Radiology Informatics Committee: Industry Workshop

Notes from the virtual RIC Industry Workshop
held on Thursday 10 September 2020, 10am to 12:30pm via GoToMeeting.

1   Welcome, introductions, apologies and conflicts of interest

Dr Neelam Dugar welcomed all attendees and a virtual round of introductions took place.

Delegates included radiologists, industry partners and PACS managers.

Dr Dugar outlined the agenda for the event and explained that the Radiology Informatics Committee (RIC) have been involved in developing guidance and standards documents for the RCR over the last few years to assist radiologists and to encourage industry to develop systems and support workflows that will enable radiologists to be more efficient and deliver a superior standard of care for patients.

2   AI and image interpretation

Dr Dugar provided an overview of the draft guidance on the implementation of AI: *'Integrating artificial intelligence (AI) with the radiology reporting workflow (RIS and PACS)'.* The guidance was initially brought in during the COVID-19 pandemic in April 2020, but which is now being expanded upon by RIC and is currently out for public consultation until 30 September 2020.

The guidance recognises that AI will play a significant role in radiologists' future working lives, and aims to help radiologists integrate AI solutions into the reporting workflow without increased burden.

Discussion points included:

- Further discussions are needed with emergency departments, regulators and other royal colleges about their views on this guidance. It is important that their views are fed in.

- Some concerns were raised about the suggested AI workflow and waiting for AI to complete before the study shows up in the worklists. What happens if there are delays in the AI server or if the AI server goes down? This would mean that certain studies would not populate on the worklist anymore or would be delayed. It was suggested that it might be more sensible to show in the worklists which ones have been processed already and which ones are still queued for processing. It was agreed that the draft guidance needed to include something on the workarounds if there is failure with AI.

- The draft guidance suggests that the modalities would send through the studies to the AI system first before forwarding them to the PACS, but it was suggested that it might be more preferable to use the PACS as the workflow orchestrator. Potentially it could be difficult to configure a lot of the modalities about where to send the studies especially in situations where you might want multiple algorithms to process certain exams. This would mean that PACS would send the images, but the concern that RIC had with that workflow was that once it's in PACS, clinicians and radiologists can see the images and decisions about a patient are made based on a human review which then gets challenged by AI with a different interpretation. From a clinical point of view, this causes confusion and could potentially be risky. However, Dr Dugar acknowledged that this alternative view was worth consideration and will be discussed further by RIC at their next meeting.

- Focus has mainly been on the interpretation that AI will make of the images that have been acquired (plain film, CT etc,) do we need to look at little steps first e.g. can AI algorithms be

used to initiate that workflow, or our reporting list, to organise which order the images are reported on first? Dr Dugar confirmed that automation can be applied to help with this, but it doesn't often require AI itself, it requires a good RIS which allows you to have a multiple data items to 'slice and dice' your reporting worklists.

- The guidance refers to sensitivity and specificity in terms of accuracy of the AI algorithm. A query was raised as to why negative predictive value and positive predictive value weren't used because sensitivity and specificity are so affected by the dataset that was used to train and test the algorithm. They would both be skewed towards whatever 'abnormal' finding you are looking for so sensitivity and specificity on its own is not necessarily the best indicator of how confident a clinician should be in the diagnosis. Dr Dugar agreed this was a good point and asked delegate Graham King to email her with some further information and RIC would look at updating the document accordingly.

- A query was raised as to whether the RCR have had any involvement with the IHE efforts on developing the AI results and AI workflow profile as a lot of the issues they have been debating are similar to the ones being discussed today. Dr Dugar confirmed that Robin Breslin is the IHE representative who sits on RIC and he has been involved in discussions. Dr Dugar has also had discussions with David Clunie with regards to DICOM.

3   Radiology Business Intelligence for service planning and workforce modelling

Dr Dugar explained that the above guidance, which has been in production for some time, was discussed at the last industry workshop in 2019 and is now due to be published by the RCR imminently. Prior to the industry workshop a summary version of the guidance was circulated to delegates (see appendix 1). Dr Dugar explained this was specific for all radiologists to help them understand business intelligence and to highlight useful elements, concentrating on the dashboards that every radiologist, working in the NHS needs in order to understand where the bottlenecks and capacity issues are. This requires a good RIS and RIS data. Dr Dugar invited comments from delegates.

Ian Judd (Sectra) commented that it is important to know the *type* of reporting physician that provided the clinical report e.g. whether they were a junior, a consultant, or whether they were acting in a sub-speciality or general role as this could skew the work type. The examination code is insufficient normally to get a typical understanding of the complexity of the case (e.g. a CT chest from oncology is very different from a CT chest for another reason in terms of the time/effort required to report it) and therefore some trusts use the sub-specialty type concept to understand the differences. More accuracy can be achieved based on the *type* of request and exam to say how long a scan/reporting might take. Having some quantification of reason for request, not just the exam code alone, is quite an important data element to include. There are some exam codes which are very specific to the clinical indication whereas other exam codes can be very generic. Dr Dugar agreed that a lot of different data items could be used, but for the purposes of this guidance RIC have tried to keep things as simple as possible, using only a small sub-set. BI units only give averages and the committee [RIC] recognise some consultants with more experience may be faster than others. Business intelligence is only a guide to tell you what the capacity deficit is, and to help with planning, but invited Mr Judd to submit his suggestion via email to the RCR for further consideration by RIC.

Tommy Vansteenkiste (Agfa) noted that in terms of the requirement for RIS vendors to support sending the data; Agfa's solution is that they have a dashboard creating application BI solution which can be fed with RIS data either from using their acquisition desktop or via HL7 from a different RIS vendor. Mr Vansteenkiste queried whether it is the RCR's expectation/wish to have this data in an overarching BI solution/how would they position the BI system in this case? Dr Dugar explained that there have been a lot of BI solutions that get data fed from modalities and from the PACS vendors because DICOM data is much more available, but the problem with ignoring the data from the RIS and only taking the data from PACS can cause lots of problems. For example, when acquisition completion is completed by a radiographer it becomes available for reporting, whereas if you have acquisition completed from the machine it prolongs the report turnaround time so it is not as accurate and it underestimates the radiographer time needed to get the patient off the scanner

and the other processing that the radiographer needs to do. For this reason, RIC are very keen that the data comes from the RIS.

Mr Judd suggested there needs to be a blend of data arguing that you cannot get a true perspective of what is happening in your department without blending RIS and PACS data into the same data set. There are a number of factors where PACS plays a significant part in dashboarding alongside the RIS data and a blend of the two is the optimal. Dr Dugar confirmed that this information was included in the main Business Intelligence guidance, but for the purposes of creating the dashboards, Dr Dugar has taken a subset of information. Whoever is reviewing and understanding the data needs to be clear about where the data has come from and what the limitations of that data are.

From a standards perspective in his role at IHE-UK, Robin Breslin commented that what was interesting about the document is that it speaks to different kinds of data. In the world of radiology, the interoperability of data can be overlooked because of the success of DICOM. You can take DICOM objects from one PACs to another and successfully display and interpret them, whereas the level of data content transfer is less standardised in the world of RIS. That's not to say it is unstandardised, but again it is hidden somewhat by the fact HL7 messaging can interchange things, however it doesn't guarantee that the same code-defined values are used in the different RIS's. Greater standardisation of things like study codes etc across radiology in the UK will help in making data more interchangeable between RIS's but there are always local things that RIS's codify in slightly different ways so it makes it difficult to make a dashboard that operates across multiple RIS's and PACS. Standardisation, as it progresses, will help with that.

Mr Breslin also commented that in other countries there is a market for a business intelligence entity that lives outside of the RIS and the PACS but which uses observable data in the messaging, that passes the DICOM and HL7 messaging and brings that together into a dashboard which gives a coherent view across both the RIS and the PACS. Mr Breslin suggested that this is something that may be worth considering in the UK market.

The RCR promised to circulate the business intelligence guidance to delegates once published.

4   Supporting radiographer vetting in RIS Workflows with iRefer Clinical Decision Support (CDS)

Hasan Dharamshi and Martin Kepa (Medcurrent) gave a presentation about the iRefer Clinical Decision Support (CDS) system. A copy of their presentation can be found in appendix 2.

Comments raised following the presentation included:

- Concern that a referring clinician working in the emergency department might look at the figures of the acceptance rate of request by the radiology department and 'tweak' the information they provide to make it iRefer-approved, constructing a clinical history to get it approved rather than providing the radiologist with all the information.

- iRefer can, however, be used very positively in radiology departments to support the vetting processes.

- Dr Miller noted that in her previous trust they had designed a simple, brief audit which consisted of comparing the e-notes to the indications on requests and fed this back to the senior clinicians and it resulted in a significantly lower inappropriate clinical history appearing. Dr Dugar agreed this was an important point and proposed incorporating this into the ordercomms document that RIC are currently reviewing.

- If this was implemented in the vetting aspect of the workflow does it do the natural language processing (NLP) and compare this with the iRefer guidelines? Hasan confirmed that this was not the case at the moment. It doesn't NLP any of the notes for the patient to compare it to the clinical history that's been given or the clinical indication. At the moment it selects from a discreet list of iRefer indications it's not natural language processing any free text or notes per se.

5   Teaching Archive: encouraging adoption of TCE Profile

Dr Jon Benham's presentation on Teaching Archives set out the clinical advantages of a system of collecting anonymised teaching files. Dr Benham explained the reason for adopting IHE's TCE standard and the work that RIC and the RCR have already done to set up a TCE Receiver.

Dr Benham went on to give a virtual demonstration of the RCR's TCE Receiver (RSNA MIRC teaching file system). The RCR would like interested PACS vendors to get in touch so we can test implementations of TCE Selector and TCE Export Manager actors with the RCR's TCE Receiver.

Adoption of TCE would standardise the way we share images with anonymisation, but it relies on PACS adopting TCE and unfortunately, we do not have any funding available for this. Trying to get this implemented has been difficult and so we want to understand the barriers.

Andreas Ehrlund (Sectra) commented that setting up and hosting a teaching file system is a lot of work and has hidden costs, and asked has there been an objective evaluation of the private vendors - both on features and price? A good teaching file is one where there is good contribution and so it needs to allow you to share information quickly and easily otherwise radiologists won't be engaged.

Matt Ferrant (Agfa) one of the practical challenges is around how you categorise all the data that is being sent to the archive. This requires some form of structure and to have this in place you need to normalise the fields that need to be put in with a catalogue/nomenclature that everyone adheres to otherwise you will end up with lots of different teaching files which pile up without any easy way to categorise them on the receiver side. A receiver can only be successful if there are contributors. The challenge for RIC has been that there are few PACS vendors who actually support the contribution side of images using TCE. Whilst this is true, all contributors will need to use the same nomenclature to feed the receiving system so that categorisation is easier afterwards and doesn't have to be done manually. Dr Benham confirmed that to some extent this has been built into the TCE standard so this shouldn't be too difficult.

The issues for RIC have been around the PACS vendors adopting TCE at the selector end, and also around funding for this. Now that PACS has been deployed there is no additional funding available to make these enhancements. Robin Breslin commented that whilst RIC are right to try and choose the easiest path for people to be able to export data from the teaching files, however it will still take effort and work to put in place and so without funding it won't get implemented.

Bob Childe (Soliton) offered to re-table this with AXREM believing that in light of COVID-19 there has been a shift in the way people work, with more people doing so remotely, and this changes the emphasis with this solution. Post-COVID people may be more willing to join up as they understand the importance of teaching virtually and moving to a more virtual environment for training of applications. As Chairman of the AXREM HI group, Mr Childe offered to share a copy of Dr Benham's presentation at their next meeting and invited Dr Benham to come and speak at the meeting. Mr Childe also suggested that there should be a conversation with the procurement people i.e. Supply Chain, Gateshead etc. about including this requirement in tenders.

A copy of Dr Benham's presentation can be found in appendix 3.

6   Networks and report-sharing (Who Shares Wins – Oct 2016). Are the guidelines in line with reality?

In October 2016, the RCR published the 'Who Shares Wins' guidance which set out what standards imaging departments should demand from RIS and PACS vendors to ensure their radiology information technology systems can function in the modern teleradiology environment in a vendor neutral way. This guidance is currently being updated by the RCR. In support of this work, Dr Nick Hollings gave a presentation on Networks and report-sharing and sought to address the question: 'are the guidelines in line with reality?'. A copy of Dr Holling's presentation can be found in appendix 4.

Discussion points included:

- How does the RCR identify examples of good network working, the 'best' architecture and value for money all on a background of the 18 networks that the NHS England/ Innovation's

(NHSE/I) set out in their national strategy for imaging networks published in November 2019?

- In terms of networks and report-sharing one of the biggest barriers that remains is funding and inertia that exists in the NHS.

- Andreas Ehrlund is the new product manager of Sectra's cross-enterprise solutions. They realised, even before COVID that the products they have were not modern enough and the need is just as monumental in Scandinavia as it is in the NHS. The shortage of radiologists makes it so that their solution for distributing work is as critical, if not more critical than the actual PACS itself sometimes. They are working on an ambitious project to radically improve workflow sharing (and image sharing, although this is trickier) and invited delegates to get in touch for more information if this was of interest.

- The national solution needs to be standards-based so it is PACS vendor-neutral. The index is DICOM-based, so that every vendor can get that imaging history. **The first priority for radiologist is the full imaging history regionally, or even nationally, so that judgements can be made on whether an exam is appropriate. The second priority that's needed is the radiology report which is usually a very small text document that doesn't overload the network connection; and the final priority is the images.**

- Bob Childe commented that from an industry point of view there is a lot of confusion about whether this national solution proposal will be back on the table as it is a concept that has been discussed for many years. NHSX have indicated it might be and there are some success stories e.g. in Scotland, Cheshire and Merseyside etc. Does the RCR have any plans to put pressure on NHSX for a national solution? If we can demonstrate success elsewhere in the UK, rather than a localised solution, it might help.

- NHSE&I have three network documents in final draft, which the RCR has commented upon: 1. Implementation Guide. 2. Organisational structure and operational governance guide and 3. Central equipment planning guide. It is hoped these will be published soon. The RCR has been working closely with NHSE/I as they have developed the network strategy and in principle, support the development of networks, but have concerns around the lack of detail. The RCR is concerned about the gap between the national network agenda and the local emergence of networks and are taking all opportunities to engage with this constructively.

7   Summary and close

Dr Dugar brought the event to a close, thanking the presenters and delegates for taking part.

In reflecting on the event, initial feedback from delegates was positive and there was a lot of support and interest for any future sessions that may be arranged. It was suggested that these industry workshops continue to be held virtually as well as face-to-face, to enable greater participation. It was also proposed that future sessions could also be limited to one particular topic but with a more in-depth focus.

Dr Dugar invited delegates to provide any further thoughts or comments via email and confirmed that the RCR would also be circulating a short feedback form to attendees following the event. The RCR will in due course publish a brief event summary and share the presentations from the event via the RCR's website.

APPENDIX 1: Radiology Business Intelligence – Dashboards for Radiologists

APPENDIX 2: iRefer CDS presentation (Medcurrent)

APPENDIX 3: Teaching Archives presentation

APPENDIX 4: Networks and report-sharing presentation

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