

Signify Research Show Report from ECR 2019

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Signify Research's key takeaways from the 25th European Congress of Radiology (ECR) hosted in Vienna. Topics covered:

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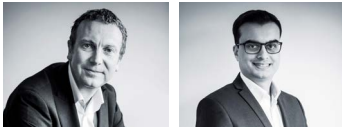


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Unlocking the Value of AI in Medical Imaging

Written by Simon Harris & Dr. Sanjay M. Parekh PhD

At ECR this year, there were over 25 independent software vendors (ISVs), many of them start-ups, showcasing artificial intelligence (AI) solutions for medical imaging within a dedicated space. Additionally, with established imaging vendors foraying into the AI space, what was once hype is now in the early stages of market maturity, and, it appears, AI within medical imaging is here to stay.

The question has now shifted to what clinical value AI solutions can provide, rather than if AI is suitable for medical imaging. Radiologists are no longer apprehensive AI will remove them from their jobs, and jobs are now in the driving seat in terms of dictating what they want from such solutions – start-ups and established vendors are both scrambling to address this. However, there was little variation in the AI solutions on show at ECR, with many vendors targeting the same clinical applications. With well over 100 companies developing AI solutions for medical imaging, some segments of this fledgling market are already looking crowded. The successful vendors will be those that are able to clearly demonstrate their ability to deliver value, both in terms of clinical relevancy, clinical validation, workflow integration and return on investment. We share our insights on each, below.



Availability of data to train the machine learning algorithm

One of the barriers to this is the lack of availability of well-annotated data to train the machine learning algorithm. Most of the public data sets are focused on high volume, routine cases, for example, lung nodules or breast anomalies (indicative of breast cancer). As a result, most AI start-ups are targeting these high-volume clinical cases, and of course they represent some of the largest market opportunities.

However, radiologists cover a large array of clinical cases throughout a typical workday. If we look at case variety in terms of an iceberg, the tip consists of a small number of high-volume cases (e.g. lung nodules), but most clinical cases are yet to be addressed by AI solutions and are an untapped market for vendors. While there is certainly value in AI solutions targeted at these repetitive and time-consuming high-volume cases, for AI to realize its full potential in medical imaging, radiologists need a more comprehensive set of AI-enabled tools. The successful vendors will be those that have innovative strategies for obtaining annotated data and that have secured multiple data-sharing partnership with health providers, enabling them to develop algorithms for a diverse range of clinical cases.

Development of an AI toolkit or body area solution

Early AI solutions were typically point solutions, developed for a specific pathology. More recently there is a trend to develop solutions that are more akin to AI diagnostic toolkits. Specifically, these solutions can detect more than one anomaly, ideally within a body area in its entirety, and in some cases across multiple organs. Not only do these more comprehensive solutions provide a greater level of diagnostic support, they also simplify the process of integrating AI in the clinical workflow (e.g. one solution instead of many individual algorithms) and are

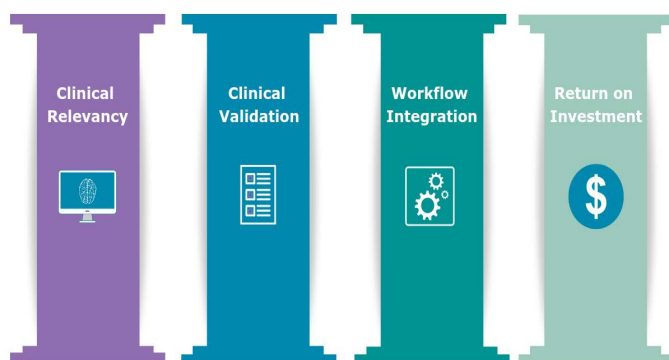


Fig 1: 4 Pillars of Value for AI in Medical Imaging

1. Clinical Relevancy

Remaining relevant in an ever-adapting environment is every company's aspiration, and companies in the medical imaging AI field are no different. Key to this is companies developing AI solutions that are clinically relevant to healthcare providers.

likely to be more cost-effective. Although the robustness and thoroughness of these solutions varies between vendors, the consensus seems to indicate this will be a key development trend in the future. This trend was discussed in more detail in our RSNA post-show report ([see Product Evolution: Where do we go from Here?](#))

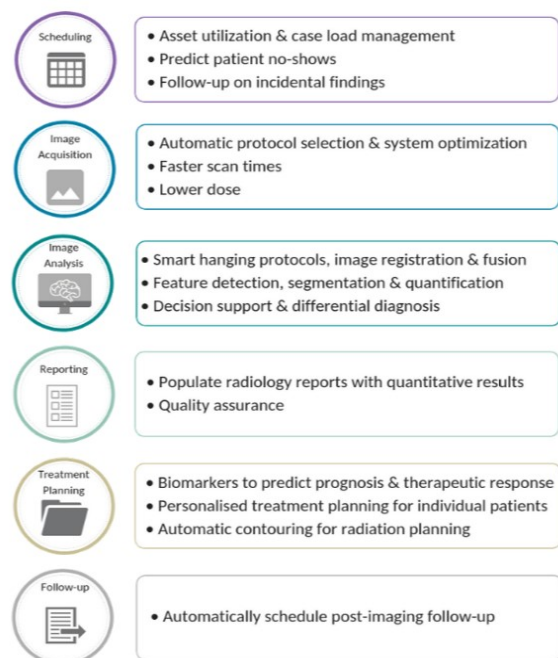


Figure 2: Use-cases for Machine Learning in Radiology

Anomaly detection only a small part of the story

This leads onto the value of medical imaging AI solutions beyond anomaly detection. The ability of AI solutions to quantify features of a scan enhances the value of radiology reports for referring physicians and can ultimately improve clinical outcomes. AI solutions that take this a step further, and support or offer a differential diagnosis remain the pinnacle, for both AI developers and radiologists alike. From the solutions on show at ECR, it was evident that vendors are making progress in this respect, with several showing solutions that give a probability score for the likelihood of malignancy for a nodule or lesion.

Further to this, AI has a wider role to play within medical imaging beyond image analysis (see figure 2 above). Image analysis is the main state of play in today's market, but image acquisition (pre-phase), and reporting and treatment planning (post-phase) will become increasingly important in the coming years.

Image acquisition appears to be the next major use-case for AI in medical imaging, with a three-fold benefit for healthcare providers. Firstly, the time to undergo a scan will be much reduced, providing benefit to the patient in terms of quality of care, and to the provider,

in terms of maximizing the number of scans delivered per day. Secondly, the use of machine learning during image reconstruction can enhance the quality of low-dose CT scans to that of normal dose CT scans, reducing patient radiation exposure. Finally, AI can be utilized to reduce noise and artefacts from scan images (especially if low-quality), to improve the radiologist's diagnostic confidence and potentially reduce rescans.

2. Workflow Integration

Integration into imaging modalities

As we covered after RSNA, it is becoming increasingly clear that for AI to become mainstream, it must be seamlessly integrated into radiology workflows, either at the point of image acquisition or in the PACS environment (see [Workflow Integration – It's a Platform Play](#)). Although AI solutions may be integrated into the scanner itself, both for image acquisition and for image analysis, this is a more difficult market to address by the independent software vendors, due to it being a more tightly regulated environment by the modality OEMs.

There were very few embedded AI solutions on show at ECR, suggesting that the modality vendors are taking a cautious approach to integrating AI. The embedded image analysis solutions on show were a mix of native applications developed by the modality vendors and third-party applications, whilst the AI-enabled image acquisition solutions were home-grown applications. We expect to see activity for embedded AI solutions gradually ramp-up during 2019.

Integration into PACS

The demand on a radiologist's time is typically very high and workflow efficiency is key. Radiologists' uptake of AI solutions will be driven by how effectively and seamlessly they integrate with their current workflow. AI solutions that are tightly integrated into the primary diagnostic viewer, e.g. PACS, and do not require radiologists to open a dedicated AI viewer are likely to gain most traction. Regardless of whether AI solutions offer an effective user interface, transitioning from the PACS environment increases the radiologist's time spent reading the scan, or the risk of software malfunctioning. This will likely lead to radiologists accessing the AI solution less, or not at all.

From our discussions at ECR it was clear that the PACS and enterprise imaging vendors are ramping-up their AI activities and are typically following similar implementation strategies – a dedicated AI platform to act as a container for native and third party AI

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algorithms that are tightly integrated into the diagnostic viewing platform, coupled with a supplementary cloud-based marketplace of third party AI applications. Some vendors are proposing on-premise and cloud variants for their AI platforms, with others offering cloud only. Over the longer term we expect cloud platforms will become the preferred solution, but at this early stage of the AI market and the transition to cloud in medical imaging, there is certainly room for both approaches. There is a strong argument that as AI becomes more commonplace, it will help to accelerate the acceptance of cloud in medical imaging.

In much the same way that the modality vendors are taking a cautious approach to third party applications, the imaging IT vendors are being very selective about partnering with AI ISVs for their AI platforms, typically putting solutions through extensive in-house testing and validation to ensure the robustness and clinical value before committing to integrations. Additional applications can then be offered through a marketplace, but typically less tightly integrated with the diagnostic viewer.

Imaging vendor or third-party marketplace?

Although most AI ISVs are initially selling direct to providers, gaining traction and upscaling will eventually become difficult, not to mention the expense of building an international direct sales team. An increasing number of ISVs have chosen to partner with AI marketplaces, often to gain access to an established customer base. The trend to AI marketplaces was discussed in our RSNA post-show report ([see Route to Market – AI Marketplaces an Attractive Proposition](#))

“For AI to be truly ubiquitous, it needs to become invisible... from the radiologist and the workflow”

Incumbent medical imaging vendors will drive greatest changes

Although many of the incumbents have been seemingly slow to react to the adoption of AI in medical imaging, we believe the modality and imaging IT vendors will have the greatest influence over the longer-term scope and future direction of the market, due to their influence and pivotal role in integrating AI in the radiology workflow. As such, it is essential that AI ISVs form partnerships with the incumbent imaging vendors.

3. Return on Investment



Fig 3: ROI Drivers for Medical Imaging AI

With healthcare budgets under pressure globally, AI vendors must clearly articulate a tangible ROI for healthcare providers, to justify the significant investment in software and the supporting IT infrastructure required to support AI deployments. This can be realized in a various way, as outlined below.

Productivity and quality

In countries where the demand on a radiologist's time is high, typically due to a shortage of radiologists, for example the National Health Service in the UK, the incentive of increased productivity is a key value proposition for AI and arguably the strongest driver of ROI. AI solutions that can triage cases (determine the urgent cases from the non-urgent cases) and decrease the time needed to read scans are key. Similar, for private radiology groups the incentive of increased productivity will be a key driver for the uptake of AI.



At this early stage of the market development, it is unclear if AI marketplaces will be successful and whether customers will prefer to use a marketplace from their main imaging vendor or an independent marketplace. The AI ISVs appear to be hedging their bets and partnering with both.

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However, in countries with an ample supply of radiologists, such as the Nordic countries, the demand on a radiologist's time may be less of a factor, and diagnostic quality will be the primary driver of ROI from AI solutions, alongside productivity.



Diagnostic pathway

Another avenue for ROI, which a small number of AI ISVs have managed to target, is to improve the effectiveness, both cost and clinical, of the diagnostic pathway. For example, fractional flow reserve-computed tomography (FFR-CT) enabled by AI image analysis is increasingly being used as an alternative to interventional angiography. This lowers cost for the provider and reduces the risk of infection for the patient, justifying the investment in AI. There is also the potential to reduce the number of biopsies in a range of clinical applications, although this is more likely to be the driver in single payer markets as biopsies are often considered to be a revenue stream by private hospitals and clinics.

Treatment pathway

ROI for AI solutions is influencing the treatment pathway by accelerating the use of quantitative imaging in routine clinical practice, automating the time-consuming task of manually taking measurements. Clinically validated imaging biomarkers can help to improve diagnostic accuracy, to determine prognosis and to predict therapeutic response, leading to more personalised, data-driven treatment planning for individual patients. Moreover, AI will play a key role in treatment planning decision support, by leveraging past patient data to inform decision making. This will lead to shorter treatment planning cycles and potentially eliminate the need for treatment planning iterations, saving costs and improving treatment outcomes.

4. Validation

Developing an AI algorithm that can address the points above is all well and good, but without proper clinical validation, it is unlikely to be trusted, and hence used, by clinicians.

Training of the algorithm

Supervised training of algorithms in a development environment requires access to a large volume of curated medical images. These images ought to have variability in terms of clinical presentation of a case, as well as the demography of patients and the variety of scanners that captured the images to develop a truly robust algorithm suitable for the global market. It is why most solutions have focused on pulmonology and the breast, as there is a wealth of publicly available data to develop such algorithms. To gain acceptance with commercial partners and health providers, AI ISVs need to demonstrate that they have developed their systems using diverse data sets.

Clinical validation – prospective studies

The key driver of clinical validation in the long term will be the ability of AI ISVs to partner with healthcare providers to conduct prospective clinical studies to test the robustness of their solutions in real-world clinical settings. The results of the study will then need to be published in a respected peer-reviewed journal. Such studies are time-consuming and expensive as they require a large amount of de-identified, well labelled (clinically) data, and the clinical environment to run the study.

However, the benefits of this will far outweigh the initial investment, giving credibility to the solution and helping to win the trust of potential partners and customers. Although some companies have started to conduct such studies, to date very few have published results. Robust clinical validation is a strong differentiator for AI ISVs. The increased availability of peer-reviewed clinical validation of AI solutions will be a major catalyst for their uptake in clinical practice.

About the Authors

Simon has 25 years of experience in global technology market intelligence, having served as Executive Vice President at IMS Research and Senior Research Director for IHS Inc.'s Technology division. Whilst at IMS Research, he established the InMedica brand of market intelligence for the medical devices industry. Simon is responsible for Signify Research's coverage of the global Medical Imaging market and wrote the 2018 edition of "Machine Learning in Medical Imaging".

Sanjay joined Signify in 2019 after two years of post-doctoral research using big data in healthcare. Prior to that, he received his PhD from the University of Nottingham, for his work on 'The Risk of Knee Osteoarthritis in Professional Footballers'. At Signify, Sanjay works as part of the Medical Imaging Team.

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Adding Value in the Market for Premium Radiography Equipment

Written by Stuart Kusta

ECR 2019 was a particularly special conference as it marked its 25th year anniversary in Vienna. While I was disappointed to miss the philharmonic orchestra at the grand opening, I did get to experience a symphony of new product launches and the latest technological innovations the industry has to offer. From a classical general radiography perspective, the core themes of product innovation were an ensemble of advances across artificial intelligence, workflow optimisation, advanced clinical applications, ergonomic design, dosage management, image quality and IT infrastructure connectivity.

The global market for general radiography equipment is well established across most geographies and is anticipated to grow over the coming years, which these product enhancements will in no doubt help to support. Despite this outlook for the overall market, there will ultimately be individual gains and losses and, radiography OEMs as well as component manufacturers are facing the tough challenge of continuing to differentiate their solutions at favourable margins. This is in part due to significant changes to healthcare provision such as the shift toward value-based care, increased competition from new entrants, product commoditisation as well as the maturing of existing technologies.

The competitive landscape is compounded by a demanding global customer base with a diverse range of priorities and needs across healthcare systems. As a result, OEMs are strategically positioning themselves to capture market share through offering tiered product portfolios to meet the needs of specific customer segments. This has led to “premium” and “value” systems, whereby the amalgamation of advanced features and capabilities have become more indicative of system value. It was certainly clear at ECR 2019 that this type of product differentiation has become more widespread.

With the adoption of value-based care becoming more prevalent, equipment OEMs have been evolving their product portfolios to compete under these rules of engagement. Premium systems are now typically more focused on introducing product features and capabilities which seek to deliver significant improvements to a radiographer's workflow (to reduce exam times) and to improve the diagnostic effectiveness of an exam (to reduce time-consuming and costly repeat exams). These types of productivity and operational efficiency gains help

vendors to demonstrate a return on investment during the sale process in order to fight price erosion or to help justify higher relative prices. Increasing system dexterity through integrating multiple imaging techniques, such as combining fluoroscopy and tomosynthesis with radiography, is also adding value through helping smaller healthcare providers to maximise the utility of their x-ray rooms or helping larger healthcare providers to manage peaks and troughs in the demand for x-ray services.

Improving diagnostic confidence through integrating advanced applications is also interconnected with this productivity and efficiency play. This is especially true for customers who are rewarded for making efficient use of resources, such as accountable care organisations (ACOs). These types of product enhancements are proving to be popular in countries where fiscal budgets are constrained, in part, due to changes in reimbursement, increasing patient volumes as well as growing government fiscal liabilities which can mean fewer financial resources are available to invest into capital equipment.



Better ergonomic design and motorisation, to help reduce repetitive movements and radiographer strain, have been a focus for recent physical product enhancements. Hardware improvements to FPDs and processing units in order to increase image quality have also been a feature. When combining these hardware enhancements with software algorithms for advanced image processing and image quality assurance (QA), material improvements to image quality can be achieved which is associated with improved diagnostic performance.

Product enhancements predicated on software has become increasingly important, particularly when geared toward delivering operational and productivity gains. For example, some OEMs are developing software solutions which seek to add value through better auto-positioning to reduce imprecise collimations, automating QA checks as well as making systems generally easier to

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use through intuitive and standardised user interfaces. As the capabilities of artificial intelligence (AI) technology becomes proven and scalable, this will enable OEMs to deliver significant workflow and productivity gains through AI-based applications for auto-disease-detection, diagnostic support aids and workflow prioritisation. Software-based features will become an increasingly important factor when differentiating premium systems in the short to medium term as well as protecting overall product portfolios from price erosion and market share losses in the longer-term. While there certainly is still a market for analogue systems and value digital radiography systems with less sophisticated software capabilities, those OEMs who underinvest in software features, may find themselves becoming increasingly marginalised within the premium segment of the market.



Focusing the Lens on Personalised Breast Screening in Europe

Written by Imogen Fitt

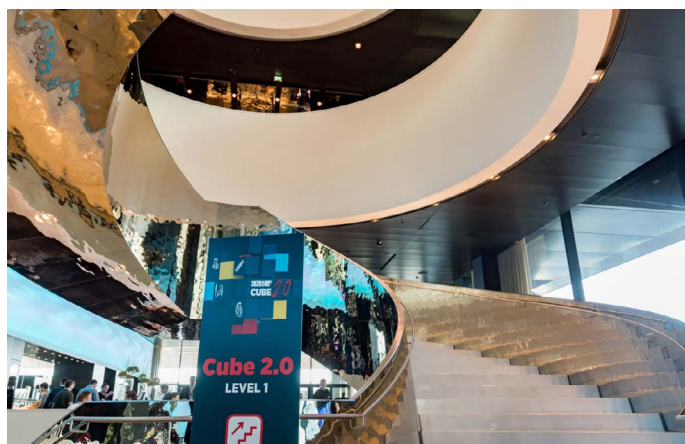
25 years since its inception, the European Conference of Radiology achieved record attendance as over 23k delegates made their way to Vienna. Breast imaging was one of the most talked about areas of radiology at the show, however it's a market traditionally slow to change in terms of technology. Was this excitement then reflecting movement then? A larger lens may be required to observe any emerging trends as we explain below.

Signs of Increasing Personalisation & Stratification

Upon initial review, the most obvious theme amongst scientific presentations this year concerned the already well-established shortcomings of current screening methodologies, mainly the limitations of conventional 2D mammography supplemented by a variety of proposed solutions. Amongst these, an interesting trend prevailed concerning the use of AI analytics in stratification for supplemental screening. Whilst the methods employed varied, women initially had their breast density evaluated with analytical software after initial mammograms; those categorised as having dense breasts, in which mammography is known to be less effective, were then sent for screening with alternative modalities, such as MRI, handheld ultrasound, ABUS, contrast enhanced mammography and DBT. Of course, subsequent screening technologies each come with their own inadequacies. For an adaptive pathway to be implemented for population-based screening, a considerable amount of evidence must be provided, proving significantly improvement on current practice.

The first published results for the DENSE trial which were announced at the conference on Friday, was one such breakthrough. The Dutch trial has been ongoing for ~10 years, with over 35,000 women screened as part of its research. It investigated the use of supplemental screening in women with extremely dense breasts using MRI and concluded that the practice was a success in significantly reducing the number of interval cancers observed. Such a large and diverse study should inevitably help in building a case for adaptive breast imaging based on breast density in Europe.

On the show floor, vendors also appear to have taken a more personalised patient—focused approach for screening. Examples include the use of AI analytics tailored to provide dose and pressure measurements



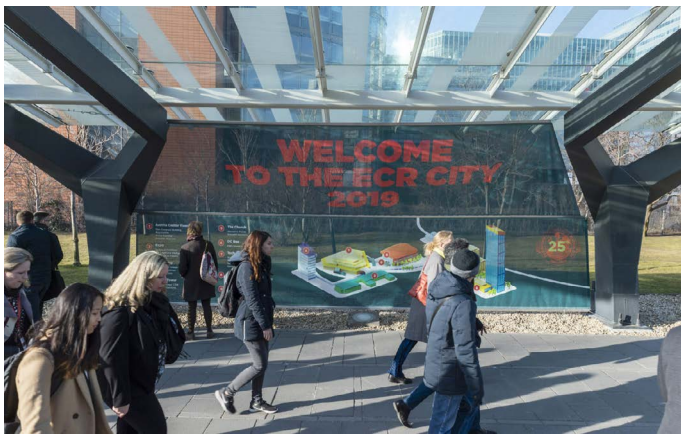
In response to the current competitive landscape and discussions with numerous OEMs at ECR 2019, Signify Research is conducting a research project to identify the global demand for general radiography and fluoroscopy equipment including FPD supply. This research seeks to highlight the current market structure through segmenting sales revenue and units by system value using features as an indicator of value. The research will also segment the market by customer type which will help our clients to identify the market size across specific customer segments and geographies, as well as identify the opportunity areas for future product development and sales revenue growth.

About the Author

Stuart joined Signify Research in 2018 bringing with him five years' experience as an analyst within the insurance industry. His creative and analytical capabilities are a valued addition to the team. Stuart is part of our Medical Imaging team focusing on ultrasound, general radiography and other imaging markets.

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for individual women (according to breast size and density), and a solution which enables image quality to be monitored in real time. IT solutions to help monitoring of technologist's performance for exams also shows that the bigger vendors are paying attention to ensuring quality of care in screening exams. Personalisation has even translated well into modality design, as vendors experiment with aesthetics and improving patient experiences; perhaps the most obvious example of this is seen with mammography systems which allow women to control their own compression. Reception of these adaptations should be interesting to watch in the future and could have an impact on screening participation rates.



Europe is Traditionally a Slow-Moving Market

But whilst the initial signs for support may be present, in the context of the global market, Europe has been notoriously slow to adapt to change. 2D Mammography is still the mainstay in most screening programmes, and whilst digital breast tomosynthesis (DBT) is well positioned as 2D imaging's successor (see our featured article in ECR Today), adoption has been markedly slower in Europe compared to the USA and other mature healthcare markets. This is despite widely available trials supporting its superiority in detection and diagnosis. This year on the show floor DBT was present, but still very much in the background against conventional mammography and so we don't expect adoption into screening programs to speed up anytime soon. However, it is gaining some traction for diagnostic use, though this also comes with some challenges in terms of the time required for interpretation and diagnostic reading.

CAD adoption, although widely embraced in the US, also remains slow in Europe. This is perhaps not a surprise in some markets, as traditionally many vendors have supported CAD as a solution to a shortage of radiologist

resources. For example, in the Netherlands where supply of radiologists is plentiful, there is no incentive for its adoption. Many screening programmes also still require two readers to review each image, again limiting any potential for CAD use. While large scale overhaul of screening programs is unlikely to change in the near future, the growing body of evidence around DBT use for screening, increasing development of artificial intelligence and patient awareness of the challenges with conventional mammography screening will all contribute to growing support for more adaptive screening. However, it will be a slow, gradual and staggered process.

Availability of Equipment is Low

Besides adoption, implementation of pathways using different modalities also relies on the availability of equipment. Established technologies such as ABUS/MRI are in relatively short supply for supplemental imaging; in the case of MRI, most systems are shared across departments at hospitals, with breast imaging making up a tiny proportion of scan volumes. Most MRI scanners are also oversubscribed, so substantial investment would be required in dedicated breast MRI to support use in screening. In the case of ABUS, the technology has been available on the market for some time, yet adoption has been slow, suggesting there has been limited confidence from legislators and providers in its merits. Had you taken two steps onto the show floor last week, you would've also seen a distinct lack of competing technologies in the space.

Whilst literature and presentations were more heterogeneous indicating an appetite for change, only three 'new' breast imaging technologies were presented on the show floor. AB-CT, Ennovis, and Micrima employ spiral CT, optoacoustic, and radiofrequency technologies respectively, and each solve a problem presented by conventional imaging. This positions them as key candidates for supplemental pathways. However, whilst presenting promising results, these companies are still in their early stages of development and are all either pre-commercial or new entrants unlikely to be used widely for some time.

To sum up, whilst unlikely to occur widely in the next few years, ECR19 certainly gave encouraging evidence towards providing personalisation in breast screening in both the stratification of larger populations, and at the individual level for women. It certainly adds a level of humanisation to these programmes and softens the almost regimental nature of screening. With current limitations widely publicised, and participation numbers

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in Europe sometimes well below the target of 70% set by the EU, (and going below 50% in some areas) this focus could help encourage women to participate more actively in their local programmes. For vendors at the show with conventional and DBT mammography systems, this is a positive sign and long overdue. Regardless of where you sit on the mammography screening debate, screening in any form needs to reach people to be effective; thus, any trend which encourages participation and individualisation should be a positive development. The big question for adaptive breast screening pathways in Europe is perhaps not if, but when?

About the Author

Imogen joined Signify in 2018 as part of their Healthcare IT team. She holds a 1st class Biomedical Sciences degree from the University of Warwick and has gained experience in international networking and communications. She is part of our Healthcare IT team focusing on Breast Imaging.



Is Europe Ready for Operational Workflow and Analytics in Radiology?

Written by Dr. Ulrik Kristensen

A change of perspective for imaging IT vendors was clear at the conference this year. Tools improving the individual radiologist workflow, solutions aimed at streamlining and optimising operations and dashboard analytics for business intelligence across the entire enterprise were all prominent. Imaging IT vendors are clearly becoming more concerned with how radiology fits into the wider healthcare enterprise. Using decades of experience in imaging technology, imaging IT vendors are now trying to help healthcare providers better manage their radiology operations in the context of the large and complex healthcare enterprises that exist today.

Below we highlight some of the new trends from ECR in radiology. We have grouped these into three core groups, radiologist workflow tools, operational tools and analytics, discussing their presence and potential viability in the European healthcare market.

Radiology Workflow Tools to Augment Radiologists

The first group of tools on show were a selection of radiology workflow tools aimed at making the daily life of

the radiologist more streamlined with less distractions, and ultimately enabling them to do more cases in less time.

Examples include anatomically adaptive hanging protocols and other viewing related features to improve the workflow of the reading radiologist, along with solutions for easy peer-review and collaborative tools with image sharing functionalities across the healthcare provider networks. Another hot topic is auto-triage tools where machine learning algorithms are pre-diagnosing the exam and feeding the result into the worklist for automated prioritisation. This means that urgent cases can be analysed first, leading to faster turnaround time for cases likely to be of disease phenotype. Although installation of such algorithms directly on the modalities is being discussed and tested, there is also an argument for installation on imaging IT instead of modalities. Broader imaging IT platforms would have access to a broader set of inputs from across the imaging department, as opposed to AI software being installed on a single scanner. On a central IT platform, data could be pulled and analysed from all modalities in the hospital, independent of brand or age. Given that many larger networks operate a fleet of imaging equipment, the status of advanced software updates and capability on each individual modality would not be a limiting factor.



The aim of these tools is to increase the workflow efficiency of the individual radiologist by automating steps and minimising distractions from their primary functions. Since many of these tools are deeply associated with the viewing and analysis process, they are most likely to be integrated into the PACS or viewing platform and essentially become integrated features in the existing systems. However, there remains some way to go for many vendors in seamlessly integrating these tools into their core imaging IT platforms, especially in the case of

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Software for modality fleet management typically manages scheduling, performance and maintenance activities in the radiology department. Reducing downtime, improving utilization and better predicting maintenance needs all also ultimately help the hospital CFO or department head to increase the cost efficiency of the department. Modality vendors are leading the charge in this area; however, there is a clear need for some degree of vendor neutrality, as many hospitals will have different brand modalities and optimally would like to manage them all through the same system. This creates opportunity for third party vendors to enter this space, although it will be difficult to compete with the dominance of the large modality vendors, especially as many vendors are increasingly offering long-term managed service offerings; therefore, third party offerings will need to offer an exceptional value proposition for the provider.

Typical subjects to be covered under the second group of operational tools would be staffing, certification, clinical audit, finance, legal or regulatory compliance related tools to ensure correct documentation and staffing and assist with due diligence. The operational tools could also include automatic case load balancing for radiologists within the healthcare enterprise, whereby time savings could be obtained at larger high-volume multi-speciality hospitals. While this area is commonly overlooked and underserved in terms of digitalisation, the costs associated with many of these activities are significant. Moreover, for imaging IT vendors, operational budgets offer a new revenue stream compared to typical clinical software and modality procurement.

Business Intelligence Solutions Helping to Optimise Healthcare Businesses

Business Intelligence tools were also on show from multiple imaging IT vendors. The purpose of these tools is generally to learn from and improving the processes and operations to optimise the business or radiology department. As opposed to the general business intelligence software from vendors such as Salesforce and Microsoft, these tools are more targeted at the specific needs of a hospital or radiology department. Typical subjects to be covered would include both financial and clinical outcome measures; e.g. follow up tracking to predict and limit missed appointments, or patterns in radiology technician performance for quality control and training. The typical format for these solutions is a customisable dashboard with data export functionalities that mines data from the core imaging IT platform.

Several enterprise imaging vendors are now developing dashboards; today, they are mostly suitable for most

mid- and large-size hospitals that have limited capability to measure and assess their own performance. However, it will be a challenge to make them relevant for very large hospitals who often have their own BI solutions and departments responsible for care quality and financial intelligence across multiple departments and sites. Some vendors therefore try to work more as a data provider as opposed to a full-service provider, enabling access to the required information from their systems for the hospitals own analytics and dashboarding. Others are taking a best-of-breed approach, offering richer and radiology-specific intelligence that far exceeds more broader multi-department analytics.

When developing business intelligence dashboards that pull data from different systems within the enterprise, and obvious challenge that industry and healthcare providers are already very familiar with is interoperability. For this reason, many dashboards from enterprise imaging vendors today are compatible only with their own systems and a small subset of partners and are unable to pull information for example from competitor PACS. However, this is changing, with more vendor neutral solutions coming to market. At the same time, consolidation in clinical IT is becoming more evident; many providers are choosing to consolidate more applications and departments with a single enterprise imaging solution, assuming that by using a single solution, more data will be available for analytics and dashboarding due to easier access to data and fewer customised interoperability solutions required.

Initially this market was dominated by standalone solutions from specialist vendors; however recent acquisitions in the industry means that now practically all solutions are owned by enterprise imaging vendors. For the enterprise imaging vendors, these capabilities offer a competitive advantage and the possibility of tapping into new revenue streams at the senior executive level of hospital leadership. Offering products and professional services to help manage and optimise imaging from an operational and a business management perspective is expected to drive future growth opportunities for the currently stagnant imaging IT market.

Operations and Analytics in a European Context

So, what are the prospects of these solutions entering the European healthcare market? At ECR, it was clear that vendors were adapting their marketing messages to address the unique characteristics of the European market.

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Whereas in the US hospital consolidation has been driven by mergers and acquisitions, consolidation has taken place in some parts of Europe through the formation of large regional networks, often with large tenders and a single imaging IT vendor within a network following the “one throat to choke” principle. This means that the operational and analytics piece becomes an integrated part of the current offering from the enterprise imaging vendor, and it would be unlikely for a provider network to use a third-party vendor for such solution. As most healthcare systems in Europe are under significant pressure to minimize costs of operation, workflow optimisation and analytics aspect will become an essential part of the value proposition, which means the platform vendors will be required to have this as part of their offering. However, the single-payer nature of many markets in Europe also changes the priority of focus. Care quality measures are a bigger driver in Europe than in the US, which has tended to focus more on financial operational costs so far.

An enterprise imaging setup is often a necessity for being able to offer many of the operational and business intelligence tools discussed above, so we can expect demand to be closely tied to the enterprise imaging maturation in each country. Overall, enterprise imaging is less mature in Europe compared to the US; however, countries with high maturation include Sweden, Denmark, Netherlands and Spain. Other countries with strong hospital consolidation but not currently a high level of enterprise imaging such as Norway and United Kingdom are also expected to see some demand in near future.

EHR is also less widespread in Europe, so dashboards and analytics from EHR vendors will compete less with specialist imaging IT analytics products on the market. This means imaging IT vendors have the opportunity to better shape the market around imaging operations, before developing broader enterprise business intelligence platforms with additional professional services and customisation offerings.

Based on feedback at ECR, we are already starting to see early uptake of these products in Europe. However, with return on investment (ROI) being absolutely essential for such products, vendors with early products in the field will require extensive ROI research to succeed and establish future market demand. That said, a strong presence in local markets with advanced enterprise imaging maturation will be equally important.

About the Author

Ulrik joined Signify Research in 2017 with five years' technical and scientific experience from the healthcare technology industry in the fields of genomics, molecular diagnostics and medical devices. Ulrik holds a MSc in Molecular Biology from Aarhus University and a PhD from University of Strasbourg, and leads our research on imaging IT, advanced visualisation, business intelligence and genomics.

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