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Dr. Max Ryan,
Consultant Radiologist

A simple safety net that saves lives

Dr. Max Ryan, Consultant Radiologist at the Cork University Hospital explains how an established and widely accessible technology – the smart phone – helped him create his ground-breaking yet simple application for actual and potential lung cancer sufferers.

New technology is often hailed for its potential healthcare benefits but, for Dr. Max Ryan, consultant radiologist at the Cork University Hospital, it was an established and widely accessible technology – the smart phone – that helped him create his ground-breaking yet simple application for actual and potential lung cancer sufferers.

> By using the alert system for only the most time critical results, it ensures that the emails are treated with the importance they deserve.

"Following a series of delayed diagnoses of lung cancer in Ireland, it became apparent that one of the key issues was that there was no reliable system in place by which radiologists could notify clinicians when they came across something significant and unexpected but unrelated during an X-ray examination," says Dr. Max Ryan. "For instance, if a lung tumour was detected as a result of a referral from orthopedics rather than from oncology, how could the radiologist be sure that the results were notified to and acted upon by the referring clinician?

"It also became clear that this situation was more likely to be an issue in accident and emergency departments. With clinicians working shifts and often handing care over to colleagues, they are less likely to have continuous contact with the patient, which makes taking ownership more difficult."

Implementing the solution through Agfa HealthCare's PACS

As a lead on the Irish National Quality Assurance Initiative for Radiology, one of Max's goals was to devise a system, both automated and auditable, through which to alert referring physicians of unexpected findings.

"I wanted to find a more efficient way than simply having the radiologist try to contact the physicians by telephone or contact their team. I knew there had to be a way to create a simple alert system that could not only ensure that the findings were notified to the relevant clinicians, but were also electronically recorded. The recording was really important from both a patient care and Quality Assurance perspective because, should a clinician fail to respond, it meant that others within a chain of nominated people would be notified to ensure that patients didn't come to harm as a consequence of falling through the net."

As with the very best ideas, Max's solution was, as he himself is quick to admit, a very simple one: to create an alert system – Rad Alert – that uses smart phones and a dedicated PACS workstation application that notifies physicians by email and/or text if significant and unexpected radiology findings are noted by the reporting radiologist.

"I was keen to keep the processes as streamlined as possible but also needed to ensure that we had a secure and auditable process. With so many of the clinicians already having access to our PACS system, I asked Agfa HealthCare if there was a way we could incorporate the solution I had mapped out within its functionality. Agfa HealthCare then brought Rivendale Solutions, one of its local partners, on board to help with the alerts and GUI development."

As a result, now, when significant and unexpected imaging findings are identified, radiologists can activate the alert system by selecting the appropriate RadAlert icon on any PACS workstation. By clicking this icon, a page opens which allows the radiologist to choose one of three options. These include Unexpected and Significant Clinical Findings, Urgent, and Critical findings from a dedicated drop-down menu system. An email alert is sent to the responsible consultant and, should that consultant fail to respond in a timely manner, the system is configured so that other relevant personnel are alerted. A permanent auditable record is held on the Radiology Information System (RIS), which allows the radiology department to monitor and take action in the unlikely event that a referring physician fails to respond to a RadAlert notification. A hospital policy has been developed to include an escalation process should there be a pattern of repeat behaviour – although it is a situation that has yet to arise.

Dr. Max Ryan, Consultant Radiologist and Professor Michael Maher Professor of Radiology CUH and UCC

"For every significant and unexpected finding, the radiologist may engage the RadAlert system within PACS, either during or after the creation of the report," explains Max. "By selecting the icon, the report is automatically electronically tagged to include date, time and details of the clinician contacted. Authorized reports are automatically transferred to both RIS and PACS where they can be read hospital-wide and acted upon. Paper copies of all reports are printed by the radiology department and sent by mail to consultants as a further backup.

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Significant and Unexpected results

Mindful that overuse or misuse of the system could lead to loss of effectiveness if recipients developed text and email fatigue, Max has set very strict policy criteria for when the system should be used. "The system records three categories of findings: Critical, Urgent, and Significant and Unexpected (see Faculty of Radiologists in Ireland/ National Quality Assurance Programme Guidelines).

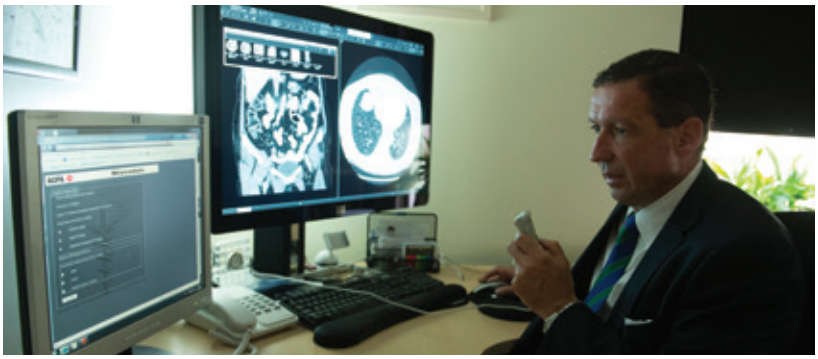
"The alert system is only used when the radiologist's findings are both Significant and Unexpected," Max explains. "So, for instance, if someone is already being treated for cancer, finding a lung nodule would not necessarily be unexpected. If, however, someone comes into accident and emergency with a sprained hand and investigation shows a bone tumour, the findings would be considered to be both Significant and Unexpected and the clinician would, therefore, be notified. By using the alert system for only the most time critical results, it ensures that the emails are treated with the importance they deserve."

Staff understanding and buy-in are essential

As with any successful solution, the attitude of staff to its implementation has been essential to its success. "The system did require a small amount of staff training but, once everyone was aware of what the system does and the benefits it would deliver when used properly, we had no real issues. That is particularly gratifying given that the physicians had to agree to have their mobile phone numbers available within the system!

"We created a clear communication strategy by adopting a Super User training approach, where I trained the first level of users, who then trained the people they were working with. It has enabled everyone to be clear about when and how to use the system correctly."

With the alert system now in its third year, it is currently being used by approximately 150 consultants at Cork University Hospital and Mercy University Hospital, Cork. Galway University Hospital, Ireland and the University Hospital Birmingham, in the UK, are also soon to come on line, and interest is beginning to be shown further afield as the system becomes more widely known about.



> "Since the implementation of the system, there has not be one missed case of lung cancer diagnosis."

Life-enhancing proven results

For the patients in Ireland, there is little doubt that it has paid dividends. During its first full two years of operation, 524 Significant and Unexpected results were flagged, of which 25% proved to be cancers. Commenting on the figures, Max says, "We always knew there would be an element of overcall, but the number is manageable. Since the implementation of the system, there has not been one case of missed lung cancer diagnosis so we are happy to live with the current ratio of alert to findings."

While the system was originally developed for lung cancer sufferers, it can also be used for other types of cancer and also non-cancer related diagnoses and Max is already looking to add functionality to the solution. "I have recently asked Agfa HealthCare to look into adding another function: to record whether the radiologist agrees or disagrees with the clinician's initial interpretation of radiology findings. This functionality is particularly useful in accident and emergency departments. If there is a disagreement, then the radiologist report will be flagged on the RIS system with a priority flag for urgent attention by the referring physician."

The fact that new cancer was confirmed on almost one third of the chest radiograph alerts indicates the importance of clinicians receiving and acting on these alerts. The study also highlights that 20% of potential cancer alerts were not officially acknowledged by the clinician. Even though the majority of patients did receive timely follow-up, there were still some delayed diagnoses and follow-up failures to be addressed.

What is RadAlert on PACS?

- A smart phone-based alert and reporting solution that enables radiologists to notify referring consultants of Significant and Unexpected results.
- Creates automated, auditable notifications from the reporting area of the radiologist directly from the PACS system.
- Provides a closed loop workflow to the tracking of unexpected findings – in particular cancer findings that are incidental to the original request for examination.
- Helps mitigate Trusts where a finding is detected and reported but then the clinical team fails to recognize or act upon the finding.

First year results

372 alerts were issued over the 1 year study period. 49% (181) of alerts were issued due to a suspected cancer diagnosis and of those 67% (121) arose from a chest X-ray report.

57% of the "cancer" alerts were acknowledged by clinicians within 3 days, however, 19% (35) of the "cancer" alerts were never acknowledged and 5 of these patients did not receive the recommended follow-up.

CT follow-up was recommended in 103 chest radiograph reports and was performed in less than 1 month in 50% (53). However 5 patients had to wait more than 90 days for the CT scan and of those patients, 3 patients subsequently had a confirmed lung cancer on CT.

20% (21) of patients never had a CT thorax for reasons including loss to follow-up, resolution on subsequent plain imaging, etc.

Analysis of subsequent CT thorax results found that previously undiagnosed cancer was detected in 31% (26) patients.