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DATA IS THE KEY TO POPULATION HEALTH:

USING ADVANCED ANALYTICS TO DRIVE HEALTH EQUITY

The Quintuple Aim is gaining traction in healthcare, providing a framework to help organizations improve individual and population health by enhancing quality of care, controlling costs, improving clinician well-being and providing more equitable, patient centered care.

Becker's Hospital Review recently spoke with three healthcare leaders who are focused on addressing health inequities to improve population health:

- Michael Cui, MD, associate chief medical informatics officer, Chicago-based RUSH University System for Health
- Abdul Shaikh, PhD, global leader for population health, Amazon Web Services (AWS)
- Rod Tarrago, MD, healthcare executive advisor, academic medicine, Amazon Web Services (AWS)

These experts discussed challenges and opportunities for leveraging data to accelerate improvement in population health. These efforts include data-driven interventions from RUSH, supported by AWS, and designed to address life expectancy disparities among residents of Chicago's West Side.

Population health defined

There are many ways to think about population health. "You can be general or specific," Dr. Tarrago said. "Anytime you stratify individuals within groups, for example, by age, by geography or by disease that is population health."

RUSH sees health equity as the cornerstone of population health. "Health equity is not about providing the same thing to every patient, but rather doing what's needed to drive more equitable outcomes," Dr. Cui said. "The challenge then becomes putting the necessary workflows in place to deliver the right quality of care to a wide range of patients."

Providers, payors and government agencies can take a population health lens to health equity to understand the complexity of the populations they serve and inform specific interventions. This includes capturing individual and group differences for value-based contracts, assessing provider burden, cost and patient risk. Each of these scenarios involves analyzing and seeking to systematically improve the health of a defined population.

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COVID-19 underscored gaps in population health

The COVID-19 pandemic highlighted the challenge of provider burnout and exposed major gaps in our ability to provide equitable care for underserved populations.

These health inequities shone a spotlight on social determinants of health. These social determinants are defined as nonmedical factors influencing health such as socioeconomic status, education, social support, and access to food and housing. Most of these social determinants lie outside the bounds of clinical care. "At RUSH, we are very mission driven. Our primary goal is to help the West Side of Chicago," Dr. Cui said. "We took huge financial hits during the pandemic, but stayed focused on keeping our doors open to everyone and providing all patients quality care."

Population health challenges are fundamentally data challenges

"Regardless of how you define population health, obtaining valid and unbiased multimodal data is a fundamental enabler for advancing health equity," Dr. Shaikh said. Data is a proxy for the determinants of health. Data makes it possible to assess the health of individuals and populations to determine the most beneficial, sustainable clinical and community interventions.

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There are several challenges with data today that are slowing progress on population health:

- **Data is difficult to capture and combine.** The slow proliferation in data standards and technical barriers for data sharing and transformation make interoperability difficult. "Historically, everybody in healthcare immediately goes to the electronic health record," Dr. Tarrago said. "But there is so much other data sitting in separate silos" including genomic, behavioral, environmental, SDoH and "everything that happens in between visits for patients" Dr. Tarrago said. Currently, this data is not brought together to provide a comprehensive view of patient health.

- **Data is difficult to harness.** A systems approach to modeling and analysis is helpful for understanding the interplay between individual and population-level drivers for health spanning the Quintuple Aim. "Recent studies demonstrate weak correlations between life expectancy and community-level social risk, indicators such as the Area Deprivation Index. This makes patient screening for SDOH a viable benchmark for assessing social risk," Dr. Shaikh said.
- **Data is potentially biased.** Responsible use of advanced analytics is essential to make technology work for everyone, maximizing benefit and minimizing harm. "This begins with recognizing how the lack of representation in data from underserved populations, such as minority, rural, non-English speaking, the list goes on, can add bias to analytic and prediction models .such as those used in predictive and generative artificial intelligence (AI)," Dr. Shaikh said.

For AWS, population health solutions is a framework

AWS is focused on helping customers solve these data challenges to address their population health goals. "Our approach is about enabling customers to get a handle on their data and use technology to obtain value from it," Dr. Tarrago said.

This focus is consistent with AWS' healthcare mission: to enable access and delivery of person-centered care, drive improved outcomes at a lower cost, and accelerate the digitization and utilization of healthcare data.

In tackling this challenge, AWS thinks about population health solutions as a framework, Dr. Shaikh said. This framework spans services and partner solutions designed to help customers:

Harness complex, structured, and unstructured data	From EHRs, claims, operations, labs, patient-generated data, public data sources, etc.
On multiple determinants of health	Genes, behavior, environmental, and physical influences, medical care, and social factors
To inform clinical and community interventions that interoperate with payers and the broader care ecosystem	Focused on quality, cost, patient/provider support, health equity, and more

Case study: How AWS has supported RUSH

Chicago-based RUSH University System for Health is a mission-driven, academic healthcare system. RUSH comprises of three major hospitals, numerous outpatient care facilities and a wide network of providers.

AWS' primary goal is to help customers advance their population health initiatives and achieve their population health goals. AWS has supported RUSH in two initiatives, creating a COVID-19 analytics hub and creating a population health analytics platform.

COVID-19 analytics hub

RUSH embraced cloud transformation for internal operations, organizational needs and in response to the COVID-19 pandemic. Dr. Cui cited advantages of the cloud as being scalable, flexible, secure, and more cost effective than hosting data and applications in-house. "Now, we don't need to develop every single new thing to integrate every single new thing, AWS already has it," he said.

The RUSH analytics team worked with the Chicago Department of Public Health to create a hub that aggregated and analyzed multi-hospital data across approximately 20 Chicago-area hospitals, helping to drive a more rapid and equitable pandemic response.

AWS powered essential aspects of RUSH's pandemic response. With AWS Professional Services, RUSH developed an open-source solution that leveraged serverless computing with Amazon QuickSight for visualizing and publishing real-time dashboards. Amazon HealthLake allowed RUSH to store, transform, query and analyze health data in minutes.

Population health analytics platform

RUSH is committed to addressing the underlying causes of the 16-year gap in life expectancy among minority and lower-income residents of Chicago's West Side. With assistance from AWS, RUSH developed the Health Equity Care & Analytics Platform (HECAP). This platform aggregates and harmonizes data from multiple sources to help inform decisions about meaningful interventions to address gaps in health outcomes.

AWS tools that are part of RUSH's solution include Amazon HealthLake, Amazon Comprehend Medical, Amazon SageMaker, Amazon Athena and Amazon QuickSight.

RUSH followed three primary pathways or steps in its journey:

- **Data interoperability.** This provides the ability to connect clinical, financial, and operational data with behavioral and social data for a unified view of patients. AWS provides RUSH the ability to store any amount of data at a low cost, in a secure, open-standards format that supports interoperability.

  Dr. Cui shared an example of how RUSH is able to use data to identify if a patient is food insecure and immediately sends a referral to a nearby food pantry. The food pantry closes the loop by indicating if that patient was provided with food. "This closed-loop referral and level of data transmission is beneficial to the patient," Dr. Cui said.

  Analytics. AWS enables structure, process and outcomes measures along with analytics that make AI/maching learning (ML) based predictions to enhance care outcomes and reduce costs. "AWS allowed us to aggregate information for population health purposes, but they've also helped us with tools to assess data bias, inform responsible use of AI, and generate insights," Dr. Cui said.

Dr. Cui pointed out for an organization like RUSH, it is difficult to undertake initiatives like this from scratch. Leveraging AWS' infrastructure prevented having to reinvent the wheel and allowed RUSH to take advantage of AWS' scale and expertise.

Continuing to advance population health

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In describing AWS' future plans to improve population health, Dr. Tarrago said that AWS sees a great deal of activity in advanced ML, generative AI, and large language models (LLMs), all of which use data to improve outcomes. AWS is working with partners and customers to use these technologies to advance interoperability and help make population health simple, faster, and more insightful.

Advice from RUSH to health systems getting started with population health

RUSH is an early adopter and a leader in healthcare and health equity improvement efforts via data and analytics. Based on RUSH's experience, Dr. Cui advised other organizations embarking on this data journey to start narrow. "Focus on one health equity concern or issue and try to solve it for the patient and your clinical staff's workflow," Dr. Cui said.

He also advised to keep in mind healthcare requires trust by patients and must be delivered by humans. During this time of staffing shortages technology can augment clinical staff, allowing doctors, nurses and other clinicians to take care of even more patients, while simultaneously lessening the administrative burden on staff.

Conclusion

The pandemic clearly illustrated the importance of population health, the inequities that continue to exist throughout healthcare, and the importance of a data-driven approach to address population health challenges.

"AWS is responding by helping customers reduce the effort required to gain information from data," Dr. Shaikh said. "The primary goal of our population health initiatives is to help customers advance their specific population health aims, be it the Quintuple Aim, developing high-performing health systems, precision medicine, comparative effectiveness research or public health. Whether an organization's needs are data storage, analytics or presentation of information for decision support, AWS will work with customers to address their most pressing population health needs."

RUSH's experience shows what is possible in leveraging AWS' infrastructure, tools and expertise to create an analytics platform focused on addressing gaps and inequities in population health.

Connect with an AWS expert to discuss your next Population Health initiative.