HIMSS 2019 - Major technology providers continue their focus on health informatics

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Introduction

- Orange County Convention Center, Orlando, FL
- 43,717 attendees from more than 90 countries
- 1,300 exhibitors

Following HIMSS last year, we wrote about the growing brand presence within the healthcare space of companies such as Amazon, Cisco, Google, IBM, Microsoft, Qualcomm, Uber, and Verizon. The influence of these companies, along with the steady push of digital and connected health technologies into the gaps of care continuity, has continued to grow into 2019—albeit with some notable changes. This tradeshow summary discusses some of these changes along with providing an overview of key industry trends that were highlighted during the conference and the interpretation of these trends within our reporting. It also discusses recent activity from the traditional health technology providers including GE, Philips, Siemens, AGFA, and Change. The topics covered include cloud, digital health, AI, mixed reality, interoperability, patient engagement, and business model innovation.
**M&A Activity**

**Qualcomm Life becomes Capsule**

Qualcomm Life was exhibiting at the conference under its new name Capsule Technologies, which has been a subsidiary of Qualcomm since 2015. The renaming occurred alongside the recent acquisition by Francisco Partners. Capsule is expected to continue selling the 2net cloud-based mobile device connectivity platform, which is currently used by more than 2,000 hospitals. While the terms of the deal have not been discussed, it appears that Qualcomm will focus on its core business while Capsule continues to scale the health platform.

**Virence and athenahealth merge**

Last year Veritas Capital acquired Virence Health from GE Healthcare, and just before HIMSS19 the investment firm completed a $5.7 billion acquisition of athenahealth. Now the two EHR vendors will be combined (although product lines are expected to remain separate), and will have an estimated 13% share of the North American market and an installed base of 160,000 providers (mostly ten and under provider groups). On a global basis, IHS Markit expects the inpatient and ambulatory electronic health records market will grow at a CAGR of 4.7% from 2019 to 2023, passing $21 billion in revenue during 2023.
Telcos get involved

AT&T looks toward mixed reality

Driven by 5G networks and edge computing, AT&T believes that within the next decade the network will ‘become an overlay on top of our physical world’. Working with partners Brainlab and Magic Leap, their remote surgery demo was an example of this. The demo included a mixed reality experience of pre-surgery disease exploration based on a patient’s own imaging, PACS files displayed via the headset, and options for the technology to be used as guidance during the procedure. While still in development, this is worth noting as one of the best rendered and most responsive mixed reality demonstrations we have seen to date.

Telcos work on patient engagement

Verizon continues to develop its end-to-end solution for connecting patients to health-related environments. This includes maps, wayfinding, in-hospital tracking, virtual consultations, appointment setting and tracking, retail pharmacy targeted marketing, and prescription filling. Spectrum is also competing for the best interactive patient experience while in the hospital room, beyond entertainment the system can be used for education, treatment planning, clinical review of images, and there is an interesting relaxation application that can be used for pain management.
AI applied to claims data

Insight from claims data revealed by both Change and IBM Watson Health

IBM Watson Health, along with Clarify Health Solutions, believe there is still much to be gained when it comes to extracting insight from claims data. Particularly when it comes to evaluating the performance of specific providers against the outcomes of their patients. Further to this point, IBM Watson Health announced a $50 million investment in healthcare artificial intelligence (AI) to explore improvements in patient safety and health equity. Through a 10-year investment collaboration with Brigham and Women’s Hospital and the Vanderbilt University Medical Center, there will be an ongoing investigation for the best applications of AI to address major health issues, including improving EHR utility and claims data to address patient safety and precision medicine. Change Healthcare also announced the new Claims Lifecycle AI which works with the company’s Intelligent Healthcare Network to improve revenue cycle management by reducing denials. The solution also reduces time to adjudicate and identifies missing charges. Change Healthcare built the new functionality in Amazon Web Services (AWS), the company currently has eight applications of AI with twenty more in the pipeline.
Embedded artificial intelligence, marketplaces, and AI beyond imaging
Embedded artificial intelligence, marketplaces, and AI beyond imaging

During the opening address of RSNA 2018, President Dr. Vijay Rao noted that AI and other emerging technologies have the capability of placing radiology back at the center of patient care. She further stated that rather than fearing AI, it should be embraced and that the profession will need to recommit to the patient-centered model of radiology in addition to forming cross-sector partnerships with colleagues in other specialties. This positive view from the RSNA toward AI, one where radiologists are empowered by technology, rather than replaced by it, was further noted during HIMSS19 and will help to spur development and uptake of machine learning tools. Beyond this positive sentiment, there are good reasons for more integration of machine learning in reading rooms including increasing volumes of digital images to read, shortage of radiologists, and clinician burnout. That said, there remains questions concerning efficacy and the financial impact of using machines, both of which must be determined on a machine by machine basis.

Of the many AI applications in development from GE Healthcare, two interesting examples on display were embedded on the Optima XR240amx and the Voluson E10 (SonoCNS Fetal Brain). The first automatically detects and prioritizes critical cases, the example was for pneumothorax. The second aligns and displays recommended views plus measurements of the fetal brain. Both applications align with the top use cases identified by IHS Markit, which include:

- Alleviate repetitive, high-volume tasks (cancer detection and screening)
- Reduce imaging time (MRI)
- Reduce radiation dose (CT)
- Provide triage, prioritizing urgent cases
- Provide automatic quantification to replace manual measurements
- Facilitate non-invasive imaging techniques
- Facilitate faster drug discovery
- Increase patient engagement concerning treatment
Embedded artificial intelligence, marketplaces, and AI beyond imaging cont.

As part of our recent reporting on machine learning for medical diagnostics, more than 260 vendors and 360 machines have been researched including companies, academic organizations, and healthcare providers. These vendors are focused on aggregating and analyzing large datasets of information from clinical care services for improving clinical decision support and health outcomes, not business analytics. One answer to the problem of providers needing to research hundreds of algorithms are new platforms that serve as marketplaces for a pre-vetted assortment of machines. These marketplaces, or exchanges, may also serve imaging IT vendors as an expedient method of bringing a wide range of machines to their customers, without incurring development costs. One of the marketplaces that is already active is the Philips HealthSuite Insights Marketplace, which provides a clearing house for machines in addition to managing data science projects and enabling deployment of client's models on premises or in the cloud. Models (currently imaging analytics) in process include: brain tumor segmentation; brain anatomy segmentation model; and TB detection model—bone age assessment model is currently available. Other marketplaces include Blackford Analysis, EnvoyAI, MDW, Nuance AI Marketplace for Diagnostic Imaging, and NVIDIA Clara/OSU Wexner Medical Center.

Among the new players pushing AI beyond imaging is Medial EarlySign. Over the last several years the company has been developing a patient risk scoring system using AI to extract information from the EHR and lab data. These clinical solutions rely upon machine learning to help identify patients at high risk for specific medical conditions, which enables healthcare organizations to focus on preventative care. The products currently available are considered low risk as CDS support. The SLUCare Physician Group has partnered with Medial EarlySign to implement LGI Flag, a tool that identifies patients at risk for lower GI disorders associated with chronic occult bleeding. The following figure provides a breakdown of machines developed for medical diagnostics by application, approximately 15% are FDA approved.
Embedded artificial intelligence, marketplaces, and AI beyond imaging cont.

World – Machines developed for medical diagnostics, by application

- Wellness
- Pharma, drug discovery
- Patient engagement
- Others
- Neurology
- Orthopedic
- Mammography
- Lung
- Liver
- Genetic disease
- Pathology
- Diabetes
- Cardiology

Notes: ‘Others’ includes oncology not already categorized within another application.
Source: IHS Markit

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Healthcare IT in the cloud; Microsoft, Google, IBM, and Amazon
Healthcare IT in the cloud; Microsoft, Google, IBM, and Amazon

In its research, IHS Markit found that most healthcare deployments today still utilize private cloud storage more than any other service. Uptake of other cloud services are restricted largely by perceived risks surrounding authentication and breaches with protected health information, infrastructure reliability and continued conjecture surrounding the cost-benefit analysis of shifting IT to an operational expense. Nonetheless, cloud healthcare implementations are increasing beyond the early adopter applications of digital pathology, EHR, health information exchange, population health management, revenue cycle management and vendor-neutral archives (particularly in regard to disaster recovery). As such, the largest global cloud providers (Microsoft, Google, IBM, and Amazon) all had a significant presence at HIMSS19.

Announcements made during the conference included:

• Microsoft Azure for FHIR (Fast Healthcare Interoperability Resource) which offers exchange of data through a FHIR API and a managed Platform as a Service in Azure. It is designed for management of PHI data in the native FHIR format, the API and data store enable secure interaction with any system that uses FHIR API’s.

• Flywheel, an imaging informatics platform, announced that it is integrating Google Cloud’s Big Query to enable scalable analysis of medical imaging metadata, biomarker data, and tabular data. Big Query is a managed enterprise data warehouse for analytics. Interest in Google is growing rapidly, including the Cloud healthcare API which provides interoperability between care systems and apps built on Google Cloud. While in alpha the Cloud Healthcare API is free to use, but fees may be incurred for other Google Cloud services such as Big Query.

• As noted previously, IBM Watson Health announced a 10-year collaboration with Brigham and Women’s Hospital and the Vanderbilt University Medical Center. There is intended to be an ongoing investigation for the best applications of AI to address major health issues including improving EHR utility and claims data to address patient safety and precision medicine.

• Technically not announced during the conference, but relatively recently, is Amazon Comprehend Medical. This is a natural language processing (NLP) service that makes use of machine learning to extract relevant medical information from unstructured text. It gathers information, such as medical condition, medication, dosage, strength, and frequency from a variety of sources including doctors’ notes, clinical trial reports, and patient health records.
Healthcare IT in the cloud; Microsoft, Google, IBM, and Amazon cont.

More about Amazon Web Services (AWS)

As of 2014 AWS has provided cloud computing and network support to the Centers for Medicare and Medicaid Services' health insurance e-commerce network (Healthcare.gov). As part of the subscription agreement, Amazon provides security for the subscriber’s system—which is particularly important within the healthcare industry. Of interest for AWS is leveraging longitudinal health records to facilitate efforts toward improving population health, and part of this would involve permanently housing patient records in the cloud and thus shifting away from ‘event-based’ records. With strong growth of 43% from 2016 to 2019, generating nearly $17.5 billion in 2019, AWS now accounts for 10% of Amazon's overall revenue. AWS has established itself as a leader in cloud computing but it is not alone in the market, and faces competition from IBM, Google, and Microsoft.

AWS fits into a broad healthcare strategy for Amazon by moving more patient data within their ecosystem through partnering with the some of the most prevalent healthcare technology and life sciences vendors. Among these vendors are Cerner Corp., Philips, and GE Healthcare. For Cerner there are four key reasons to collaborate with AWS; to expedite the expansion of their global presence, implement archiving redundancy, adding new features to Cerner's population health management platform (HealthHelIntent), and accessing machine learning tools (AWS SageMaker is a machine learning platform to build and connect machine learning models to training data, and to select the best algorithm for a particular application). For Philips, the company is building out it's HealthSuite digital platform on AWS. Growing by one petabyte per month, Philips HealthSuite analyzes and stores patient data gathered from imaging studies, medical records, and various patient inputs. Philips is leveraging AWS for performance and scalability to protect and manage massive amounts of growing patient data. And GE Healthcare has launched the GE Health Cloud with AWS to continue the company’s digital transformation, and to increase customer value from data derived through their devices. The company launched Health Cloud in the US to provide radiologists and other clinicians with a single portal to access enterprise imaging applications such as PACS, and are now looking to add more services and applications such as device protocol management and analytics.
More about Amazon Web Services (AWS) cont.

AWS further integrates into Amazon’s healthcare push in the following ways:

- Facilitating analytics and machine learning with a growing quantity of healthcare data provides Amazon with more insight into population health management as well as precision medicine. This can inform telehealth services, part of which could be delivered through Alexa, or new health-focused devices that facilitate patient monitoring and coaching.
- Democratizing healthcare information and enabling a continuum of care that reduces unnecessary utilization of primary care and more cost-effective chronic care management for their own employees, and those of Berkshire Hathaway and JP Morgan (the venture now known as Haven). Similar to how Amazon redefined retail, they are putting together the elements necessary to redefine healthcare provision.
- Providing strong revenue growth. Healthcare providers have historically been reluctant to move to the cloud; however, this reticence is fading and uptake of infrastructure-as-a-service is accelerating.
Digital health; virtual care and remote patient monitoring
Digital health; virtual care and remote patient monitoring

Telehealth, telemedicine, and remote patient monitoring technologies have been a top topic of conversation for more than twenty years, and their presence at HIMSS continues to build. An important part of this discussion surrounds diffusion determinants because, while adoption is inevitable, significant scale has yet to be achieved. Diffusion is a key process for all innovations, as it implies a growing level of meaningful use. While diffusion is commonly measured by level of commercial success, the precursor to commercialization is an understanding of how a value proposition is effectively demonstrated to the market. IHS Markit has identified four determinants that can either support or substantially undermine telehealth and remote patient monitoring solutions in fulfilling the overall value proposition of virtual healthcare. These determinants are clinician willingness, regulatory support, technology and consumer awareness. The United States has been found to have one of the highest aggregate diffusion determinant scores of 2.5 out of 5, based on the following analysis:

- **Clinician willingness**: Telehealth and remote patient monitoring are primarily being used in urgent care, screening, mental health, chronic disease management and transitional care. In the United States, financial incentives set by the Center for Medicare and Medicaid services determine how healthcare is conducted – why only 59% of physicians in the United States who believe they should use the majority of their resources on preventive care.

- **Regulatory support**: The regulatory environment differs widely from state to state, with 48 states providing reimbursement for virtual consultations and 13 states reimbursing store-and-forward models of telehealth—22 states provide reimbursement for remote patient monitoring. The lack of a cohesive policy has a negative impact on adoption of telehealth and remote patient monitoring, but has improved significantly in the last five years.

- **Technology**: Overall, a low co-innovation risk exists in the US digital health market. Despite this fact, healthcare providers are skeptical regarding investing in new technology. Interoperability and security measures have improved significantly since 2009, but seamless health information exchange remain a fundamental roadblock for integrated care.

- **Consumer awareness**: Approximately 40% of consumers in the US use some form of connected health. However, the general awareness of healthcare technologies is much higher. Rising healthcare costs and disease prevalence are the two primary drivers of demand for telehealth and remote patient monitoring. For telehealth, this has resulted in the spread of virtual urgent care and community-based health kiosks.
As highlighted by the diffusion score, there are mixed near-term signals in the US market for digital health, which is one of the largest country markets for both devices and services. The FDA plans to maintain a focus on advancing digital health, including expediting innovative technology into the market. Digital health should also prove to be a valuable tool within bundled payment programs, particularly for post-acute care. That said, the Centers for Medicare & Medicaid Services (CMS) has ended two of these mandatory bundled payment programs for cardiac and hip replacement, along with reducing the number of regions included in the mandatory joint replacement model. However, this setback in the move toward value-based care may be temporary, as the CMS is still working toward a long-term goal of shifting volume to value. Consumers may also play a part in spurring demand of digital health services. As noted in Accenture’s 2019 Digital Health Consumer Survey which was released during the conference, millennial and Gen Z consumers are least likely to have a primary care physician and will become the largest generation in the US this year, thus holding significant influence on future healthcare models. These consumers have up to three times higher dissatisfaction with traditional care as compared to baby boomers, and will seek alternatives that can meet their expectations of effectiveness, convenience, efficiency and transparency.

Following are a few examples of the growing presence of digital health technologies at HIMSS this year:

- Regarding telemedicine and virtual consults, Children’s Mercy of Kansas City has recently increased the number of specialties they offer to 30 through the InTouch Health telemedicine platform. The hospital has found that pairing the technology with highly trained RN’s enables them to provide Level 3 and 4 new patient exams while meeting care standards with nearly a hundred percent patient satisfaction. Other technology providers exhibiting at the conference included American Well, Ambra Health, eClinicalWorks, GlobalMed, MDLive, Novotalk, Snap MD, Teladoc Health, TeleHealth Services, Tellus, TytoCare, and GE Healthcare among others.

- With the goal of reducing the cost of care, mortality rates, and length of stay, the GE Healthcare Centricity TeleICU is now extending multispecialty hospital treatment to the critically ill in remote areas. A small team of clinicians can monitor as many as 75 patients located in a satellite facility on a continuous basis. Philips eICU also offers a scalable, centralized tele-ICU solution combining A/V technology, predictive analytics, data visualization and advanced reporting capabilities.
Digital health; virtual care and remote patient monitoring cont.

Cisco is focusing on care team collaboration with virtual tools, including the clinicians, patients, and the extended care givers into videoconferences where medical records, images, and other data can be viewed and shared via WebEx. The endpoints can be room or desk systems, phones, and peripherals such as tablets, cameras, and headsets. The company has also introduced DNA Spaces, which digitizes physical spaces to help providers understand their patients and staff, in addition to assets and sensors, within their facilities using existing wi-fi infrastructure.

Regarding telehealth, there were a few relatively new wearable solutions from Current, Somatix, VivaLNK, and WellCare Today:

- **Current** offers non-invasive, IoT remote patient monitoring device that uses AI to analyze collected data to identify patients whose health is at risk for deterioration, enabling earlier interventions. The wearable is designed to be worn on the upper arm and monitors vitals such as respiration rate and oxygen saturation.
- **Somatix** offers a RPM platform that can utilize any wrist tracker or watch that the patient may have (provided it incorporates a motion sensor and Bluetooth connectivity), and derive physiological and emotional symptoms through simple hand gestures. The platform intends to facilitate personalized cognitive behavior therapy health intervention to increase treatment adherence.
- **VivaLNK** incorporates patch wearables for continuous monitoring on their platform, and while priced within the range of a disposable, they are rechargeable and may have an extended lifespan. The ECG monitor is unique as it is designed for both online and offline recording.
- **WellCare Today** has partnered with Samsung for the HealthAssist application embedded on the Samsung galaxy watch. The app tracks medication adherence, heart rate, activity level, sedentary time, stress level, and blood pressure reading and provides a monthly report family caregivers.

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Business model innovation, data storage, and interoperability
Business model innovation, data storage, and interoperability

There are two key opportunities for PACS and VNA vendors, with the first being a universal need for providers to reduce costs and improve outcomes. Vendors can enable cost savings and greater efficiency by improving the integration of radiology systems and other clinical information systems, which will be increasingly important in an environment where payments are centered on value-based care. The second is that outcome-driven healthcare delivery metrics will result in greater need for data visibility. Providers will look for solutions that are able to parse critical, clinically significant information and present them in an operationalizable format on a real-time basis. Further, providers expect to see greater tailored support throughout the entire contract as well as a thorough understanding of how a solution functions within the ecosystem of their network. One response to this expectation comes from Philips and the IntelliSpace Enterprise Edition, with innovation focused on the managed services business model to provide 99.99% uptime guarantees for critical systems, risk sharing, and consulting services that focus on clinical and IT program management as well as change management. As discussed at the conference, the IntelliSpace platform is intended to provide clinicians with the latest informatics innovations in a way that is seamless and scalable across the enterprise, increasing ROI over time.

Many vendor neutral archive (VNA) products have evolved significantly over the past several years, adding functionality that enables advanced workflow capabilities on top of storage and disaster recovery. As data becomes increasingly important to healthcare systems, VNA platforms are bringing together disparate patient information silos to form a more complete longitudinal medical record. In advanced platforms that serve as an enterprise service bus (ESB), VNA is also translating requests for both imaging and unstructured content into the appropriate message types and routing them to the appropriate provider. As such, many vendors believe the term VNA may no longer adequately capture full range products and services currently available. These new product offerings include communication and workflow tools, universal viewers, and an array of maintenance, consulting and implementation service options. Delivery of archiving solutions in this way has benefits for both the healthcare provider and the vendor. However, PACS is proving to be resilient against VNAs, and the rapid growth of the VNA market has slowed considerably. When comparing VNAs with enterprise PACS, many providers are opting to extend their PACS to include non-radiology data.
Business model innovation, data storage, and interoperability cont.

One example of VNA evolution is the HealthStore Independent Clinical Archive from BridgeHead where images from all clinical departments, scanned patient documents, HL7 events (observation results messages), and unstructured data types can be centrally archived for sharing management. During HIMSS19 BridgeHead also announced details surrounding the launch of their elite sports market offering with clients including the Southampton UK Premier League football team, as well as the England and Wales Cricket Board. The teams are using Bridgehead’s ICA to upload, share and review athlete medical records and images to improve the management of athlete health and as a basis for analytics.

Another example of software and services evolution in this space is from Agfa HealthCare, which has operated as a stand-alone unit from Agfa-Gevaert since late 2018. Agfa HealthCare is focused on comprehensive enterprise imaging technology rather than just departmental PACS or VNA. While PACS and VNA are still part of the overall solution, they are viewed more modules than primary elements. The ultimate goal is to have all images available within the EHR to improve patient care. These images may be derived from various points of care such as portable ultrasound, teledermatology, and the patient’s smartphone.

IHS Markit expects the combined global markets for radiology and cardiology PACS, RIS, CVIS, VNA, and image exchange (IE) to pass $4.2 billion during 2023, growing at a CAGR of 3.8% for years 2018 to 2023.
Importance of collaboration and interoperability

The health informatics field is highly dynamic and evolving. While spurred most recently by the HITECH Act (meaningful use and quality measurement requirements), and hence largely influenced by a relatively small group of EHR vendors. The market has been evolving since the 1960’s when it began to standardize as a field of study. Today informatics touches nearly every aspect of care delivery and coordination, and is essential for providers and payers in managing billing. However, after sixty years of development, much of the data generated remains siloed, limiting a holistic, longitudinal view of the patient. Now that most clinicians in countries with developed healthcare IT markets are utilizing EHRs, natural language processing and clinical inference can be applied for clinical data analytics purposes. This was one of the primary topics of conversation throughout the HIMSS 2019 conference, coupled with the shift to value-based care models. It is apparent that interoperability is necessary to democratize data to the point where it can become transformative to increasing positive patient outcomes, and the ecosystem of vendors seem to be engaging with this reality.