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FEATURED ARTICLE

AI in Healthcare @RSNA19: Revenue Generation Underway

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This time, at #RSNA2019 (The Radiological Society of North America,) there was no snowstorm like last year. The event was in full attendance, buzzing with activity. Chicago did continue to be windy, sunny on most days, quite pleasant actually. On the lower floor of the McCormick place, brilliant lines of code, and a warm set of people together made a statement. Promising that the future of medical imaging is in capable hands, and claiming to thoroughly augment every clinical decision making touchpoint in the Radiology workflow, within the next few years.

RSNA 2019, McCormick Place, Chicago, USA.

The event, spread out over six days, witnessed a 50,000+ attendance, with over 450,000 sq.ft of overwhelming floor space, was home to highly technology-intensive showcases, dwarfing all other trade shows in the segment.

The AI Pavilion alone accounted for over 145 (up from 70 last year) companies (out of ~800,) both big and small. Most of them emerging start-ups, with very low employee footprints. AI for advanced diagnoses, workflow orchestration, patient experience, and clinical decision support, were the core themes around which discussions were centered.

So What was Different Here in Comparison with the Other AI showcases we Have Seen in Healthcare?

1. Over 50% of the companies showcased clinical evidence to support claims - one of the most important factors for the survival of AI in B2B healthcare

2. Technology progression towards complex diagnoses has been satisfactory. It began with first-pass diagnoses on chest X-rays 3-4 years ago and now has moved on to automated qualification and quantification in CT brain scans

3. Most importantly - almost all of the companies present were aiming to create B2B solutions in healthcare. Solutions that help hospitals ease workloads, bring about accuracy, ensure compliance, and overall augment clinical quality. Solutions that actually have been installed in multiple sites, with favorable early outcomes. Revenue generation is clearly underway. The one big difference - they were mostly revenue-generating companies. Unlike consumer aimed AI solutions

4. Engagement from both hospital administrators and Radiologists was very high. While many were driven by curiosity, most of them were there in the booths testing solutions with the intent of implementation.

The Democratization of Data Can Lead to Wonderful Things - Companies from all around the World Made a Mark - Small Footprint, High on Intent

Another gratifying part of this bustling pavilion was the demographic of companies presenting these solutions. Companies from all around the world were present. From a small company that codes and builds its MRI brain scan solution from a single hospital in South Korea, to a five-member company that accelerates 3D reconstruction in Mammography from Taiwan.

As a team, we spent around 40 hours during the last week, visiting and speaking to each of these vendors. The number of installations these companies have been able to pull off, with successful adoption, was a feat that could not have been imaginable two years ago. A big 60-70% of the companies did not have more than 10 employees. A third of them were only a year old in terms of full commercialization.

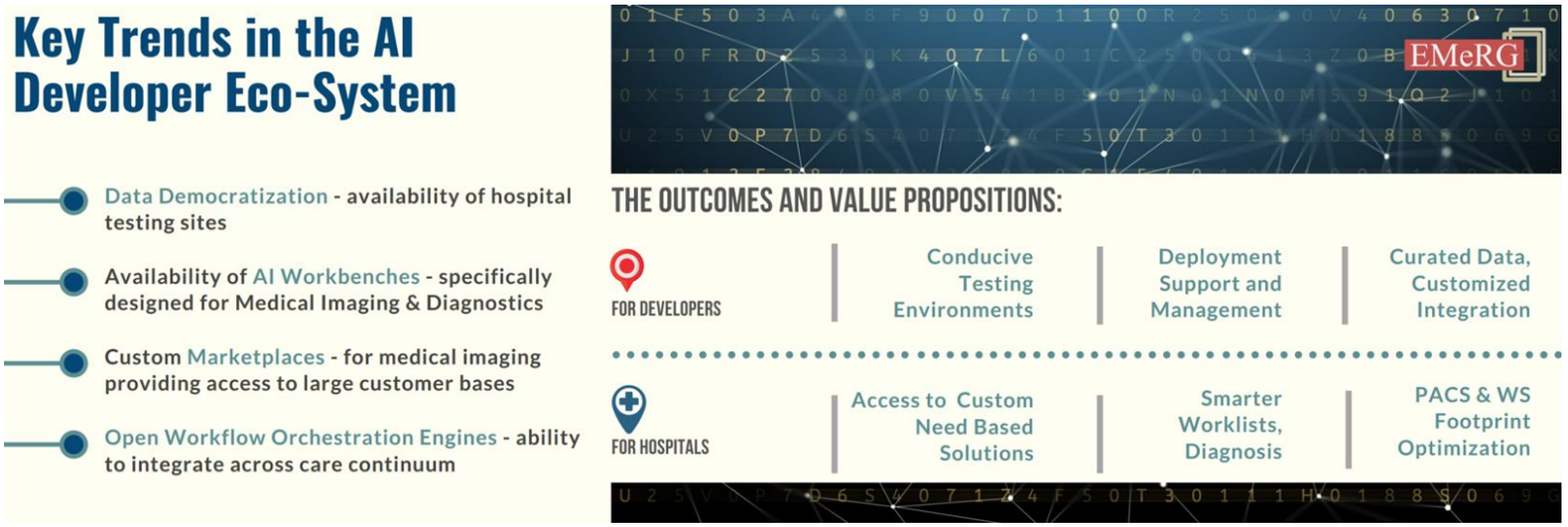
Access to data has been key to this explosive growth in AI for Radiology - many of the smaller companies we interviewed quoted access to healthcare datasets as the key for solution engineering. There are now an estimated 40 hospitals in the Asia-Pacific region alone, that work with such small companies around exploratory algorithms and deep learning techniques. Over the past 4-5 years, data democratization in healthcare has picked pace. Hospitals both large and small, have been more than open to collaborating with AI companies. These tech-knowledge partnerships are currently enabling a rapid engineering process in which the time to market is being reduced each day. The same provider sites are also allowing for clinical evidence generation - another key area of AI in medical imaging, that could make or break the adoption curve. As healthcare analysts, we sincerely hope and wish for geometric growth in such 'data-incubators' that allow for the growth of algorithmic sciences in healthcare.

The Underlying Technology Infrastructure Bolstering Growth in Innovation

The growth of AI Workbenches and Marketplaces has been another key driver for the success of these AI solutions, both financially and technologically. As of December 2019, there are now at least eight renowned marketplaces, specifically built for the advancement of

AI applications in medical imaging. Workbenches have been a boon to some of these companies - helping them fine tune their models on curated data, in secure environments. Such environments being one of the biggest voids in the health AI world until 3-4 years ago.

2. Siemens Healthineers' teamplay eco-system
3. The recently launched Nuance Marketplace for Diagnostic Imaging
4. Change Healthcare's API marketplace
5. Blackford's AI Imaging Platform
6. TeraRecon's Envoy AI Platform
7. Arterys' Viewer Based Marketplace
8. Intelerad's AI HUB
9. And IBM's Imaging AI Marketplace



The number of AI Marketplaces now available for these single solution companies is probably the cornerstone on which the future of AI in healthcare now positions itself. This availability of marketplaces, engineered specifically for Radiology and diagnostics is helping companies mature their algorithms faster, deploy sooner and reach a much larger customer base. Some of the marketplaces currently prevalent on the market include:

1. Philips' HealthSuite Insights platform (With a Developer module)

Make no mistake, this "Marketplace" list is expected to grow. And as competition continues to differentiate itself, we expect the solutions to get more lucrative for developers in terms of revenue sharing and integration eco-system. Developing, testing, validation, refining and deployment of AI solutions and deep learning algorithms will be made easier, and with the provision of expanding audiences. A dynamic, intuitive eco-system in the making for health data scientists and developers.

Another new trend is around Workflow Orchestration & Navigation as an engine for Hospitals, again specifically designed for medical imaging and diagnostics. One of the biggest challenges in medical imaging is around visualization, post-processing of images and automated prioritization of imaging studies in the Radiologist's workflow.

GE Healthcare and Philips showcased their open platforms for AI-based workflow orchestration, prominently at RSNA2019. Workflow Orchestration & Navigation based AI Platforms are growing in numbers each year, making Radiology Worklists smarter, reducing Workstation footprints, optimizing PACS loading, and continually augmenting clinical decision making. These new-age engines are expected to soon become the hotbeds for collaboration and integration of 3rd party applications.

Progression of Diagnostic Complexity and Imaging Modality Mix Moving at an Accelerated Pace

The procedure mix or care area based diagnostic complexities that these solutions are trying to solve is aggressively evolving. Until two years ago, unstructured image analysis or deep learning algorithms for imaging were strictly centered around X-ray images for diseases like Tuberculosis and Pneumothorax. This year, detection of ICH (Intracranial Hemorrhage,) automated prioritization of cases in line with CT perfusion analysis from MRI/CT images, scarring quantification, semi-quantitative perfusion in cardio - were all surprisingly commonplace.

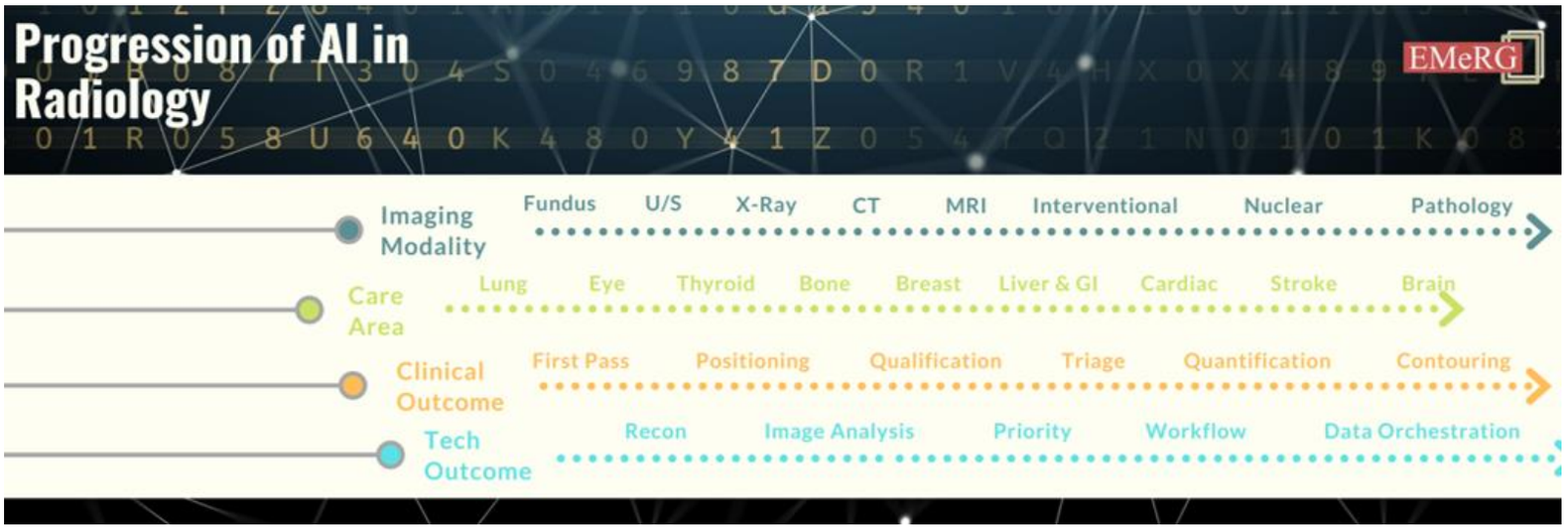
The range of imaging modalities these companies are working on has also been expanded. Towards the beginning of 2016, almost all solutions under development or approved by the FDA were centered around image analysis for X-ray, Mammograms, and Ultrasound. Very few solutions dealt with images from CT and MRI. This year, almost all AI in medical imaging companies showcased solutions specifically designed for complex diagnoses in MRI and CT scanning. In fact, some companies stated their strategic intent to focus only on CT and MRI related image analysis.

The pace setting in the care area mix is supersonic. To give an example of how fast solutions are being created - JLK Inspection is a company that was founded in 2014, in the Cheongju province of South Korea. The company at the event showcased solutions tailored for over 35 diseases across 15 organs in the human body. And for almost all imaging modalities. AIRS, is a year old company, again from South Korea, with around 12 employees - working on a solution that promises to accelerate MRI scan & recon times, across all vendors, by 4 times. Vuno Health is another four year old company that showcased a brilliant solution around brain parcellations for the quantitative analysis of neurodegenerative disorders. We will see most of these solutions being integrated onto digital platforms owned by bigger companies like GE Healthcare, Philips and Siemens.

A handful of companies have also already progressed into PET related image analysis (more detail to follow in our full version of the report.) What we will witness in

the next RSNA is very clear - independent solutions that will focus on the following:

Digital pathology - focused approach to automate lab based image analysis. The convergence of pathology and lab based data with medical imaging is another key trend in terms of the rapidly changing digital health eco-system. Digital Health ISVs are expected to play a larger role in engineering solutions that combine the two, with rapid automation



Vendor Neutral Parallel imaging algorithms to accelerate imaging and post imaging reconstruction, in the bigger modalities like MRI, CT, and Image Guided Systems. A market that is currently dominated by the OEMs. Solution focus is expected to be centered around noise reduction, 3D rendering, and cinematic visualization, along with scan time reduction.

Encounter based imaging - the final frontier will be around automating decision support on photographic images originating from Point of Care. The number of images that are today circulated from the patient bedside, related to wounds, bedsores, deformities, burns, and dermatological visual cues, are increasing each day. All of which are currently shared informally on unsecured hospital communication channels. The need for holistic disease progression indicators is expected to push companies into providing real-time diagnoses for these images also.

Still a Long Road Ahead for a 'Native Technology Status'

The distance covered has been astonishing. Revenue and orders are flowing in, case studies being developed well. Within a very few years, AI solutions for Radiology have made a mark in showcasing accuracy in reporting, ease

in use and implementation, and evolution in complex diagnoses.

The next obvious hurdle is change management. Scalability in hospitals has always been a quotient of user adoption. The believability is in place, more Radiologists and Cardiologists than ever before, were being awed by the early outcomes from most of these solutions. However, the distance between single site installations and the commonplace presence of a technology being accepted as digitally native has to be bridged.

The only way forward is more clinical evidence. Whether in the form of studies, whitepapers or testimonials - there needs to be volume generated around the stories of successful adoptions. If ever there was a segment in healthcare whose survival depended on market access, it is AI. We expect to see this volume soon enough. A majority of companies we interviewed at RSNA19, were cognizant of the importance of clinical evidence. It is already part of their core business strategy.

That is our summary for today. We thank each of the respondents who took time out to speak to us. We also wish them more data! And more clinical evidence! All the best!!

Key References:

Study conducted on field at RSNA 2019 in Chicago, USA. Over 5 EMeRG analysts attended the RSNA annual conference for a period of 6 days. Over 100 companies and their exhibits were visited.

About the author:

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Ashwin Moduga is the Director of Digital Transformation Strategies at EMeRG. As part of the role, Ashwin focuses on enabling smart decision services for Hospital CIOs in the US and Europe. Creating blueprints for full-scale digital transformation of large hospitals and health systems, driving customized research to re-engineer business and IT processes at hospitals across the patient care continuum is part of his core responsibility. Apart from this, Ashwin also focuses considerable time on analyzing the future of medical device convergence with digital enablers like AI, Analytics, Cloud and Mobility.

To hear more from Ashwin around the future of care delivery, the future of living and healthcare transformation, please reach out to him at ashwin.m@emerg-inc.com

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EMeRG is a fast growing, business consulting firm, with tailored solutions for med-tech and health-tech companies. We are a team of management consultants and health transformation specialists that design solutions and services for on-point decision making and strategy for the CXO. Process re-engineering, customer voice mapping, and fluidic decision blueprinting are the core engines of our offerings-matrix.
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