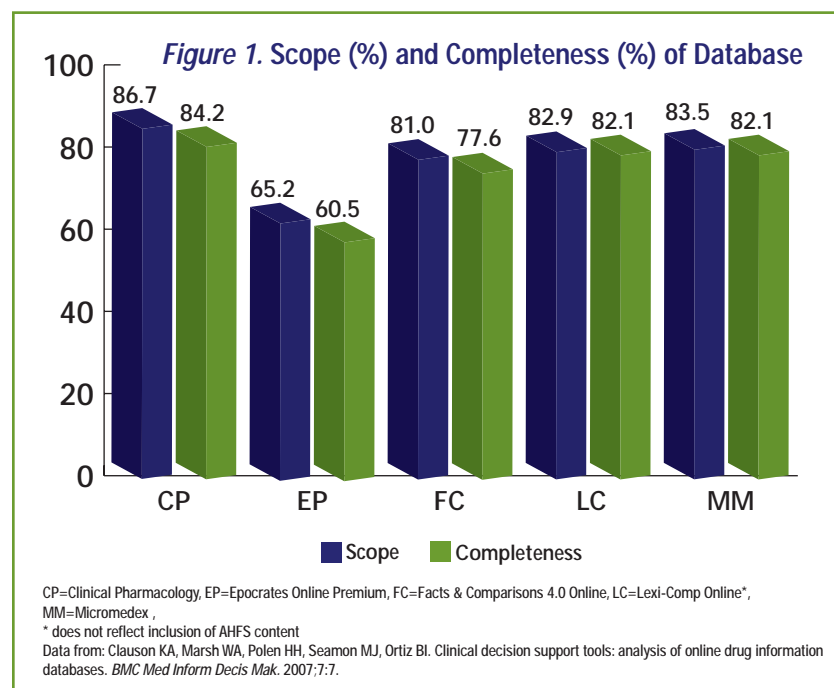# Selecting the Right **Online Drug Information Database** for Your Organization

IN THE LAST 10 YEARS THERE HAVE BEEN OVER 700 NEW DRUG APPROVALS by the FDA, and more than three million articles are published every year in scientific journals. Overall, it is estimated that the entire body of medical knowledge doubles every two years. Given these staggering numbers, the challenge for pharmacists to retain their status as pharmacotherapy experts grows more daunting every year. One way to help manage this tidal wave of information is to utilize technologies such as online drug information databases. These tools had their origin as tried and true reference books, but have since evolved into something far more comprehensive, functional, and up-to-date. They can provide easy access to a myriad of drug information, such as drug interactions, indications, mechanisms of action, and side effects.

online database is able to provide enough information to fill the need? Or will a subscription online database be required? Will a single database satisfy all of the informational needs necessary for a department or institution, or do circumstances dictate more than one?

The purpose of this article is to provide a brief overview of some of the most commonly used online drug information databases as well as to provide insight into the different strengths and weaknesses each database presents, in order to give guidance to the reader. Published reviews and evaluations, as well as institutional adoption, have identified the following online drug information databases as the most commonly used and most comprehensive candidates: Gold Standard's Clinical Pharmacology, Epocrates Online Premium, Facts & Comparisons 4.0 Online from Wolters Kluwer, Lexi-Comp Online with AHFS (American Hospital Formulary Service), and Thomson Micromedex.[1-5] The most recent and comprehensive article used 158 drug information questions distributed across 15 weighted categories (e.g. drug interactions, dosage, cost, etc.) in order to evaluate seven of the most commonly used online databases.[3] Databases were scored according to scope (absence or presence of an answer), completeness (how comprehensive the answers were), and ease of use (how many steps it took to get to an answer). Additionally, a composite score integrating all three of those criteria was generated to allow for direct comparisons.

A summary of selected strengths and weaknesses for each database is provided in Table 1. Figure 1 depicts the percentage of questions each database could answer (i.e. scope) and how complete the answers were. Table 2 displays a measurement of user-friendliness determined by how many steps it took to locate an answer.

Figure 1. Scope (%) and Completeness (%) of Database

CP=Clinical Pharmacology, EP=Epocrates Online Premium, FC=Facts & Comparisons 4.0 Online, LC=Lexi-Comp Online*,
MM=Micromedex ,
* does not reflect inclusion of AHFS content
Data from: Clauson KA, Marsh WA, Polen HH, Seamon MJ, Ortiz BI. Clinical decision support tools: analysis of online drug information databases. *BMC Med Inform Decis Mak.* 2007;7:7.

Product Selection

The selection of an online drug information database should ultimately be based on the needs of the end user. Determining the need the database is meant to fill is the first step in making a sound choice. Each database described in this article has its own strengths and weaknesses. Identifying the reference that can provide the most benefit is of paramount importance. Doing so will allow the pharmacist to maximize the database's performance capabilities and enhance clinical decision-making.

Factors such as the extent of content provided, the completeness and depth of the information offered, and the ease of data retrieval must all be considered before reaching a decision. Pharmacists and administrators also need to take other aspects of online drug databases, such as cost, into consideration. Is it possible that a free

Subscription-Based Online Drug Information Databases

Clinical Pharmacology (www.clinicalpharmacology.com), hosted by Gold Standard/Elsevier, is a peer-reviewed database that provides a large array of drug information searchable by a variety of fields, such as the standard brand or generic name, as well as therapeutic class, indication, and contraindication. The database has several tools including drug interaction reports, IV compatibility checks, and a drug identification function. English and Spanish drug information handouts for patients are available and, as an additional purchase, Krames Disease Information Handouts can be used to enhance patient understanding of diseases and drug com-

pliance. Clinical Pharmacology (CP) offers several other tools that the pharmacist can add to the basic CP package. For example, Physicians' Information and Education Resource (PIER), an evidence-based medical resource meant to help practitioners make clinical decisions based on current guidelines, is available for separate purchase, but it can be integrated into CP with quick-links from the drug database to the PIER modules. CP offers individual annual subscriptions for $482, and institutional pricing is available through site licensing.

Epocrates Online Premium (www.epocrates.com) is unlike the other products in this article in that it originated as a database for personal digital assistants (PDAs). Epocrates Online Premium (EP) has streamlined search functions that allow particularly fast access to the desired drug information. It has very concise drug monographs for over 3,500 brand and generic drugs, along with a drug interaction checker. EP also has medical calculators, algorithms, comparative dosing charts, and a pill identifier. Herbal information is supplied for over 400 natural products. Cost information is provided by www.drugstore.com, and formulary information, including Medicare Part D, is also selectable. Patient leaflets are available in English and Spanish. The cost for a single subscription to EP is $60 per year, and institutional licensing is also available. EP has also made the content from AHFS Drug Information available as an add-on to expand the depth of their database.

Facts & Comparisons 4.0 Online (www.factsandcomparisons.com) is a database that compiles all of the drug information publications from Facts & Comparisons/Wolters Kluwer. Its content is primarily sourced from the following print references: A to Z Drug Facts, Drug Facts & Comparisons, Drug Interaction Facts, Drug Interaction Facts: Herbal Supplements and Food, MedFacts, Nonprescription Drug Therapy, and the Review of Natural Products. It also features a drug identification tool, daily news updates, and patient education materials. The search interface for Facts & Comparisons (FC) 4.0 Online allows all of those components to be searched concurrently, along with the added content the online database provides. One of the best aspects of this database is that its core information

Database	Steps Needed^
Clinical Pharmacology	3.50
Epocrates Online Premium	1.72
Facts & Comparisons 4.0 Online	3.02
Lexi-Comp Online*	2.16
Micromedex	2.70

Table 2. Average Number of Steps Needed to Find an Answer from Online Databases

^ lower scores indicate that data retrieval is easier
* does not reflect inclusion of AHFS content

Data from: Clauson KA, Marsh WA, Polen HH, Seamon MJ, Ortiz BI. Clinical decision support tools: analysis of online drug information databases. *BMC Med Inform Decis Mak.* 2007;7:7.

comes from Drug Facts & Comparisons, including all of the comparative charts that many pharmacists are familiar with. A single account for FC costs $495, and institutional licensing is available as well. It can also be accessed by means of a 30-day free trial. Wolters Kluwer has just released a new database, Clin-eguide, which combines information from Facts & Comparisons, Ovid, and Lippincott Williams & Wilkins. To date, this new product has not been made available for evaluation, thus the information in this review pertains only to Wolters Kluwer's current offering.

Lexi-Comp Online with AHFS (www.lexi.com) uses the lion's share of Lexi-Comp's print library, which has been converted to online databases, as its source content. Lexi-Comp Online (LC) includes: Geriatric Lexi-Drugs; Infectious Diseases; Lab Tests and Diagnostic Procedures; Lexi-Drugs; Lexi-Drugs International; Natural Products; Nuclear, Biologic, and Chemical Exposures; Pediatric Lexi-Drugs; Pharmacogenomics; and Poisoning and Toxicology. It also contains charts from the Clinician's Guide to Diagnosis, Clinician's Guide to Internal Medicine, and tools like Lexi-CALC, Lexi-Drug ID, Lexi-Interact, and Lexi-I.V. Compatibility. Patient advisory leaflets are also included, which are available in 18 languages, along with a pronunciation guide with audio files of the drug names. Perhaps most significantly, LC has just expanded the depth of their database by adding all of the content from AHFS Essentials and AHFS Drug Information. LC is known for being a quick, concise database, but in the past has suffered somewhat from a lack of depth. The current version has the same basic bottom-line approach, but now contains links embedded in its monographs to the more expansive information from AHFS. Access to LC is typically not sold to individual users, but a single desktop version is available. Institutional licensing is available according to practice site, and cost is tied to the number of end users.

The information offered by **Thomson Micromedex** (www.micromedex.com) is evidence-based and comprehensive, and contains information on over 2,300 products. The drug-specific content is primarily housed in its DRUGDEX module, which contains drug monographs in the Drug Evaluations section and comparative charts and tables in the Drug Consults subsection. Drug monographs can be searched by brand or generic name, indication, or adverse event, and so on. They contain standard drug details with regard to such topics as adult and pediatric dosing, pharmacology, and

kinetics, but Micromedex goes a step further. This database also contains data from such sources as post-marketing surveillance, clinical trials, and case studies, and all of their content is exhaustively referenced. This type of information can be helpful to a pharmacist who wants more in-depth knowledge or is seeking data beyond that in the product package insert. Thomson also offers bundles of products or a-la-carte selections in which Micromedex can be subscribed to along with other fully searchable references such as Martindale: The Complete Drug Reference, Index Nominum, and The Physicians' Desk Reference, thus further increasing the extent of their content. Micromedex has recently introduced a program in which they provide complimentary subscriptions to eligible educational institutions. Micromedex is unavailable to individual subscribers and the cost varies for institutional use, depending on the number of users and the licensing agreement.

Free Online Drug Information Databases

As an alternative to subscription products, there are a number of online drug information databases that are completely free. The best of this group includes: Epocrates Online Free (www.epocrates.com); The Internet Drug Index (www.rxlist.com) operated by WebMD; Medscape's Drug Reference (www.medscape.com), also a WebMD product; and Thomson Healthcare Academic Program's Micromedex for eligible academic institutions. These databases source content from reputable, established providers such as AHFS and FirstDataBank; are easy to navigate; and do not require an invasive registration to use their services.

Epocrates Online Free provides abridged content from the Epocrates Online Premium product. Some of the sections omitted in the free version include the pill identifier, herbal product information, and medical calculators. The Internet Drug Index uses drug information from the FDA, combined with generic drug information from FirstDataBank, in conjunction with their in-house materials. Medscape's Drug Reference includes package insert informa-

Table 1. Databases at a Glance

For complete contact information on the vendors listed in this chart and other helpful product sourcing resources, visit www.findit.pppmag.com

findit findit.pppmag.com

	Strengths	Potential Drawbacks	Reader Service Number
Clinical Pharmacology *Ranking according to overall score: 1*	• Broad scope and depth of information that is quickly accessible • Drug monographs are referenced • Ability to design comparative drug tables • Updated daily	• Some monograph fields such as adverse reactions could be more detailed • No foreign drug information • No drug price information	30
Epocrates Online Premium *Ranking according to overall score: 5*	• Unique interface makes finding information quick and easy • Contains formulary information for health insurance and Medicare Part D • Updated weekly • Includes drug price information	• Drug monographs may be too concise for some applications • Drug monographs are not referenced • No stability and compatibility information • No foreign drug information	24
Facts & Comparisons 4.0 Online *Ranking according to overall score: 4*	• Good comparative tables • Format is familiar to many pharmacists • Significant depth of content on interactions • Updated weekly	• Interface is not very user friendly • Herbal information is not as robust as other top-tier databases • No foreign drug information • No drug price information	9
Lexi-Comp Online *Ranking according to overall score: 3*	• Two-tiered approach allows quick access to basic information with links to more in-depth AHFS content • Audio pronunciation files for drug names • Updated daily • Includes drug price information	• Drug monographs are only partially referenced • AHFS content only available to hospital and academic institutions; versions without suffer in areas such as pharmacokinetics	10
Thomson Micromedex *Ranking according to overall score: 2*	• Broad scope of extremely in-depth monographs which provide information on case studies and clinical trials • Drug monographs are very well-referenced • Updated weekly	• Voluminous information can be difficult to navigate • DRUGDEX lacks extensive OTC information • No drug price information	51

Rankings from:
Peak AS, Girt A. Comparison of tertiary drug information databases. Abstract 75. *Pharmacotherapy 2005;25:1431-1551.*
Clauson KA, Marsh WA, Polen HH, Seamon MJ, Ortiz BI. Clinical decision support tools: analysis of online drug information databases. *BMC Med Inform Decis Mak. 2007;7:7.*

tion and FirstDataBank content, along with excerpts from AHFS. While the appeal of free databases is obvious, they may not be an institution-wide solution to drug information needs. In a study comparing online drug information databases, the subscription databases averaged 20 to 30% more content and also offered more depth than the free ones.[3]

Conclusion

The selection of an online drug information database is a process as individualized as the databases themselves. Selection criteria will be based on usage requirements and financial options of the organization or individual.

Each database has several strengths and weaknesses that must be carefully weighed. Vigilantly researching each database's capabilities, discussing preferences and experiences with colleagues, and even utilizing free trials when available will help ensure that the product purchased is ideally suited for the task. If an in-depth, fully referenced database with broad scope and depth is required, the pharmacist could consider Clinical Pharmacology, Micromedex, or Lexi-Comp Online with AHFS. If a concentration in over-the-counter products is essential or if there is a need for an authoritative brand to generic substitution recommendation, Facts & Comparisons may be a better choice. And, likewise, if the

pharmacist requires quick and concise information only, then Epocrates Premium Online is a good choice. While any one of these databases is typically capable of serving the needs of a general drug information search, each one has certain intrinsic characteristics and additional features that can make it a better choice for accurate and appropriate clinical-decision support. ∎

Kevin A. Clauson, PharmD, is an associate professor of pharmacy practice at Nova Southeastern University's College of Pharmacy. Clauson received his PharmD from the University of Tennessee College of Pharmacy, and completed a fellowship in natural product research at the University of Missouri–Kansas City.

Hyla H. Polen, PharmD, is the pharmacy department manager at the Delray Beach Health Care District of Palm Beach County and is a practicing pharmacist at CVS/pharmacy. Polen received her PharmD from Nova Southeastern University.

References
1. Belgado BS, Hatton RC, Doering PL: Evaluation of electronic drug information resources for answering questions received by decentralized pharmacists. *Am J Health-Syst Pharm.* 1997;54:2592-2596.

2. Kupferberg N, Hartel Jones L. Evaluation of five full-text drug databases by pharmacy students, faculty, and librarians: do the groups agree? *J Med Libr Assoc.* 2004;92:66-71.

3. Clauson KA, Marsh WA, Polen HH, Seamon MJ, Ortiz BI. Clinical decision support tools: analysis of online drug information databases. *BMC Med Inform Decis Mak.* 2007;7:7.

4. Keplar KE, Urbanksi CJ. Personal digital assistant applications for the healthcare provider. *Ann Pharmacother.* 2003;37:287-96.

5. Keplar KE, Urbanksi CJ, Kania DS. Update on personal digital assistant applications for the healthcare provider. *Ann Pharmacother.* 2005;39:892-907.

PHARMACY Purchasing&Products