Imaging: the new frontier for clinical decision support

The clinical decision support (CDS) system is one of the most exciting areas of healthcare IT. It leverages state-of-the-art IT tools ranging from data-mining algorithms to complex neural networks, and seeks to address one of healthcare IT’s biggest challenges - Big Data. For its proponents, CDS is a means to standardize clinical practice with a framework of evidence-based clinical rules.

Information overload and CDS
In a recent publication, Ken Ong, Chief Medical Informatics Officer of New York’s Queens Hospital, discusses the importance of CDS tools and processes to modern medical practice. He cites the quadrupling in medical journal articles from 200,000 in 1970 to over 800,000 in 2010, and calculates that given the current rate of publication in medical literature, a medical school graduate reading two articles every day “would be 1,225 years behind at the end of the first year.” Another interesting figure concerns national clinical care guidelines for preventive services and chronic disease management. Ong writes that were physicians to follow all these, alongside doing their routine tasks for a typical patient panel, they would need a workday of 21.7 hours. His conclusion is simple: “Information overload coupled with a paucity of time suggest the value of CDS and greater team-based care.”

Reduction of inappropriate imaging
In its radiology incarnation, a CDS platform provides evidence-based information and patient-tailored tools to make imaging decisions at the point of care. The system is optimized within clinical workflow and allows a physician to quickly determine what type of imaging exam is needed for a patient with specific symptoms, effectively steering choices away from low-yield exams. This ensures the appropriate use of radiation, while avoiding unnecessary exposure. It also evidently save costs.

In practical terms, radiology CDS is provided as an interface to a computerized physician order entry (CPOE) system. In February 2012, ‘The Journal of the American College of Radiology’ published results of a pilot study at Boston’s Brigham and Women’s Hospital on a web-enabled (CPOE) system with embedded imaging decision support. The project was run between 2000 and 2010 across the hospital’s outpatient, emergency and inpatient departments and established significant increases in meaningful use for electronically created studies (from 0.4 percent to 61.9 percent) and for electronically signed studies (from 0.4 percent to 92.2 percent).

Also in 2012, the American College of Cardiology announced the results of a two-year old initiative known as ‘Imaging in FOCUS’, which aimed at reducing inappropriate use through CDS software. The initiative had considerable success, with participating practices reporting a sharp reduction in inappropriate ordering, by close to 50% in one year (from 12 to 7 percent).

Laggard in healthcare IT
In spite of this, CDS has until recently been limited to prescriptions, laboratory tests and treatment protocols, with imaging described as “a laggard on the health IT technology adoption curve.” In the US health IT investments of higher priority to hospitals—certified electronic health record (CEHRT) technology needed to comply with the federal meaningful use (MU) programme, better security systems, and ICD-10 conversion software—have superseded investments in radiology CDS.

A boost from PAMA
However, radiological CDS systems received a boost in the US after passage of the Protecting Access to Medicare Act (PAMA) in April 2014. Although much of its focus is on physician reimbursement, PAMA also provides incentives to change physician behaviour with regard to imaging. The key clause in PAMA is Section 218 which encourages the development and use of clinical practice guidelines for ordering imaging tests. These guidelines, in turn, form the core of radiology decision support tools.

PAMA closes a gap in the meaningful use clauses of the EHR Incentive Reimbursement Program, which has been targeted at the electronic health record. EHR design does not accommodate radiology workflow and processes - and therefore had little relevance for radiologists so
far. This is what PAMA seeks to address. The impact of PAMA on CDS is likely to be major, after it takes effect. The deadline was originally set for January 1 next year, but has since been shifted to “approximately the summer of 2017,” in order to give more time to healthcare providers to get used. After PAMA is in force, physicians in their office, in the hospital outpatient or emergency department settings will have to consult appropriate use criteria (AUC) when ordering CT, MRI and nuclear medicine-based imaging such as PET (X-ray, fluoroscopy, and ultrasound exams are excluded). PAMA explicitly states that physicians offering diagnostic interpretation will be reimbursed by Medicare only for claims which confirm that a certified CDS system was used.

ACR Select: appropriate use for imaging

Although there are several initiatives, the radiological CDS system which seems most likely to become a global reference is ACR Select. This system, which debuted at the Radiological Society of North America (RSNA) Annual Meeting in 2012, was developed jointly by the American College of Radiology (ACR) and National Decision Support Company (NDSC). ACR Select is designed to “reduce inappropriate use of diagnostic imaging” by using CDS software to track AUC criteria. ACR Select offers a database with more than 130 topics and 614 variant conditions that provide evidence-based guidance for the appropriate use of all imaging procedures. More than 300 volunteer physicians, representing more than 20 radiology and non-radiology specialty organizations, participate on the ACR expert panels to continuously update these guidelines. An ACR Select interface is provided for computerized physician order entry (CPOE) applications. The interface pops up when a physician requests an imaging exam for a patient. The physician is required to input information on the latter’s clinical condition, along with the imaging exam sought. ACR Select then gives an appropriateness score, accompanied by a colour code – green, yellow, or red which instructs whether a study is clinically indicated based on the ACR’s appropriateness criteria.

Europe sees no need to reinvent the wheel

Developments in the US have spilled over into Europe. In autumn 2013, Hospital Clinic of Barcelona started to test ACR Select, with the aim of adapting its appropriateness criteria to European standards of practice. Shortly afterwards, a team of senior radiologists began work developing Europe-specific and evidence-based imaging referral guidelines. These were based not only on translating the US criteria into Spanish, but also adapting them to local clinical situations, diagnostic codes, and country-specific practices. The target was “to cover around 80 percent of requests in daily practice by reviewing the clinical scenarios, indications and recommendations” for a large range of topic groups.

At the European Congress of Radiology (ECR) in Vienna in March 2014, Dr. Lluis Donoso Bach, director of the diagnostic imaging centre at Hospital Clinic Barcelona’s network, The tests were then rolled out to other specialists, including emergency physicians.

The embryonic system was subsequently tested at 80 general practitioners in Hospital Clinic Barcelona’s network. The GPs were provided feedback on how their requests for imaging exams matched appropriateness criteria. The tests were then rolled out to other specialists, including emergency physicians.

In the months to come, some ten pilot projects to adapt ACR Select to Europe were launched in various other European countries, including the United Kingdom, Germany, Italy, Spain, Portugal, and Sweden.

Conflicts in European models, global ambitions

In retrospect, one of the most persuasive arguments swinging the choice of radiology CDS towards ACR Select consisted of conflicts between emerging European CDS models. The ESR had first sought to develop a CDS system based on guidelines from the French and British radiological societies. However, preliminary work soon identified ‘considerable discrepancies’ between the two sets of rules and this led the ESR to turn to ACR Select.

Yet another advantage of a joint Euro-American approach is acknowledged by the ESR. It gives “a global dimension for the ACR and ESR’s common vision of establishing a global set of imaging referral guidelines in the future.” As ‘Pharma Times’ noted, the collaboration is “a decisive first step towards harmonizing AUC for imaging at a global level”. It added that interest in the system from Australia and Asia suggests “that the radiology field is indeed headed towards a globalization of ordering guidelines.”

In March 2016, National Decision Support Company (NDSC) established a European subsidiary in Vienna, home of the ESR. Outside Europe, one of its first targets is the Middle East.

ESR launches Europeanised prototype

In March 2015, the European Society of Radiology (ESR) formally launched a prototype of the adapted US CDS system, which it called iGuide. The launch took place at the ECR in Vienna. During the occasion, Dr. Lluis Donoso Bach also took over as ESR President, with his term lasting until 2016.

During the launch, Erika Denton, National Clinical Director for Diagnostics with NHS England, discussed some figures regarding the localization and adapting of ACR Select into the ESR iGuide. There were 16% rating changes – that is, changes in the ratings attributed to an orderable imaging exam; 9% category changes – that is, changes in the imaging modality being recommended in a given clinical scenario.

iGuide

iGuide makes evidence-based, imaging referral guidelines available and easy to use across Europe. It is designed as a user-friendly system available at the point of care, and can be stand-alone or integrated with ordering systems and linked to electronic health records. As with ACR Select, it aims to ensure “a simpler, faster and reliable clinical workflow.”

iGuide also retains an element of flexibility. Users can localize recommendations according to their needs starting from the evidence-based core. In addition, the ESR iGuide can be adapted to users’ needs and institutional settings, for example by taking into account the availability of certain types of imaging equipment. This is not only relevant for Europe, but across other heterogeneous global markets, and will be crucial to eventually make the Euro-American effort an international success.

The ESR plans to continuously update iGuide to provide users with the latest evidence, instead of publishing a complete overhaul every few years.