Cybersecurity: Preventing the Worst-Case Scenario

Unlocking the Power of Data to Transform Patient Care

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Cloud computing revealed its tangible positive impact on health outcomes during one of the worst global health crises. But we're still only scratching the surface of what's possible.

✓ Key Points

- By eliminating data silos and enabling providers to view complete medical histories, interoperability stands to provide a better patient experience and empower individuals to take greater control over their health care.

- The power of the cloud is democratising access to data, artificial intelligence (AI), and machine learning (ML) to bring

- about the next generation of healthcare solutions for use at the point of care.

- As healthcare organisations unlock the power of their data, they will be able to address pressing needs in diagnostics, preventive and predictive care, and access from anywhere.

The healthcare industry has worked to adapt and find new ways to get accurate information to patients and direct them to resources and care at scale. And much of this—from chatbots and remote patient monitoring to telehealth to electronic health record (EHR) systems—has relied on technology and the cloud. However, more can be done to enable transformative change for patients, caregivers, and providers.

To better support patients, the healthcare industry needs to look at how to securely access the right patient data, paired with advanced analytics, AI, and ML, to help enhance insights tied to outcomes in an accurate, scalable, secure, and timely manner. Additionally, the industry needs to come together to ensure that data connectivity, security, and privacy aren't barriers to achieving the promise of digital transformation.

Creating a Clearer View of Patients Through Healthcare Interoperability

With advances such as remote monitoring, EHRs, and wearable devices, significantly more health data is being captured today than ever before. However, that data is only useful if it is available, indexed, and structured in a way that allows clinicians to see and analyse it at the point of care.

With the current state of fragmented patient data, an estimated 80% of which is stored in unstructured medical formats (Kong 2019), important information might be overlooked or misinterpreted. Extracting information from patient data has

traditionally been a labour-intensive and error-prone process, but now cloud tools such as Amazon HealthLake are designed to take on the monumental task of normalising, indexing, structuring, and analysing data to make it useful for providers in understanding patients' entire medical histories.

EHR systems do not follow patients on their care journey beyond the hospital or clinic walls, but cloud technology is also being used in remarkable ways to facilitate interoperability and address this. Change Healthcare, for example, launched a service that allows for the free exchange of medical records between facilities. With access to prior lab results and previously siloed patient-history data, physicians can avoid costly duplicate testing, diagnose patients more easily, and initiate treatment faster. Change Healthcare's clinical data interoperability services also give patients improved access to their medical records by aiding in document retrieval, identity management, and record location.

Progress has been made in developing open standards like the Fast Healthcare Interoperability Resources (FHIR) from Health Level Seven (HL7) and application programming interfaces (APIs) that facilitate data sharing across systems—although adoption and scaling has been slow. When a health system uses interfaces that are proprietary or conform to earlier standards, they can fail to support true interoperability. Open source software toolkits such as FHIR Works on AWS enable customers to build interoperability into their

platforms, as Black Pear Software has done for the National Health Service (NHS). And Amazon API Gateway, a service designed to allow developers to create, publish, monitor, and secure APIs easily at any scale, enables the building of inno-

The sensitivity of the algorithm now means that 95% of skin cancers will be detected if they appear in the image.

Advanced computing power and improved database capabilities also enable population health analytics and preventa-

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vative solutions that help healthcare organisations share data.

Interoperability stands to provide a better patient experience anywhere, and cloud-based services are making a clearer, more comprehensive view of patients possible while empowering individuals to take greater control over their healthcare journeys.

Better Insights and Outcomes with Cloud-Enabled Technologies

With ongoing emphasis on value-based care, interoperability paired with AI and ML models are helping healthcare organisations optimise use of their data, increasing diagnostic accuracy and efficiency, making preventive and predictive care a reality, and improving patient access and experience.

AI and computer vision can aid with diagnosis across radiology, oncology, ophthalmology, and dermatology, as well as in the prediction of disease and health events. With this, unnecessary imaging examinations and clinical procedures are reduced, errors that contribute to poor outcomes are minimised, and costs decrease.

To predict the prognosis of hospitalised COVID-19 patients, the Centro Diagnostico Italiano, Bracco Imaging, and a group of Italian institutes and hospitals created an AI model to forecast the trajectory of disease using chest x-rays and medical records as training input. This non-profit project, called *AIfor-COVID*, was funded through the AWS Diagnostic Development Initiative, and it helps doctors identify those likely to experience a serious form of disease and intervene faster with an appropriate level of care.

These technologies also put more power in the hands of patients. Netherlands-based SkinVision developed a solution for early detection of skin cancers using images. The algorithm trained on hundreds of thousands of images to detect melanoma and other types of skin cancer. To use SkinVision, a patient uploads a picture of their skin spots into the app. The patient can also indicate symptoms such as itching and bleeding. Within 30 seconds, the images are analysed and tagged as low or high risk. Low risk advises to set a reminder to recheck, and high risk advises the patient to see a doctor. With SkinVision, instead of mole checks happening every two or three years, patients can check themselves more regularly.

tive care. In 2021, Omada Health unveiled the Omada Insights Lab, a data analysis engine that uses over 1 billion proprietary data points from over half a million members' real-world interactions with Omada Health programmes, to yield recommendations for optimising and personalising care. Data continuously ingested from glucose monitors used by prediabetic and diabetic programme members is then securely analysed with ML models. Ninety-six data points per day per patient are produced, yielding deep insights and metrics-based alerts for clinicians that can improve care and health outcomes on both individual and population levels.

Telehealth and remote monitoring have also found their place in routine clinical practice like never before. With an urgent need to monitor and identify trends in vulnerable cohorts remotely during the pandemic, London-founded Huma established a solution so clinicians can track vital signs using biomarkers collected by portable, wearable, and implantable digital devices. Clinicians can view these metrics from a single dashboard, allowing them to care for 50% more patients at a time, and patients have the confidence of knowing their healthcare professionals are monitoring their vital signs.

Cloud-enabled technologies also provide better patient experiences and help connect in-need populations with resources. Early in the pandemic, the NHS worked with AWS and technology consultancy Slalom to set up an automated service that aimed to reach 1.5 million of the UK's most vulnerable people to help them register to receive social and medical care and essential supplies. The service, which was set up in 48 hours using the flexibility of cloud tools and technology, enabled the NHS to act quickly to reach vulnerable groups as the country prepared to enter lockdown. Another example that demonstrates the benefit of being able to scale with cloud is Nye Health in the UK. Nye Health built a scalable, NHS-compliant platform that allows all NHS staff to offer consultations from any device, anywhere. In 2020, the platform covered more than 10 million patients, was growing by as much as 150% weekly, and was servicing thousands of patient consultations each week.

Virtual care tools like automatic speech recognition and natural language understanding applications also allow providers to offer patients highly engaging, lifelike

conversational interactions that recognise the intent of voice and text transactions. Additionally, translation services convert text from one language to another so providers can support patients in multiple languages.

Addressing Security, Privacy, and Compliance

With purpose-built cloud solutions, healthcare organisations can improve their ability to meet core security and compliance requirements. Based on AWS's Shared Responsibility Model, customers evaluate their compliance requirements, and we continually monitor the evolving privacy, regulatory, and legislative landscape to identify changes and determine what tools our customers might need to meet them. Additionally, AWS customers control their data by using powerful services and tools to determine where it is stored, how it is secured, and who has access to it. These solutions help ensure that IT infrastructure is compliant with changing policies and regulations, allowing in-house IT teams to focus on projects centred on patients and providers.

AWS regularly achieves third-party validation for thousands of global requirements, like Europe's General Data Protection Regulation (GDPR), as well as country-level regulation like Digital Health Applications Ordinance (DiGAV) in Germany and Hébergeurs de Données de Santé (HDS) certifications in France, as well as non-government programmes like Health Information Trust Alliance (HITRUST).

Delivering on the Promise of Digital Transformation in Healthcare

More and more healthcare organisations are recognising the benefits of cloud-based solutions and will rely on cloud to scale data storage, analytics, and ML looking ahead. It has been estimated that the global healthcare cloud computing market will grow at a CAGR of 18.74% between 2021 and 2028 (Vantage 2021). With this growing adoption by healthcare organisations, interoperability and wider use of open standards will help extract more meaningful insights from patient data.

Increased use of cloud can also result in reduced computing costs, enabling providers to reinvest savings. In fact, a new Amazon Web Services analysis (2022) identified 14.4 billion euros in potential IT savings across the European Union and UK healthcare sectors over the next five years—the equivalent of 5,665 euros per hospital bed—through migration of IT systems to the cloud.

Working together, healthcare and technology organisations have the opportunity to support a future that delivers more effective, efficient healthcare centred around patients' individual needs. As organisations move to the cloud, they can move from a system-centric view to a patient-centric view and, as a result, move more toward predictive and preventive care. This fundamental shift is what will ultimately deliver meaningful improvement in care decisions and overall patient outcomes. ■

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