Thus, the evaluation of information on the Internet requires a critical assessment of the integrity of the content, careful examination and attention to the source, and a detailed appraisal of the intent for disseminating the information. Fortunately, these same guiding principles can serve as a foundation for assessing the credibility, accuracy, and intent of mobile apps.

Evaluating Mobile Medical Apps

Mobile medical apps come in a variety of forms, each with their own unique purpose. As such, the evaluation of medical apps must vary based on the specific product in question. For example, an app designed to provide antibiotic recommendations for the treatment of pneumonia is very different than one designed to measure a patient's blood glucose levels. With the antibiotic app, one might be interested in evaluating the clinical references used to support treatment recommendations; however, when evaluating the blood glucose app, one might be more interested in evaluating aspects related to operability. Nevertheless, most apps can be evaluated based on several common principles including their usefulness, accuracy, authority, objectivity, timeliness, functionally, design, security, and value.

Usefulness. One of the first things to consider when evaluating a medical app is its overall usefulness in a particular practice setting. Ideally, apps should help improve one's efficiency and knowledgebase. An app that is truly useful should make life easier and help streamline job responsibilities. It should be relevant and pertinent to one's area of practice and have the potential to be used regularly. For example, a pediatric pharmacy specialist may find that an app used to calculate calorie requirements for infants requiring total parenteral nutrition is useful, since it saves him or her time from performing the calculations by hand. Not only does the app streamline the specialist's job responsibilities, but it is also something that he or she would use on a regular basis. This same app, however, would be of little use to an adult cardiology pharmacy specialist. Thus, the usefulness of an app will largely depend on the purpose of that app relative to one's practice setting. Evaluating this aspect is often a good starting point because it may not be worthwhile to fully critique an app that would not be useful in daily practice.

Accuracy. After evaluating usefulness, the accuracy of medical apps should be thoroughly examined. This part of the evaluation, however, may vary depending on the intent of the app. For apps designed to provide drug or medical information, the source material used to develop the content will be an important consideration. One should evaluate whether or not the clinical information is well referenced, and then further determine if these references are appropriate (e.g., are they up-to-date and applicable to the content being discussed). For instance, one may determine that the accuracy of an app for warfarin reversal would be better if it cites the most recent guidelines from the American College of Chest Physicians. Similarly, an app used to calculate a $CHADS_2$ risk score may be considered more accurate if it provided details on how to interpret the score and referenced the original studies used to validate the calculation.

The accuracy of the drug or medical content itself should also be checked. One should evaluate the completeness of the information presented and determine if there are inconsistencies or mistakes in the text. For example, one would question the accuracy of an app on antibiotics if it stated that methicillin-resistant *Staphylococcus aureus* infections could be treated with cephalexin—a drug known to be ineffective against this strain of bacteria. Depending on the app in question, accuracy may also refer to how well it performs its intended purpose. For instance, with the $CHADS_2$ calculator described above, it is important that the calculation is accurate and does not over or underestimate the risk score. Likewise, it is important that an app designed to measure blood pressure accurately captures the systolic and diastolic readings within an acceptable margin of error.

Authority. The authority, or authorship, of an app is another important consideration. Given that medical apps can be developed by anyone, it is critical to assess whether the authors and developers are reputable, qualified, and authoritative enough to create the medical content in question. To this end, one must first determine if the content experts of an app are listed. In addition, contact information for the developer should be available in the event that a user has a question or wants to provide feedback about the app. Determining this information can be challenging; however, it can often be accessed in the "about" or "contact" section of an app, as well as various information buttons (Figure 3). The download page within the app marketplace is also a good source of information for authors and developers. Figure 4 demonstrates locations to obtain additional details about an app.

If authors are found, it is important to assess their qualifications and expertise. Considerations should include whether or not the author has medical training, his or her profession (e.g., physician, pharmacist, computer programmer), level of education (e.g., postdoctoral degree, residency training), field of specialty (e.g., cardiology, infectious diseases), previous contributions to the medical literature, previously developed apps, potential sources of bias (e.g., professional affiliations), and years of experience. For instance, one might consider that an app for calculating opioid conversions would be more credible if it were developed by a well-published palliative care physician, as opposed to a software engineer with no medical training.

One must also consider the authority of the developer, especially if specific authors and content experts are not disclosed. Well-recognized and reputable infectious disease resources such as *The Sanford Guide*® and *Johns Hopkins ABX Guide*®, for example, will likely hold more authoritative weight than infectious disease apps developed by an unknown entity. Regardless, it is wise to research developers to determine the scope and purpose of the company, other apps they have developed, and the people or organizations with whom the company is affiliated.

Objectivity. Apps that provide drug and medical information should also be evaluated on their objectivity, meaning that the content within the app is fair, balanced, and unbiased. Although making this determination can be difficult—especially if one lacks clinical knowledge or background in a certain area—it is often easy to recognize. For example, an app that is marketed to help clinicians choose an antidepressant medication, but only includes drugs made by a certain manufacturer, is obviously biased since it steers practitioners

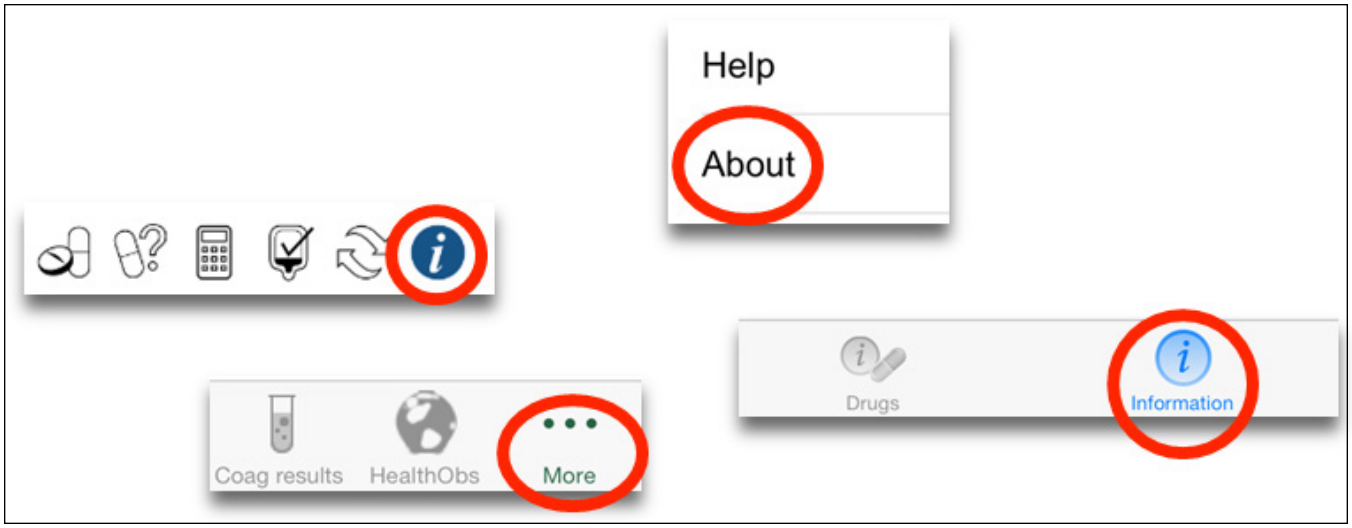

Figure 3: Common information icons used in mobile apps