GOAL
The primary goal for this section is to familiarize the student with the usefulness and limitations of various sources and types of drug information, as well as develop skills in information retrieval. This goal coincides with those Life-Long Learning objectives listed in the Experienced Based Curriculum. The skills gained in this section can be utilized throughout the medical school curriculum (i.e. MED 408) and can be applied to other topics besides pharmacology.

OBJECTIVES

SKILLS WORKSHOP:

After reading and studying this syllabus, and examining the online and print resources for this section of the course, the student should be able to:

1. Define primary literature, secondary literature and tertiary literature.
2. Give one or two examples of primary literature, secondary literature and tertiary literature.
3. Demonstrate the ability to appropriately comprehend and utilize the primary, secondary or tertiary literature to answer a variety of drug information questions.
4. Demonstrate the ability to access Internet applications for drug information purposes.
5. Given a drug related question, give an effective search strategy to find the appropriate drug information necessary to answer the question: tablet identification, usual dose, available dosage strengths, dose adjustment for renal impairment, drug safety in pregnancy or lactation, drug interactions, and accessing drug information in specific journal articles.
6. State five limitations of using and recommending Internet resources for drug information.
7. Define the benefits and limitations of sources of drug information from experts, pharmacists, hospital based treatment plans, and pharmaceutical companies.
SOURCES OF DRUG INFORMATION

Knowledge is power.
Sir Francis Bacon

The overall amount of medical information is growing at an alarming rate; even the body of knowledge covering only drug information seems to be endless. There are vast amounts of data on drugs that are approved by the Food and Drug Administration (FDA), and on agents undergoing clinical investigation. There are many sources of information available that can help answer drug-related questions. Deciding which one is best for a specific situation is the key. This outline will discuss drug information sources and explain how to effectively utilize them. Exercises posted on the web, and the self-paced news group will assist you in developing the skills to efficiently utilize these resources to better manage your patients’ drug related problems.

SECTION I: THREE TYPES OF DRUG INFORMATION LITERATURE

A. Primary Literature:

- **Definition:**
  Primary literature forms the foundation of the literature hierarchy. It is the source of information for the development of secondary and tertiary literature resources. Primary literature is comprised of original research that is written in the author(s) own words. It consists of research studies, case reports, editorials, and letters to the editor. Most primary literature contains a detailed description of the study design, methodology, and scientific results. The reader is able to critique and analyze the study in order to develop a conclusion.

Examples of excellent primary literature resources include research articles and studies published in the *New England Journal of Medicine, Journal of the American Medical Association, Archives of Internal Medicine, Annals of Internal Medicine, Lancet, and British Medical Journal*. These publications are among about 100 others designated as Core Clinical Journals by the National Library of Medicine. They are important journals because they contain information that is significant to medical practice.

- **Advantages of primary literature:**
  1. Information from primary literature is current, original, and "cutting-edge." Core Clinical Journals contain information about patient-oriented, evidence-based medicine that may change or affect patient care. The mnemonic POEMS (Patient Oriented Evidence that Matters) is often utilized to define this information and the journals in which it is contained.
  2. Many articles undergo review by the author's peers before an article is accepted for publication, thereby incorporating unbiased views and suggestions to improve the quality of the report. This is known as the "peer-review process."

- **Disadvantages of primary literature:**
  1. With any research report, flaws in study methodology may lead to inaccurate conclusions. For example, utilizing inappropriate statistical analysis may lead one to reach an inappropriate conclusion of the results of a study.
2. In assessing the primary literature, knowledge of scientific methods and statistics is necessary to properly interpret the information.

3. Since the information presented in the primary literature is so new, it may take time before wide acceptance occurs throughout the medical community.

- **Using the primary literature:**

1. Be cautious, careful, and conservative when utilizing new information from a primary literature source.

2. Is the article from a peer-reviewed journal? Articles published in peer-reviewed journals are generally better in quality and objectivity than non-peer reviewed work.

3. In utilizing data from primary sources be sure that all aspects of the primary source are understood (i.e. patient inclusion or exclusion criteria, study methods and interventions, primary outcome being assessed, statistical and clinical relevance of the reported findings), before applying that information to your patient.

4. To extrapolate primary literature data to a single patient encounter, make sure the patient population mentioned or utilized in the primary work corresponds to your practice population.

5. Remember that case reports relate only to one patient not a whole patient population. Be watchful for potential for bias and avoid relying solely on anecdotes.

**B. Secondary Literature:**

- **Definition:**
The secondary literature is compiled by indexing and abstracting services that can be used to systematically locate various types of published literature. The indexing system usually provides bibliographic information indexed by topic and will allow the user to view a brief description of the information within most citations.

Examples of secondary literature databases are PubMed (Medline), Embase, National Library of Medicine Gateway, International Pharmacy Abstracts, Scopus, and Toxline. There are many secondary literature databases and each has its own scope, look, feel, and features to make it easy for the user to search the database.

- **Using the secondary literature:**

Here are some things to know when using and finding primary literature through the secondary literature databases.

1. Each database has its own focus, or scope, and collects primary literature in a certain field about a disease, drug-information, or literature related to patient care. Medline focuses on the biomedical sciences, Toxline focuses on toxicology, CINAHL focuses on the nursing and allied health literature.

2. The databases link you to citations that show you the author, title of the work, location and date of the publication and generally, an abstract of the manuscript. Sometimes the full text of the article will be available, but other times you need to get access to the article itself through a subscription. That's where the library comes into the picture. The UMKC Health Sciences Library makes the article available online through its subscriptions to journals. You can always use the [Find it @ UMKC](http://libguides.library.umkc.edu/content.php?pid=11136) link to see whether the article is available electronically or in print through the library or, if the article is not available, you can order it for free from another library using the Health Sciences Library's inter-library loan service, known as “ILL.” Unfamiliar with ILL? Here’s a website with more information: [http://libguides.library.umkc.edu/content.php?pid=11136](http://libguides.library.umkc.edu/content.php?pid=11136).
3. The Clinical Medical Librarians (CMLs) are highly proficient in searching the secondary literature, especially if you are not well acquainted with medical subject headings (MeSH), or other terms used to index the information. The medical librarians are extremely helpful. If you have questions you can get live online help from the HSL website, or text to ask a librarian. For details on how to contact a librarian, see more information at this link: http://library.umkc.edu/ask-a-librarian

- **Advantages of secondary literature:**

1. Provides quick access to the primary literature.
2. Provides a broad scope and/or concise information on specific topics. The information is usually current, but it depends on the abstracting service and the specific type of information for which one is looking.
3. Generally, the journal sources are peer reviewed and of a high standard.
4. With most resources, updated information can be sent to you periodically, i.e. weekly or monthly.

- **Disadvantages of secondary literature:**

1. The time period between publication and inclusion (lag time) into secondary sources can vary for each database, from days to weeks.
2. The number of journals indexed by each system depends upon the scope of the database. Hopefully, they are the journals that you consider important and regularly review.
3. Because a secondary source can encompass such a large amount of information, one must be proficient at sifting through the sources listed on a particular subject to find the exact information one is looking for.
4. To obtain useful information, one must utilize specific search terms and be proficient with a particular database's search techniques. Medical databases organize the literature using Medical Subject Headings (MeSH). The way MeSH works is this: if you search for “heart attack” in a medical database, the system will look for “Myocardial Infarction,” which is the MeSH heading. Your use of terms will influence what you find. If you search for “the use of aspirin” in a particular medical database, hundreds of articles would be reported. However, if you specify “aspirin use in myocardial infarction, secondary prophylaxis,” use of the more exact term will yield more focused results.

- **Examples of Secondary Sources of Drug Information:**

  - **OVID:** The Ovid database is used by many health professionals to search large collections of scientific, medical, and technical databases (currently over 80). For the most part it is extremely easy to work with and use. The UMKC Health Sciences Library uses OVID technology which is available online. The CMLs can demonstrate how to utilize it. For a discussion of the company that created OVID, see the OVID website at http://www.ovid.com.

  - **MEDLINE:** Abstracting service produced by the National Library of Medicine; indexes articles from over 4000 journals of international biomedical literature including allied health fields; available on-line through UMKC Health Sciences Library (via the OVID Medline interface). The UMKC Health Sciences Library has excellent tutorials available on-line that explain how to properly perform a search. Check them out here: http://library.umkc.edu/hsl/hslhowdoi-videos
    
    - Access to MEDLINE is also available online from the National Library of Medicine via the Web through PubMed. You should go to PubMed from the Library’s homepage and select it from the right-hand side of the homepage. In doing so, you will see the “Find It @ UMKC” button in the
abstract view of articles you are searching for. The Health Sciences library homepage is http://library.umkc.edu/hsl

- **The Medical Letter**: This is basically an abstracting and evaluating service that reviews recently approved medications, drug classes, and lists current treatment options for various diseases; the reviews (although brief) are excellent and non-biased and offer specific recommendations; published every two weeks. The Medical Letter is available as an online resource from the Health Sciences Library website. It is also available in print, and can be found with the Health Sciences Library journals, filed under “M.”

- **Iowa Drug Information Service**: IDIS indexes English articles relevant to drugs and treatment of disease from approximately 200 journals; [http://www.uiowa.edu/~idin/](http://www.uiowa.edu/~idin/) The database is sold on a subscription basis. Full-text articles are available on the web or on CD-ROM.

- **International Pharmaceutical Abstracts**: Offers an extensive list of indexed information, including information pertaining to international pharmacy and pharmaceutical sciences; index includes all pharmacy periodicals. IPA is available as an online database from the Health Sciences Library website in the OVID databases.

- **The Cochrane Library (Collaboration)**: Provides an assessment of the literature on particular health care topics through a very complete and thorough literature review. Cochrane is available from the Health Sciences Library website in Evidence Based Medicine Reviews in the OVID databases.

- **Review Articles**: Review articles are summaries that are usually written by experts in the field; however, they may have the same inherent limitations as texts. The reader needs to be aware of the timeliness of a review, and the author’s credentials.

C. Tertiary Literature

- **Definition and types**

The information presented in tertiary literature is core knowledge established via primary literature or accepted as standard of practice within the medical community. Drug information contained in the tertiary literature is generally well-established information that is approved and accepted by the FDA (i.e. a FDA labeled indication) or well founded in the primary care literature (i.e. an unlabeled but well-documented use for an FDA approved drug).

Tertiary references may be of textbooks on various drug or disease topics (e.g. Pharmacotherapy), compendia (a vast array of information about many drugs such as the Physician's Desk Reference) or online, full-text databases. As with any tertiary reference, the information should be evaluated for bias.

- **Advantages of tertiary literature:**

1. Tertiary references are convenient and accessible, especially in light of their full text availability on the Internet.

2. Drug information references may be divided into specific subjects to make them easier to use. For instance, one text may be devoted only to drug interactions, while another might discuss principles of pharmacotherapy or use of drugs in pregnancy. This way, if a specific subject needs to be queried, a specific reference can be reviewed.

3. Usually the information contained in tertiary literature is well accepted in medical practice. This is because most forms of tertiary literature are referenced with primary literature sources and should undergo a
stringent review process to ensure that the information presented is generally well regarded in the medical community.

- **Disadvantages of tertiary literature:**
  1. Because of the lag time between when a text was written and the actual publication date whether in print or electronically, time passes before the information is available, and more updated information may be available in a database.
  2. Space limitations within a text may prevent extensive discussion of a drug or topic.
  3. Authors may emphasize limited information about a topic or drug.
  4. Authors may present information that is based on a less than thorough review of the primary care literature.
  5. The tertiary literature may not be referenced appropriately, thus preventing a proper check of the primary care literature.
  6. If the information presented in the tertiary literature is based on flawed primary care literature, (i.e. poorly designed research studies are referenced) then the tertiary information may not be the most accurate and reliable.
  7. In the case of print resources that are tertiary literature, any updated or new information may need to be inserted into the printed copy of the tertiary literature in a timely fashion. This is time consuming, and may not get accomplished.

- **Evaluation of Tertiary Literature**
  1. The reader should assess the text for timeliness. In the case of print resources, ask yourself when the last edition was published. If available to you, know what your institution or affiliation has available online and make sure you arrange to have access to the online information. *Scientific American* online journal is an excellent example of this. It is available from the UMKC Libraries and it provides detailed, up-to-date reviews on a variety of topics. Many online journals and publications have RSS feeds to a feed reader, and the feeds notify you via email when new information is added.
  2. The reader should assess consistency by comparing information presented in one text to the same information presented in another text.
  3. The reader should evaluate the credentials of the authors/contributors.
  4. The reader should check the resource’s references, and whether they are up-to-date.

- **Examples of Tertiary Sources for Drug Information**
  1. This is not intended to be a comprehensive list, but the following categories contain sources of drug information that are examples of tertiary literature resources. Many of these resources are available online to UMKC students, faculty, and staff through the UMKC Health Sciences Library.
  2. Use the UMKC Libraries’ catalog to look up the tertiary resources that are available to you. MERLIN is the library catalog for all of the libraries in the University of Missouri system. It tells you what items the libraries own. If you need help understanding how to use the catalog, this guide will assist you: [http://libguides.library.umkc.edu/catalogguide](http://libguides.library.umkc.edu/catalogguide) or contact the library.
3. The examples of tertiary literature sources are numerous. Many examples are listed below, and you will become familiar with them as you continue your career. The best examples include textbooks, encyclopedia articles, guidebooks, and handbooks. Other examples include sources that DO NOT include references or that are NOT published in peer reviewed sources.

SECTION II. EXAMPLES OF DRUG INFORMATION RESOURCES AVAILABLE FROM UMKC HEALTH SCIENCES LIBRARY

A. Pharmacology And Drug Information Resources

- **Goodman and Gillman's Pharmacological Basis of Therapeutics** contains general principles of action, absorption, distribution and metabolism. It is a "gold standard" pharmacology text and is very well referenced (general references and reviews are separated). Available online in the Access Medicine collection. [http://library.umkc.edu/hsl/hslfindonlinebooks](http://library.umkc.edu/hsl/hslfindonlinebooks)

- **Basic & Clinical Pharmacology** - 12th Ed. (2012) is a complete and comprehensive general pharmacology text which is utilized nationally as primary reference for many pharmacology courses. Available online in the Access Medicine collection. [http://library.umkc.edu/hsl/hslfindonlinebooks](http://library.umkc.edu/hsl/hslfindonlinebooks)

- **American Hospital Formulary Service (AHFS)**: FDA approved and non-labeled uses; extensive dosage and usage sections; not referenced; published annually with quarterly updates (call# QV740. AA1 A5132; located in the Health Sciences Library Core Texts Collection behind the Circulation Desk. Available online in the STAT!Ref collection. [http://library.umkc.edu/hsl/hslfindonlinebooks](http://library.umkc.edu/hsl/hslfindonlinebooks)


- **Micromedex**: Micromedex is an online pharmacology database which has a vast array of information dealing with pharmacology, therapeutics, poison information, etc. It is available online on campus from the Health Sciences Library website. Mobile applications are available if you go to the Micromedex website from an on-campus computer and follow the instructions for Micromedex 2.0 mobile applications. The supported devices are: iPhone®/iPad®, Blackberry® and Android™, and Palm OS® or Pocket PC. Micromedex contains the RED BOOK Online®.

- **Clinical Pharmacology**: Clinical Pharmacology is an online pharmacology database that consists of extensive, peer-reviewed, current, accurate drug information for health care providers. Contains full-text information on generic, brand, herbal or investigational drugs. UMKC students, faculty and staff can access this database either on or off-campus. Contains drug identification information online via tablet or capsule markings, shapes and color(s). The Health Sciences Library (816-235-1880) can provide you an access code from Clinical Pharmacology to obtain a mobile application.

- **Drug Facts and Comparisons**: FDA approved drugs and investigational and orphan agents; legend and OTC listings; good quick-source; not referenced; (available as an annual bound edition, call# QV772. FI422; located on the shelf in the circulating collection of the Health Sciences Library.
- **Drug Information Handbook**: alphabetical listing of drugs by generic name; many charts, algorithms, and tables with information; not referenced; updated editions published annually (2009/2010 edition: call# QV735 .D794 is located in the Core Texts Collection of the Health Sciences Library).

- **Martindale: The Complete Drug Reference**: foreign drug information including selected US drugs; great resource for obscure information and for names of drugs in other countries; well referenced; published by the Royal Pharmaceutical Society of Great Britain; updated editions published approximately every four years; call# QV738. M384c (2011); located in the Health Sciences Library Core Texts Collection behind the Circulation Desk.

- **Physician's Desk Reference (PDR)**: FDA approved product information; usage and dosage information only as approved by the FDA; not referenced; does have pictures and tablet and capsule markings for some drugs which can be an aide in drug identification; lists manufacturers of specific drugs and manufacturer contact information; lists FDA pregnancy categories for drugs (categories describe current knowledge of relative safety or harm for a product in pregnancy); not useful for finding critical drug information; updated annually; call# QV772. P579 (2012); located in Core Texts Collection of Health Sciences Library.

- **USPDI Volume I: Drug Information for the Health Care Provider**: FDA approved and some non-label uses; auxiliary labeling; not referenced; new editions published annually (call# QV738. AA1 P53; located in the circulating collection of the Health Sciences Library).

- **American Drug Index**: listing of products available in US and cross-referenced by trade, generic, and chemical names; various pharmacy type information; updated editions published annually (call# QV747. A512; located in the circulating collection of the Health Sciences Library).

- **Drug Topics Red Book**: National Drug Codes (NDC numbers); average wholesale prices (AWP) of legend (prescription) and OTC (over-the-counter) drugs; manufacturer’s phone numbers; “do not crush or chew” list; updated editions published annually with monthly updates (call# HD9666.1.D573; located in the circulating collection of the Health Sciences Library). Micromedex contains the RED BOOK Online®.

**D. Drug Interaction Resources**

- **Drug Interaction Facts**: Mechanism of drug/drug and drug/food interaction listed as well as clinical significance; well referenced; updated quarterly for placement binders or available annually in a text version (call# QV38 .D796; located in the Core Texts Collection of the Health Sciences Library).

- **Hansten and Horn's Drug Interaction Analysis and Management**: similar to Drug Interaction Facts; an introductory chapter provides an excellent discussion regarding mechanisms of drug interactions (call# QV39 .H251 (updated quarterly); located in the circulating collection of the Health Sciences Library).

**E. Medical And Pharmacy Therapeutics Resources**

- **The Washington Manual of Medical Therapeutics**: quick reference to the treatment of disease states and medical emergencies; numerous charts and tables; updated editions published approximately every two or three years (call# WB300 .319m 2007).

- **Applied Therapeutics: The Clinical Use of Drugs**: pathophysiology and pharmacotherapeutics in a case presentation format (interesting format but sometimes it makes it hard to find the information you are
seeking unless it is directly attributable to the case; focus is on drug therapy; well written; updated editions published approximately every four years (call# WB330.A651 2009; located in circulating collection of the Health Sciences Library).

- **Pharmacotherapy: A Pathophysiologic Approach**: pathophysiology and treatment of disease; focuses upon drug therapy; very well written; updated editions published approximately every four years (call# WB330. P5357 2005; located in circulating collection of the Health Sciences Library).

- **Textbook of Therapeutics: Drug and Disease Management**: focus is on drug and disease management; organized by disease groups; an excellent text; updated editions published approximately every four years (call# WB 330.T3555 2000; located in the circulating collection of the Health Sciences Library).

### F. Information On Drug Side Effects

- **Meyler's Side Effects of Drugs**: lists and discusses side effects associated with drug therapy; comprehensive index referenced by drug and adverse drug reaction; updated editions published approximately every four years with yearly updates (also called Side Effects of Drugs Annual) (call# WB 330 .S5681; located in the circulating collection of the Health Sciences Library) and also available online in the ScienceDirect database. [http://library.umkc.edu/hsl/hslfindonlinebooks](http://library.umkc.edu/hsl/hslfindonlinebooks)

### G. Drug Information Resources For Special Patient Populations


- **Handbook of Commonly Prescribed Pediatric Drugs (Barbieri)**: excellent reference on pediatric drug therapy; updated every few years (call# QV39 .B236h 1999; located in circulating collection of the Health Sciences Library). (NOTE: This topic is extensively reviewed in the year five Self-Paced Learning Module [Medicine 575R])

- **Handbook of Geriatric Drug Therapy**: drug handbook organized alphabetically by drug name (call# WB39 .H23643 2000; located in circulating collection of the Health Sciences Library). (NOTE: This topic is extensively reviewed in the year five Self-Paced Learning Module [Medicine 575R])

- **Drug Prescribing In Renal Failure (Aronoff et al.)**: discusses all aspects of drug dosing in renal failure including recommended dosages of individual drugs; soft copy pocket guide is an excellent reference and is updated every few years (call# QV16 .D794 1999; located in circulating collection of the Health Sciences Library). (NOTE: This topic is extensively reviewed in the year five Self-Paced Learning Module [Medicine 575R])

- **Drugs in Pregnancy and Lactation**: excellent reference that discusses all aspects of drug dosing in pregnancy and lactation; updated every four years (call# QV772 .D795 2005; located in Core Texts Collection of the Health Sciences Library). (NOTE: This topic is extensively reviewed in the year five Self-Paced Learning Module [Medicine 575R])

- **Cancer Chemotherapy Handbook**: by Fischer DS, Knobf MT and Durivage HJ (call# QZ39 .F533c 2003) and Lippincott's Cancer Chemotherapy Handbook by Baquiran DC (call# QZ39 .B222L 2001) are both excellent references relevant to the pharmacology and use of chemotherapeutic agents. (Both titles located in circulating collection of the Health Sciences Library).
The Review of Natural Products: from Facts and Comparisons; monographs include a comprehensive and up-to-date source of referenced, evaluated, factual information about natural products (call# QV 766 R485; located in the circulating collection of the Health Sciences Library).

Natural Standard is an evidence-based resource that is available online in full text. It contains information on alternative, complementary and integrative medicine, arranged in topic monographs. It is continually updated and international in scope. (http://proxy.library.umkc.edu/login?url=http://www.naturalstandard.com/index.asp)

H. Other Information Resources

Remington: The Science and Practice of Pharmacy: information concerning the practice of pharmacy and pharmaceutical sciences; republished approximately every five years. (call#QV704 R38815 2006; located in the circulating collection of the Health Sciences Library)

USPDI Volume II: Advice for the Patient: supplements for patient education; updated editions published annually and updated monthly (call# QV740 .AA1 P54 2007; located in the circulating collection of the Health Sciences Library; also available online as part of the MedlinePlus website from the National Library of Medicine at this URL: http://www.nlm.nih.gov/medlineplus/druginformation.html.

USPDI Volume III: Approved Drug Products and Legal Requirements: some pharmacy practice acts and regulations; list of A and B ratings; lists older drugs and discontinued agents; updated editions published annually and updated monthly (call# QA740 .AA1 P55; located in the circulating collection of the Health Sciences Library).

I. Drug Information And Poison Control Centers

UMKC Drug Information Center (ph# 816-235-5490): staffed primarily by pharmacy students and instructors from the UMKC School of Pharmacy; turn-around time for response to questions is not always rapid; may want to speak with a pharmacist and not a student (must know the credentials of the person); DI center only open for a limited time period each day.

Missouri Poison Center at Cardinal Glennon Children's Hospital: Phone 1-800-222-1222. Used by the TMC Emergency Medicine Department for FAX-back information on poisonings and overdose; consultation provided by trained center staff. They provide statewide service 24 hours a day, 7 days a week.

University of Kansas Poison Control Center. One of the 61 poison control centers in the United States and the only one in Kansas. It is certified by the American Association of Poison Control Centers. Phone: 1-800-222-1222.

SECTION III: DRUG INFORMATION ON THE INTERNET

The Internet is inextricably woven into our culture as a tool for finding information, and it can provide quick access to numerous sources on medicine and drugs. As when using any information resource, the important factor in using the Internet for drug and medicine information is for you to analyze whether the information source is authoritative, reliable, up-to-date, and unbiased. This section has two sub-sections. First, it addresses five questions, and second, it offers some reliable Internet sites on drug information for you to explore.

A. When is it most appropriate to use the Internet for drug and medicine information?
B. What technology and technology skills do you need to use the Internet?

C. In which areas of drug and medicine information is Internet use very useful?

D. What problems might be experienced in using the Internet for drug and medicine information?

E. How do you evaluate drug and medicine information from the Internet?

A. When is it most appropriate to use the Internet?

1. Accessing the Internet depends on your time and need. Is it a necessity to get online to find information when opening up a particular reference book would be faster and easier?

2. Do you have the computer comprehension needed to use the Internet efficiently? Will you save time looking for the information you need on the Internet?

B. What technology and technology skills do you need to use the Internet?

1. Reliable broadband connections are available in urban areas of developed countries like ours, but if you are located in another setting, you may not have access to the Internet.

2. Organizations, facilities and institutions can be concerned about privacy and security, and may have policies and procedures to restrict use of technology and applications.

3. A person’s skill and comfort with the Internet, computer equipment, and applications takes time, training, and motivation for learning.

C. In which areas of drug and medicine information is Internet use very useful?

1. If a reference to the Internet is found in an advertisement or a citation, you may already have the Internet address you need to quickly access the information described.

2. When company specific information is necessary, such as information on pharmaceutical companies, Internet information is usually readily available.

3. Items in the news and current event topics are rapidly available through the Internet.

4. Content offered by United States government sites such as the Food and Drug Administration or the Centers for Disease Control is widely and freely available on the Internet.

5. Some information, such as rare diseases, alternative medicine, vector borne diseases, or tropical diseases may be unique to the Internet, and unavailable in any print information.

D. What problems might be experienced in using the Internet for drug and medicine information?

1. Sometimes, accessing and navigating the Internet can be time consuming and restraining.

2. Not all content distributed over the Internet is useful. Some of the information is advertising from pharmaceutical companies, some contains discussions of people in support groups. You must be willing to take the time to critically and judiciously review all the information that is presented.

3. Many useful sites may charge a fee, or require a subscription to get the information.

4. Some sites require you to register before you may use the content. You need to determine the reliability of the site, and which personal information you want to give.
5. The sheer amount of information that is available on the Internet can be daunting. It may be time consuming and challenging to sort through all of the clutter to get to what you need.

6. Some Internet drug information sites give incorrect information since many of the articles, reviews, and citations are not referenced. The accuracy of this information should always be questioned.

7. Many patients will utilize the Internet as their primary information source. Effective communication with patients can ensure that patients understand their medical conditions and therapies. You may be in a position where you need to teach your patient about how to evaluate medical information presented on the Internet, and to explain why some can potentially be misleading, or not related to a particular patient's condition. You can use the Internet to teach a patient about a condition, and how to stay well informed and educated.

E. How do you evaluate drug and medicine information from the Internet?

The Internet can be an effective tool to access drug information quickly and efficiently, but you should remember that the best counterfeit looks the most like the real thing. Here are some questions you can ask to help you evaluate web sites on the Internet.

1. Author
   - Is the name of the author/creator on the page?
   - Are the author’s credentials, such as years of experience, position or education given?
   - Is there contact information, such as an email address, somewhere on the page?
   - What does the domain name/URL reveal about the source of the information, if anything?
   - If the owner is not identified, what can you tell about the origin of the site from the address?

2. Purpose
   - For what underlying reason did someone create the web site?
   - Who is the intended audience? Scholarly audience or experts? General public or novices?
   - Is the purpose of the site to inform, teach, persuade, or sell a product?

3. Objectivity
   - Is the content on the web site fact, opinion, or propaganda?
   - Does the author's affiliation with an institution or organization appear to bias the information?

4. Accuracy
   - Are the factual information resources clearly listed so that the information can be verified?
   - Has the information been reviewed or refereed?
   - Is the information free of grammatical, spelling, or typographical errors?

5. Reliability and Credibility
   - Why should anyone believe information from this site?
   - Does the information appear to be valid, well-researched, and supported by strong scientific evidence?
   - Is there a non-Web equivalent of this material that would provide a way of verifying it is legitimate?

6. Currency
   - If timeliness of the information is important, is it kept up-to-date?
   - Is there an indication of when the site was last updated?

7. Links
   - Are links related to the topic and useful to the purpose of the site?
o Are links still current, or have they become dead ends?
o Are the links evaluated or annotated in any way?

8. Conclusion
o Are you sure the Internet is where you want to be? It may take more time to find the answer to a question on the Internet that would take you a few minutes to find if you used a print resource.
o Being able to effectively assess medical and drug information will enable you to provide proper care for your patients. You will develop these skills throughout your medical education at UMKC. Two sites that may aid in this development are:
   ➢ http://guides.library.jhu.edu/evaluatinginformation
      Johns Hopkins University, Evaluating Information Found on the Internet.
   ➢ http://www.lib.berkeley.edu/TeachingLib/Guides/Internet/Evaluate.html
      UC Berkeley - Teaching Library Internet Workshops

The following freely available Internet sites are reputable sources of drug and medical information.

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<tr>
<th>Free Drug and Medicine Information Internet Sites</th>
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<tr>
<td>U.S. Food &amp; Drug Administration</td>
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<tr>
<td>National Guideline Clearinghouse</td>
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<tr>
<td>Merck Medicus</td>
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<tr>
<td>BestBets</td>
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<td>NHS-NICE Prescribing Support Center</td>
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SECTION IV: DRUG AND MEDICINE INFORMATION FOR MOBILE DEVICES

Mobile medical applications are available free, or for a fee, for smartphones and tablets that support iPhone®, iPad®, BlackBerry®, and Android platforms. This table contains applications for you to explore, and a Google search of the Internet on drug applications or medical applications will give you many, many more. Another source for free and paid handheld resources is available from the Health Sciences Library website at http://library.umkc.edu/hsl/hsljustforyou-pda

<table>
<thead>
<tr>
<th>Drug and Medicine Applications for Mobile Devices</th>
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<tbody>
<tr>
<td>Please explore the web sites for available applications and supported platforms. There are typically ones for iPhone®, iPad®, BlackBerry®, and Android platforms. Some apps are free, others available for minimal costs.</td>
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<tr>
<td>Unbound Medicine</td>
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### Drug and Medicine Applications for Mobile Devices

<table>
<thead>
<tr>
<th>Source</th>
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<tr>
<td>Skyscape</td>
<td><a href="http://www.skyscape.com/index/home.aspx">http://www.skyscape.com/index/home.aspx</a></td>
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<tr>
<td>iMedicalApps.com</td>
<td><a href="http://www.imedicalapps.com/">http://www.imedicalapps.com/</a></td>
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<td>qxmd.com</td>
<td><a href="http://www.qxmd.com/">http://www.qxmd.com/</a></td>
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<tr>
<td>Sites recommended by the University of Wisconsin School Of Medicine and Public Health</td>
<td><a href="http://www.med.wisc.edu/education/md/resources/pda-mobile-computing-resources/833">http://www.med.wisc.edu/education/md/resources/pda-mobile-computing-resources/833</a></td>
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<tr>
<td>Sites recommended by the University of Connecticut Health Center</td>
<td><a href="http://library.uchc.edu/pda/">http://library.uchc.edu/pda/</a></td>
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### SECTION V: DRUG INFORMATION FROM OTHER SOURCES

Your association with colleagues, associates, and experts whom you encounter will enable you to build a network of people who have information to share with you. As with any information resource, it is your responsibility to analyze the risks and benefits of using this information, and to ascertain whether it is accurate, reliable, up-to-date, and relatively free from bias. Here are highlights of things to remember when using information from experts and other sources.

#### A. Information from experts

1. **Benefits**
   - The expert may have great wisdom gained through many years of experience.
   - Important clinical "pearls" can be obtained.

2. **Detriments**
   - The information may be out of date.
   - The expert may be biased.
   - Experience may be favored over good scientific evidence.

3. **General considerations**
   - Make sure the expert advice makes good medical sense and if possible can be supported by current best evidence or research data. If seeking expert advice, give the expert the full case history.
   - Make sure that the expert's experience parallels your patient population.
B. Other Sources

- **Review articles from non-peer reviewed journals, referred to as "throw-aways."**
  
  These may offer good information but that information needs to be reviewed very carefully for author or organization bias, especially those from drug company sponsored journals such as "Hospital Pharmacy Hotline" or Welcome Trends in Pharmacy.”

- **Hospital based treatment plans or clinical pathways.**
  
  Although some people consider this to be "cook-book" medicine, these plans (if done well) can ensure that patients with certain problems are treated correctly and uniformly. The drug information they contain may be very specific and may be based on cost. Only use them if they conform to what is currently recommended in the medical literature.

- **Pharmacists**
  
  Pharmacy professionals are an excellent drug information source, especially if you develop a good working relationship with one. Make sure you know this person's background and skill level. When utilizing pharmacist for information, make sure that only a licensed pharmacist responds to your request, not a technician or student. It is also advisable to inquire which resources the pharmacist utilized to answer your request. Always know the resource from which the information was taken, and whether it is current.

- **Pharmaceutical companies and sales representatives.**
  
  Generally, pharmaceutical companies and their representatives mean well. However, in the business of promoting their product the information that they provide to you may be very biased. Never base a drug treatment plan solely on what is provided to you by a pharmaceutical company. Always ask that it be backed up by sound scientific evidence based on research.

## SECTION VI: CONCLUSION

These are the important points for you to learn, reflect upon, and practice.

1. Understand what drug information you need.
2. Go to the most accessible and convenient source first (generally a textbook or tertiary reference).
3. If more information is necessary seek other sources (e.g., the secondary or primary literature).
4. If you still cannot answer your question seek help from a qualified pharmacist or a medical librarian.
5. Remember, the worst question is the one that is not asked.
6. Continue to ask lots of drug information questions as this can only enhance your experience, expand your knowledge and most importantly, benefit your patients.
7. Never settle for poor or inadequate answers.
THE INFORMATION LADDER

REFERENCES