

Appendix: Content Summaries of Best Papers for the Health Information Exchange Section of the 2022 IMIA Yearbook

Nsaghurwe A, Dwivedi V, Ndesanjo W, Bamsi H, Busiga M, Nyella E, Massawe JV, Smith D, Onyejekwe K, Metzger J, Taylor P

One country's journey to interoperability: Tanzania's experience developing and implementing a national health information exchange

BMC Med Inform Decis Mak 2021 Apr 29;21(1):139

Nsaghurwe *et al.* describe a national approach for health data exchange and a viable nationwide health information exchange (HIE) system in Tanzania. The paper details a systematic approach to planning, developing, and implementing a nationwide HIE. The authors describe a 5-year effort focusing on major data challenges depicted in four "use case scenarios" (data exchange among hospitals, between services and the supply chain, across digital data systems, and within the supply chain reporting system). The researchers also detail business use cases, challenges, and outcomes after implementation.

From 2014 to 2019, the Tanzanian government and partners implemented a five-step procedure based on the "Mind the GAPS" (governance, architecture, program management, and standards) framework, using both proprietary and open-source tools. The partnership was between Tanzania's Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC) and the US Agency for International Development's (USAID) Maternal and Child Survival Program (MCSP). The Mind the GAPS approach consists of five steps:

- **Identifying leadership structures and roles:** This included addressing the need for coordination, partnerships, and financing. Partners reviewed key concepts and global models, reviewed national

applications, developed a common vision, and determined high-level requirements for a comprehensive HIE framework. Participants also assessed legal and technical issues, governance, data standards, and existing systems.

- **Defining public health information system priorities:** Partners identified, prioritized, and developed use cases, gathered stakeholder input to customize and configure the proposed system; and test the system based on use case specifications. Identified challenges included the use of different EHRs and the lack of data standardization.
- **Designing the HIE architecture:** They focused on user-centered design (especially health care workers and data users). The architecture approach required stakeholders to incorporate interoperability, open standards, flexibility, collaboration, and technology. It was a time-consuming process and required continuous collaboration and feedback. Throughout the five-year process of design and implementation, Tanzania incorporated input from partners and stakeholders, using a collaborative approach.
- **Designing, testing, and implementing the system:** Participants customized the system and conducted conformance testing. Tools developed included a systems installation manual, users' operationalization guide, and system administration and implementation guide. Documentation also covered privacy and security, as well as system sustainability.
- **Building capacity and supporting data use:** Participants developed a user guide, and training manuals and conducted hands-on and on-the-job training for technical staff and users.

While this article focuses on one use case (improving access to and use of data across specialized hospitals), Tanzania enabled data exchange across 15 separate information systems that resulted in improved data availability, data quality and use, as well as significant time savings. The government has adopted the HIE within the national strategy for health care information, and the system is being operated and managed by Tanzanian officials.

Chen J, Amaize A, Barath D

Evaluating telehealth adoption and related barriers among hospitals located in rural and urban areas

J Rural Health 2021 Sep;37(4):801-11

This article focuses on issues relevant to health information technology (HIT) and HIE implementation and use. The study is especially timely given the increased use of telehealth during the COVID-19 pandemic. Using the 2018 American Hospital Association (AHA) Annual Survey and Information Technology (IT) Supplement Survey (an annual census of US hospitals that was administered from January 2019 to April 2019), the researchers applied state fixed effects multivariate analyses and Oaxaca decomposition to estimate the variation of outcomes of interest by hospital geographical locations. Focusing on telehealth, the researchers sought to better understand the barriers that rural providers face in implementing robust and responsive HIT systems.

The authors examined the patient engagement capabilities with hospital HIT systems and HIE capabilities with external providers and partners. The hospital-level analysis multilevel approach assessed telehealth adoption among hospitals in rural and urban areas, and identified barriers related to patient engagement via enhanced telehealth capabilities and HIE between hospitals and external providers and community partners. The authors note the need for interoperability and integration between telemedicine and other HITs, EHRs, and data systems. The researchers discuss the importance of promoting data communication, data exchange, and data sharing among multiple sectors and stakeholders. Research results demonstrated significantly lower levels of telehealth adoption and poorer telehealth capabilities in rural area hospitals overall, compared to urban area hospitals. Results also demonstrated that rural hospitals were the least likely to report that clinical information was available electronically from outside providers. The model used by the authors explained 65% of the rural/urban difference in telehealth adoption, 55% of the number of telehealth services adopted, and 43%-49% of the rural/urban difference in telehealth barriers.

The article also describes barriers of telehealth use in rural areas, including patients' inability or difficulty to view their medical record online or electronically transmit medical information to a third party. The study also found that providers' ability to query electronically for patient health information from an outside source was significantly higher in hospitals located in metropolitan areas. Given the authors' findings about differences in telehealth use and related barriers between hospitals located in rural and urban areas, the study has public policy implications about access to care, population health, and health care equity. Additionally, the article identifies areas for additional research about the role of health IT and telehealth in improving information exchange and sharing to address health disparities.

D'Amore JD, McCrary LK, Denson J, Li C, Vitale CJ, Tokachichu P, Sittig DF, McCoy AB, Wright A

Clinical data sharing improves quality measurement and patient safety

J Am Med Inform Assoc 2021 Jul 14;28(7):1534-42

Noting the increased adoption and implementation of HIT and EHRs, along with EHR-based (electronic) quality reporting processes, the study focuses on quality measurement and the role of incomplete information when calculating quality measures. The authors demonstrate the potential benefit of data from an HIE in contrast with data from only single EHRs.

Data were sampled from 53 healthcare organizations (ambulatory care practices and health systems) participating in the statewide HIE (in Kansas, USA). The authors randomly sampled 100 distinct patients from each organization within the Kansas statewide HIE, which connects over 10 000 clinicians with approximately 95% of hospitals and 75% of ambulatory providers in Kansas. The authors selected 14 quality measures representing various preventive care screenings, and measures of disease control and patient safety. The measures were eligible for inclusion in the US program for EHR-based quality reporting (the

Merit-based Incentive Payment System (MIPS)) that affects provider payments. The 14 ambulatory quality measures for 5,300 patients were calculated using the data from an individual EHR source and contrasted to calculations when HIE data were added to locally recorded data.

Results obtained in this paper demonstrate that quality measures calculated using single-site EHR data may be limited by incomplete information. Moreover, effective data sharing significantly changes quality calculations, which affect healthcare payments, patient safety, and care quality. While this study focused only on one state HIE, it shows how data completeness facilitated by an HIE quantitatively affects quality measure calculation. HIEs prioritize sharing and exchanging data within and across geographical areas (local/state/regional). Data completeness has implications for interoperability, quality of patient care, patient safety and care coordination. The authors note several policy implications from these findings given the potential to improve the accuracy and robustness of future quality measurement