Dental professionals as well as consumers of dental health care are driving the demand for access to reliable information so they can make more informed decisions. Clinical decision support (CDS) includes a variety of printed and electronic tools, systems, products, and services that make knowledge and information available to the user. CDS is the main way people will be able to access important facts, ideas, concepts, and the latest thinking about personal and population-based health subjects. CDS has its greatest potential at the point of care where it can facilitate good-quality evidence-based decision-making.

**CDS ROADMAP**

In 2005 the National Coordinator for Health Information Technology in the United States commissioned the American Medical Informatics Association to develop a plan that would help advance Clinical Decision Support (CDS). CDS includes a variety of printed and electronic tools, systems, products, and services that give the user knowledge and information to help make more informed and individualized health care decisions. The result of their efforts was the release, in 2006, of the *Roadmap for National Action on Clinical Decision Support*. The Roadmap recommends a series of activities to improve CDS availability, usefulness, and effectiveness, and to increase the use of CDS (Table 1).

The Roadmap identifies 3 major components of the CDS initiative. The authors refer to these as “pillars” and they reflect the common sense and practical approach that good-quality CDS provides (Table 2). The 3 pillars emphasize the use of evidence-based (EB) methods to determine the validity and generalizability of data and the integration of information technology (IT) that makes it easier for high-quality information to be used at the point of care.

Bringing EB and IT together improves the ability to personalize treatment plans, avoid medical errors, and ensure that the best treatments and alternatives are presented to the patient.

**MANAGING LARGE AMOUNTS OF INFORMATION**

Dental and medical practitioners work in an increasingly more difficult information environment. It is estimated that the medical literature is doubling every 19 years, and in some fast-moving subspecialties in medicine, such as

<table>
<thead>
<tr>
<th>TABLE 1. Assistance of Clinical Decision Support to improve health decisions</th>
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<tr>
<td>Clinical Decision Support assists in the improvement of health management decisions by:</td>
</tr>
<tr>
<td>■ facilitating the detection of potential medical errors</td>
</tr>
<tr>
<td>■ suggesting risk factors and approaches to patient management</td>
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<tr>
<td>■ suggesting optimal clinical strategies based on the best clinical knowledge and cost-effectiveness considerations</td>
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<tr>
<td>■ organizing the details of a treatment plan</td>
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<tr>
<td>■ helping to gather and present data needed to execute a plan</td>
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<tr>
<td>■ communicating to third party payers</td>
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AIDS-related health care, it may double as quickly as every 2 years.2

In 2006, Merijohn introduced the Translational Clinical Practice System (TCPS) in an attempt to provide guidance to clinicians trying to deal with and make sense of the information onslaught (Fig 1).3 The system provides both a conceptual context and some specific suggestions about how to use EB essentials to answer clinical questions and dilemmas that often require the latest information to enable good decision-making. More importantly, the system helps readers manage their approach to “translating” data into tangible guidance for patient care.

**EXAMPLES OF CDS**

1. Electronic health record. CDS technology can already be found in the electronic health/dental record (EHDR). EHDRs can enhance patient care because they make information about a patient more accessible, accurate, and complete. Computerized provider order entry (CPOE), as differentiated from handwritten paper charting, can facilitate workflow and minimize transcription errors. And now a type of CPOE has been introduced by at least 1 dental company to enhance communication and avoid errors in the dental laboratory prescription.4

The Roadmap authors clearly state that “the storage, connectivity, and automation functions of EH(D)R’s and CPOE are necessary, but not sufficient to reach the desired gains in health care quality. It is only through CDS that EH(D)R’s and CPOE can achieve their full potential for improving the safety, quality and cost-effectiveness of care.”

2. Drug prescribing. In dentistry one of the major examples of integrated CDS is related to medications. Electronic records systems linked to order entry systems with CDS can supply patient data needed for proper drug dosing.5 Drug prescribing for dental patients has become more difficult as the complexity of their patient’s medical status and medication profiles become greater. CDS can help dentists by making it easier to:

- know the effects of patient medications on oral structures such as the gingiva, mucosa, and tongue
- prevent untoward drug interactions
- avoid allergic reactions

Becoming proficient in electronic information management can increase confidence in the quality of dental practice, and in the future, this daily activity may be sufficient for earning CE credit. This makes a lot of sense, because every time clinicians go online to access information, they will learn something. If this activity is
repeated many times a day, it can add up to a considerable investment of effort. By rewarding this effort with continuing education credit, there is an added benefit and reinforcement to keeping up.

3. Clinical reference content. There are many CDS products and services that deliver real-time clinical decision support by putting evidence-based, point-of-care clinical reference content directly into the electronic workflow of dental practitioners (Figs 2, 3; Table 3). This information can help clinicians:
- keep up with an overwhelming amount of information
- reduce unwanted variation in clinical practice
- help make clinical decision-making more useful and personal

Good CDS should assist rather than detract from normal daily activities. How to “fit” CDS into a busy practice is a challenge. Making scientific evidence and clinical best practices information more accessible makes the information more useful. If the information is more useful it will be more readily integrated into practice.

4. EB reviews and analysis of primary articles. EB analyses and reviews of research are often more helpful than a single study or expert opinion in guiding clinical decision-making. Resources that provide this second level of analysis include the Cochrane Center and journals such as Evidence-Based Dentistry (EBD) and the Journal of Evidence-Based Dental Practice (JEBDP). Secondary high-quality information sources expedite translation, integration, and implementation of information. Other areas where analysis and reviews of important information are available to dentists include many of the dental and medical specialty professional organizations, the Centers for Disease Control and Prevention and the American Dental Association.

DENTAL EDUCATION
In some dental schools, students are learning to master the electronic resources necessary to gain control of the information explosion. For example at New York University College of Dentistry and UCLA School of Dentistry, students use electronic access to JEBDP because some reviews and analysis within the journal are required reading. At the University of Michigan’s School of Dentistry students can download and listen to class lectures on their MP3 players. The experiences students are getting in a more digital world will likely pay off in multiple ways as they enter the dental workforce where CDS will play an increasingly more important role in managing patients. Research about educational best practices is negatively perceived by some dental faculties according to Masella and Thompson.

DOES CDS IMPROVE HEALTHCARE? SOME EVIDENCE TO DATE
A systematic review of literature on the effect of health information technology on quality, efficiency, and costs of care found 3 major benefits of CDS-like information:
1. increased adherence to guideline-based care
2. enhanced surveillance and monitoring, and
3. decreased medication errors

New research suggests that the economic value of CDS is considerable. A Center for Information Technology Leadership analysis of the value of CPOE in ambulatory settings found that the most profound impact arises with sophisticated clinical decision support. Advanced CPOE systems were estimated to cost nearly 5 times as much as basic CPOE, but were projected to generate over 12 times greater financial return.
CHALLENGES

In 2001, the Institute of Medicine (IOM) cited studies of underuse, overuse, and misuse of care and came to the conclusion that the US health system “has floundered in its ability to provide consistently high quality care to all Americans.” Of great importance was their observation that the health care system “frequently falls short in its ability to translate knowledge into practice.” The IOM described the situation as “a large chasm between today’s system and the possibilities of tomorrow.” The size of the knowledge gap is less important than the fact that the gap exists at all. In some cases in medicine the gap between discovery and clinical practice integration may be for many years.

According to the Roadmap authors, there are several challenges to the wide scale adoption of CDS. Some of the most important include the following:

TABLE 3. Free Point of Care Clinical Decision Support Tools available from the Journal for Evidence-Based Dental Practice

- Pocket Consult
  - Journal of Evidence-Based Dental Practice abstracts and tables of contents automatically delivered to your PDA as well as more than 100 other journals and clinics.
  - 20 medical calculators, including BMI, Glasgow Coma Scale, Sodium Deficit, and Metric Unit Conversion
  - Daily news updates from MD Consult
  - Weekly drug updates from MD Consult
1. A lack of a common and portable clinical knowledge base that can be easily and widely used in electronic health and dental records (EHDRs) and other clinical information systems.

This would avoid duplication of common knowledge that remains stable over long periods of time. For example, a catalog of known drug interactions with commonly prescribed antibiotics.

2. Barriers to adoption faced by health care providers and health systems caused by financial considerations.

Supportive policies by professional dental organizations and licensing bodies would help to rectify these deficiencies and facilitate adoption of CDS more quickly and broadly because there would be incentives for using the latest knowledge to make treatment recommendations and decisions.

3. Clinician resistance to CDS systems out of fear that CDS will reduce autonomy or increase liability.

Just the opposite is likely to occur, since CDS systems give the clinician the most important information and thinking about the clinical question at hand. Much more flexibility and freedom in practice will come from having more information rather than from less.

4. Multiple issues designing the necessary and continuous evaluation of CDS.

5. Providing meaningful financial and personal incentives for using CDS.

The use of CDS will reduce errors, avoid under- or overtreatment and give the clinician and patient satisfaction by knowing that the best care was provided. CDS-supported continuing education credit, as mentioned earlier, will be an additional incentive for using CDS.

NEXT STOP ON THE ROADMAP

The Roadmap suggests that an incremental approach to implementation is the most practical because no single entity has the resources or the “authority” to manage it all by itself.1 In the future there will hopefully be an ongoing dialogue among the many CDS stakeholders.

The JEBDP will keep readers informed of CDS developments through print and its own CDS services found on the JEBDP Web site: www.jebdp.com. Many of these and other available CDS products are transportable to the PDA where the information can be used at the point of care. The JEBDP also regularly updates and publishes a Glossary of Terms that can always be found online.

REFERENCES


