QPID (Queriable Patient Inference Dossier) is a programmable search tool that uses natural language processing to extract meaningful information from the electronic health record (EHR).

Currently, QPID search queries
- Enhance safety by prescreening patients scheduled for examinations and procedures, including CT, MRI, gastrointestinal endoscopy and anesthesia
- Improves efficiency in the Emergency Department (ED) by gathering and organizing data resulting in better healthcare decisions
- Improves quality of interpretation and increases speed of interpretation by providing radiologists with relevant patient history
- QPID has been validated by comparing the results of its automated searches with manual searches and shown to be highly accurate

Electronic health record (EHR) systems are advanced databases that include data from laboratory and pathology reports, clinical and administrative notes, and demographic data. These health record systems are combined with interface components that allow ordering, event recording, and decision support. However, searching for relevant information for a particular patient from the databases is time consuming. Instead, physicians may be tempted to order new tests to answer their questions.

Following the advent of digital storage of images in the 1990s, radiology has become a technology-driven specialty at the forefront of the development and deployment of information technology (IT) including picture archiving and communications systems (PACS), web-based transmission of images, voice recognition for radiology reports, order entry decision support, and natural language processing for data mining. The advent of the EHR provides a similar opportunity to use advanced IT to develop powerful tools for the extraction of clinical data that will improve patient care.

QPID (Queriable Patient Inference Dossier) is a programmable search engine that extracts data from multiple data repositories that comprise the EHR and indexes the data in preparation for programmable searching. QPID uses natural language processing to find exact or partial matches of medical terms including acronyms, synonyms, or misspellings. It can search for related terms such as hepatitis and cirrhosis, and it can exclude unwanted hits such as the negative phrase "the patient does not have hepatitis." Such queries can be very helpful to radiologists (and, of course, many other clinicians) who often have insufficient information about patients for optimal interpretation. For example, a radiologist may see an adrenal lesion and would like to know if it had been documented previously, which could change a recommendation from an adrenal CT examination to no action. QPID also has the ability to identify salient information related to broad concepts, such as infection, by searching for relevant information in one query rather than searching for individual items. Thus QPID can search for data that physicians typically associate with infection including elevated white blood cell count, fever, potential source/etiology of the fever, antibiotics and drug sensitivities, and laboratory cultures. Such queries, which only take seconds, markedly improve the ability of physicians to provide prompt, safe, and effective care of their patients.
Enhancing Patient Safety

Before an examination or procedure takes place, it is essential to check whether patients have any contraindications or if they are at risk for complications. To avoid such problems, several departments employ patient questionnaires and/or conduct interviews immediately prior to an examination. If they reveal a potential problem, the examination may have to be cancelled (e.g., if a patient with a pace maker is referred for an MRI) or rescheduled to a hospital setting (e.g., if a patient is at risk for complications from conscious sedation during a gastrointestinal endoscopy examination). If these issues occur, it is both inconvenient for the patient and inefficient for the provider.

Automated QPID applications have been developed to provide advance notice of potential problems in several situations. In Radiology, QPID prescreens patients for potential contraindications for MRI or histories of adverse reactions to contrast material and alerts caregivers to these issues, allowing them to cancel or reschedule the examination as appropriate. QPID also detects duplicate orders for examinations within a certain time frame to avoid unnecessary imaging and radiation exposure. In gastroenterology, QPID prescreens patients for indications of high risk during sedation or who may require anesthesia, alerting caregivers and allowing them to reschedule to an in-hospital setting. In anesthesia, QPID prescreens patients for diabetes to ensure their safe management in the operating room.

Enhancing Patient Care in an Emergency Setting

One of the major challenges for effective care in an emergency department (ED) is the need to evaluate complex patients promptly without full knowledge of past medical histories. Often, these problems are addressed by ordering imaging and laboratory studies, which may result in overutilization of these resources. To provide more detailed information rapidly and efficiently, a team of clinicians and software developers from the Departments of Radiology and Emergency Medicine developed a QPID application for the ED, comprising a set of 74 query topics deemed important for screening and management but difficult to search for manually in the EHR. Several searches have the
potential to affect imaging utilization, such as deep vein thrombosis in the last five years, pulmonary embolus in the last 10 years, evidence of prior ectopic pregnancy, low ejection fraction, mechanical valve, coagulation parameters, and presence of automatic implantable cardioverter-defibrillator. The QPID ED application displays the result of each of the 74 queries for all patients who present to the ED. The average search time to gather and display the data on the QPID summary screen is 15 ± 5 seconds per patient. The results are displayed in a web-based dashboard, arranged into sections that show statistics and general information, laboratory tests, text searches and recent medications (Figure 1). Clinical information that is notable but not immediately crucial is displayed in bold black; critically important clinical information is displayed in bold red. Hovering the cursor over the alert allows the user to access the source document. Compared to untimed manual searches, the QPID ED search demonstrated a positive predictive value of 99% and a negative predictive value of 96%.

Further Information
For more information about QPID, please contact, Michael E. Zalis, MD, or Arun Krishnaraj, MD, MPH, Abdominal Imaging and Intervention, Massachusetts General Hospital, at 617-726-0583.

We would like to thank Michael E. Zalis, MD, Arun Krishnaraj, MD, MPH, Abdominal Imaging and Intervention, and James M. Richter, MD, Department of Gastroenterology, Massachusetts General Hospital for their assistance and advice on this issue of Radiology Rounds.

References


QP ID (Queriable Patient Inference Dossier) Informatics. Mass General Imaging


©2013 MGH Department of Radiology

Janet Cochrane Miller, D. Phil., Author
Raul N. Uppot, M.D., Editor