to the individual practitioner.
- » **Context-specific parameters**, such as clinical setting or organizational affiliation, which will enable responses to be tailored to an outpatient versus an emergency care setting, or tailor medication results based on formulary status, for example.

In short, this is just the beginning of a revolution in the way information is provided to clinicians. Over time, the knowledge supplied will be increasingly specific to the case at hand, and to the clinical question.

A Simple Solution with Big Results

Physicians and other clinical users are likely to embrace Micromedex® InfoButton Access because it helps overcome many of the hurdles associated with accessing information at the point of care. For example, InfoButton Access helps users overcome:

Information Access Difficulties. Instead of toggling between applications such as an EMR or CPOE and a clinical knowledge application, users can seamlessly connect to Micromedex® InfoButton Access from any host application.

Data overload. The system uses advanced logic to return only pertinent and reliable information culled from Micromedex databases. As a result, users do not spend time searching through reams of information.

Data Inconsistencies. InfoButton Access is the first information retrieval product that can be deployed in a consistent manner in multiple systems across the entire patient care process, including diagnostic evaluation, treatment planning, medication ordering, order processing, medication administration, patient education, and patient monitoring. When consistent information is delivered in a consistent manner, clinicians will use the system more frequently to

answer their clinical questions – resulting in more consistent, and better patient care.

Workflow snags. The application fits seamlessly into clinicians' established workflows. Because it is context-sensitive and non-interruptive, with a few mouse clicks users can initiate a search, find information, and then resume the clinical task in the host application.

Training burdens. The information icon is intuitive and easy to use, thus clinicians quickly begin using InfoButton Access with little or no training. If training is needed, Micromedex provides on-site and pre-recorded training materials.

Major investments. Best of all, healthcare providers can begin using the system with very little upfront investment because InfoButton Access does not require an additional investment in another content system or technology platform. Instead, it works seamlessly to bridge between the current health information system and the existing Micromedex subscription.

In addition, healthcare providers will experience increased use and return on investment from Micromedex subscriptions already in place. Already 88% of the top 200 U.S. hospitals (according *to U.S. News & World Report)* and more than 3,200 hospitals across the nation utilize Micromedex clinical knowledge resources. InfoButton Access will help these providers get more out of their investments.

Technically Speaking

Micromedex® InfoButton Access is hosted on an expansive network and production environment, in a world-class data center that provides:

» 24 x 7 availability
  - Fully redundant network, application, & database tiers
  - Dual geographically dispersed data centers
  - Software clustering to provide full application fail over
  - 24 x 7 network and application monitoring by highly trained technical staff
  - 24 x 7 call center & help desk
» Scalable and flexible hardware and software
» State of the art security
  - Physical security
  - Firewalls
  - Authentication and Access Control
  - Full usage logging
  - SSL encryption of sensitive data
» InfoButton Access Web Services
  - URL based and XML based API's
  - HTML or XML responses
  - Alignment with evolving HL7 standards
  - Easy incorporation into existing HIS applications
  - Support for HTTPS
  - Vendor Certification/Integration Testing Site

Case study: Changing Behaviors

Although the theory of evidence-based medicine promises to improve the quality of care delivered, many are waiting for the proof.

A study conducted at Partners HealthCare System in Boston, indicates using effective information retrieval technology at the point of care can indeed change the way clinicians practice medicine. Clinicians including doctors, nurses practitioners, and other caregivers at the healthcare system, just like their brethren across the country, had for many years administered care to patients even when they had questions about optimal treatment.

Performing research at the point of care, however, was difficult. It took too much time or resulted in what Saverio Maviglia, M.D., describes as "data overload, information underload." That is, clinicians would conduct research and find volumes of related data but rarely pinpoint the information to answer a specific question.

That all changed when Partners began to access Micromedex and other decision support content via infobutton technology designed by Partners.

Without any training or promotion of the technology, clinicians used the infobuttons in about 2 percent of all patient encounters. When clinicians used the technology, they **found an answer to their question 83 percent of the time**.

> "The application is very convenient and useful," says Maviglia, who serves as a hospitalist and informaticist with Partners. "Users quickly get the information they need without having to search in a lot of different places. They don't have to exit the application they are working in. Instead, the information is seamlessly presented to them and they can go back to work."

In one out of five cases, the answers culled via the infobuttons actually resulted in a change in the course of treatment. Such changes are expected to reduce medication errors, practice variation, serious adverse events, complications — and even patient deaths.

> "Ultimately, more information leads to better care – and ultimately that is what the healthcare system needs," Maviglia says.

Partners will be using Micromedex® InfoButton Access. Maviglia expects as the InfoButton Access application, as well as other automated clinical decision support tools, is rolled out as part of a comprehensive move toward evidence-based medicine, more clinicians will embrace the technologies – and quality throughout the organization will continue to improve.

The New Imperative:
Better Information Systems

There is a new imperative in healthcare: Clinicians need to quickly access reliable, pertinent clinical information at the point of care. Accessing information at a later time or information that is not context-specific simply will not do in this era of evidence-based medicine.

Indeed, a number of healthcare and regulatory organizations are issuing recommendations and guidelines to make the evidence-based approach to healthcare the standard.

In 1997, the Agency for Health Care Research and Quality launched its initiative to promote evidence-based practice in everyday care through the establishment of 12 evidence-based practice centers (EPCs). In addition, the Joint Commission on Accreditation of Healthcare Organization's Integrated Delivery System Network Standard 5.10 requires healthcare providers to have knowledge-based resources that are readily available, current, and authoritative.

The regulatory push, however, is not the only thing motivating healthcare executives to invest in clinical information systems. The fact that enhanced quality also results in desirable operational and financial by-products is prompting more executives to consider clinical information systems investments as well.

As healthcare executives realize clinical systems can help them practice "smarter" medicine – and thereby reduce overall costs, they are becoming increasingly willing to make investments. For example, two-thirds of I.T. leaders at provider organizations report they spend at least 20 percent of their I.T. budgets on clinical information technology, according to results of a survey of 511 I.T. leaders who participated in the *Health Data Management* 2004 CIO Survey.

Micromedex is committed to building effective solutions that meet the need of the evolving Healthcare marketplace. InfoButton Access is just one example of the solutions designed to assist clinicians and healthcare organizations in providing better patient care, faster.

References

1) Covell, D.G., et al. Information needs in office practice: Are they being met? Annals of Internal Medicine 1985; 103: 596-9

2) Ely, John W., Osheroff, Jerome, et.al. Analysis of questions asked by family doctors regarding patient care, British Medical Journal, Aug. 7, 1999; 319: 358-361

3) Ely, John W., Osheroff, Jerome, et. al. Obstacles to answering doctors' questions about patient care with evidence: qualitative study. British Medical Journal March 23, 2002, p. 1 – 7

4) Gorman, P.N, Helfand M., Information seeking in primary care: How physicians choose which clinical questions to pursue and which to leave unanswered, Medical Decision Making, April-June, 1995, 15: 188-189

5) Kohn, Linda T., Corrigan, Janet M., and Donaldson, Molla S., Institute of Medicine Report – To Err is Human: Building a Safer Health System, Committee on Quality of Health Care in America, National Academy Press, November 1999, Washington D.C.

6) Institute of Medicine Report – Crossing the Quality Chasm: A New Health System for the 21st Century, Committee on Quality of Health Care in America, National Academy Press, March 2001, Washington D.C.