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Identifying priorities for data quality improvement within Haiti's iSanté EMR system: Comparing two methods

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KEYWORDS

Health information system;
Electronic medical record;
Delphi technique;
Stakeholder analysis;
Data quality

Abstract

Objectives: The aim of this case study was to compare two alternative strategies for prioritizing data elements for data quality assessment (DQA) in a routine health management information system. The study used data from iSanté, a multi-site electronic medical record implemented by the Haitian Ministry of Health. We described and compared two prioritization strategies: (1) a Delphi process drawing iterative feedback from clinicians and stakeholders responsible for monitoring and evaluation (M&E) of health programs to identify consensus priorities for data on HIV patients; and (2) a process using burden of disease estimates from Haiti to establish priorities for data on primary care patients.

Methods: The Delphi process included 26 individuals across 6 institutions, including clinicians and M&E specialists. Through three rounds of questionnaires, the stakeholders provided input for prioritization of 13 indicators for completeness, accuracy and timeliness of HIV data. The burden of disease prioritization process revealed that cardiovascular disease contributed to the greatest number of disability-adjusted life-years (DALYs). This resulted in the selection of 16 data quality indicators for primary care data.

Results: Both methods informed the definition of a set of automated data quality queries to assess internal validity, completeness, and timeliness using logic and clinical plausibility. The Delphi process benefited from stakeholder input, but was lengthy in process. The burden of disease prioritization process was objective and easier to implement, but lacked stakeholder buy-in.

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Conclusions: A hybrid approach guided by both disease burden and stakeholder input may be most beneficial for prioritizing data elements for DQA.

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Introduction

A crucial component to any health system is a robust health information system (HIS) [1], which increasingly encompasses electronic medical records (EMRs) in low-resource settings [2,3]. EMRs promise to improve documentation, timely feedback, and enhanced data transmission while integrating care across sites [4-8]. Several studies have demonstrated positive benefits from EMRs in terms of quality and efficiency of care [9,10-17]. Yet, these benefits depend upon strong data quality, which unfortunately remains problematic both in high- and low-resource settings. Data quality reinforcement, therefore, is a crucial requisite in health systems strengthening efforts [7,18,19].

Multiple methods have been employed in low-resource settings for data quality assessment (DQA) within routine facility-based information systems. These include in-person audits based on comparison of electronic and paper sources [20], patient exit interviews [21], workplace walkthroughs [19], and surveys [22]. Automated database queries represent a complementary, efficient strategy to bring data quality issues to light and facilitate routine data cleaning. Kahn et al. [23] offer a framework for data validation of large, multisite health care databases. These rule-sets can expose contradictory, inconsistent, or illogical data relationships through cross tabulations, descriptive statistics, and time trends (Table 1). However, since possibilities for validations and data cleaning rules and procedures are potentially limitless yet resources to undertake data review and cleaning are limited, it is important to prioritize attention within a comprehensive EMR data systems on where to focus attention for improved data quality. The goal of our research was to identify priority automated data validation queries, inspired by the Kahn framework, for a large-scale EMR system in Haiti.

Haiti's iSanté EMR is a multi-site EMR implemented in more than 120 sites since 2005, with longitudinal health data for more than 550,000 patients [24,25]. Haiti is the poorest country in the Americas, with a per-capita GDP of \$1220 USD [26]. The life expectancy in Haiti is 63 years of age [26] and traditional diseases of poverty, including communicable diseases, maternal, neonatal and nutritional disorders contributed to 44.5% of deaths in 2005 with 7.1% of deaths due to HIV/AIDS [27]. The iSanté EMR is implemented by Haiti's Ministry of Health (Ministère de Santé Publique et de la Population, or MSPP) through funding from the US President's Emergency Plan for AIDS Relief (PEPFAR). Technical assistance is provided by the International Training and Education Center for Health (I-TECH) at the University of Washington and the US Centers for Disease Control and Prevention (CDC) [24,25]. At its inception in 2004, iSanté was focused on outpatient care for patients with HIV, but has since expanded to cover general outpatient primary care, maternal health care, malaria, and tuberculosis [28]. Sites may use the EMR via a local area network or via the Internet, and all data are regularly replicated to a central repository as internet connectivity permits. Initially, iSanté was designed for retrospective data entry, where data clerks entered information from standardized patient encounter, laboratory, and pharmacy forms to the database following patient visits. Over time, the iSanté software and implementation have evolved to support point-of-care system use at selected sites. The system is comprised of approximately 150,000 HIV patient records and 400,000 primary care patient records.

While there is evidence of improved data use in iSanté over time [24], data quality remains a concern, which could result in suboptimal use of data for patient care, health services management, and program reporting. The system is used both by data clerks for retrospective data entry and by

Table 1 Data quality rules for multi-site EMR assessment [23].

Data quality rules	Definition
Attribute domain constraints	Anomalies in values (e.g. 1390 instead of 1930), incorrect units, or missing information
Relational integrity rules	Inconsistencies across related variables (e.g. discrepancies between prescription records of the pharmacy and clinic)
Historical data rules	Temporal relationships (e.g. someone who was hospitalized in 2009 could not have died in 2008)
State-dependent object rules	Logic violations in the expected or allowed evolution of a process (e.g. series of prenatal visits would be expected to result in an outcome, like birth or postpartum checkup)
Attribute dependency rules	Conditional dependencies and expected correlations across subsets of data (e.g. a postpartum visit is unlikely to occur 18 weeks after delivery)
Semantic variability	Differences in representation of data elements (e.g. documenting medication history in different EMR locations) or differences in source of data collection (e.g. recording fasting vs random blood glucose)

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