Findings from the Health Information Management Section of the 2020 International Medical Informatics Association Yearbook

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Summary

Objectives: To summarize the recent literature and research and present a selection of the best papers published in 2019 in the field of Health Information Management (HIM) and Health Informatics.

Methods: A systematic review of the literature was performed by the two section editors with the help of a medical librarian. The search through bibliographic databases for HIM-related papers was achieved using both MeSH headings and keywords in titles and abstracts. A shortlist of 15 candidate best papers was first selected by section editors before being peer-reviewed by independent external reviewers.

Results: Over half of the 15 papers addressed the issue of data auglity in the electronic health record (EHR). In addition to the focus on data quality, there were papers on other topics of long-standing interest to the field of HIM. These topics include privacy, security, and confidentiality of health information, comparability of different coding vocabularies, classifications and terminologies, and the HIM workforce. Finally, there were papers on newer topics for the HIM field, including mobile Health (mHealth), EHR use by public health departments, and usability of different strategies for displaying information in the EHR. Conclusions: Traditional HIM concerns about HIM practice and workforce as well as issues about data in the EHR including data quality, coding, and privacy and confidentiality continue to be a large part of the HIM research literature. However, newer topics which reflect innovative and emerging technologies, usability assessments, and the application of the EHR outside the traditional clinical setting are starting to appear and more research is needed on these newer areas.

Kevwords

Health information management; data quality; electronic health record

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1 Introduction

Major concerns of Health Information Management (HIM) professionals are the quality of the data in the medical record, the privacy and security of that information, and the accuracy of representing the information in terms of controlled terminologies and vocabularies. These were major concerns in the era of paper medical records and they still are now that most health information is in electronic form. At the same time, the field of HIM and the roles for HIM professionals have expanded. The exchange of electronic health information provides new challenges to data quality, security, and semantic interoperability as does the increasing use of mobile technologies. Finally, as the COVID-19 pandemic has made tragically clear, the need for access to health information for public health purposes is essential, and the issues of data quality and privacy, and of accurate representation of information are as important in this arena as in direct health care. In this review of the 2019 research related to HIM, we explore these themes as exemplified by the group of papers selected as candidates for best papers in 2019.

2 Methods

In January 2020, with the assistance of a medical librarian, the editors of the HIM section conducted a search of both PubMed and Embase using both MeSH headings and keywords in the titles and abstracts, with a focus

on Health Information Management. The publication year was 2019. The search strategy was as follows. A search of PubMed was done first using the following query on MesH terms ([MeSH]), title and abstracts ([tiab]), and journals ([journal]): "Health Information Management" [MeSH] OR "Health Information Management" [tiab] OR Health Information Management Journal [Journal] OR "J AHIMA" [Journal]." This search returned 141 articles. A search of Embase was then done using the following terms: 'medical information system'/exp/mj OR "health information management":ti,ab OR "clinical information system":ti,ab OR "clinical pharmacy information systems":ti,ab OR "health information exchange":ti,ab OR "health information management":ti,ab OR "health information manager":ti,ab OR "health information network":ti,ab OR "health information system":ti,ab OR "health information systems":ti,ab OR "IS-H med":ti,ab OR "medical information service":ti,ab OR 'Health Information Management Journal'. After eliminating duplicates from PubMed, there were 55 remaining articles retrieved from Embase.

The 196 unique articles were then rated by both section editors, who excluded articles that were opinion pieces, editorials, reviews, or articles where the full text of the article was not readily available. Each of the two section editors independently judged the relevance to the HIM field and the quality of the articles. Those articles that both co-editors rated as not appropriate were excluded automatically. After discussion on the criteria for elimination, articles where either editor

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judged it as not appropriate were eliminated also. The rest of the articles were discussed, and disagreements adjudicated to arrive at 15 articles that, based primarily on the abstracts, were judged to be candidate best papers of the HIM subfield. The full texts of these 15 articles were then rated independently by both section editors, one of the Yearbook editors, and at least two external peer reviewers.

Four 'Best Papers' were selected based primarily on consensus of reviewers. Factors included having a high average rating from the reviewers, diversity of research approaches or focal area and setting diversity. Below, we discuss the major themes of the 15 research papers from 2019 that were candidates for being selected as a 'Best Paper.'

3 Results

3.1 Quality of EHR Data

Over half of the papers selected as candidate best papers addressed the issue of the quality of the information in the electronic health record (EHR). Methods to assess the quality differed across studies. One approach to assessing quality involved focus groups and interviews of Health Information Managers and coders [1, 2]. This qualitative research found problems in completeness, accuracy, and consistency in coding. Recommendations included increased use of standards, greater awareness of the problems, and increased resources to avoid the decrement in quality caused by increasing demands on HIM professionals.

More systematic methods that did not involve perceptions were also used. Rodenberg *et al.*, [3] described documentation improvement studies that examined claims data or patient clinical data. Braund et *al.*, [4] focused on the quality (completeness and accuracy) of documentation of adverse drug events (ADRs). They compared multiple electronic sources of information and found omissions and multiple discrepancies across sources regarding drug allergies and adverse drug reactions. A study by Endriyas *et al.*, [5] examined a variety of data sources related to documentation of maternal health across 163 facilities in Ethiopia that reported data

to a central health office. Comparisons of source data within the individual facilities as well as comparison of the individual facility reports with the data in the central system were done. The researchers found discrepancies at all levels and variability among the different variables, with some showing high accuracy and others showing low quality. Gribsholt et al., [6] also looked at multiple information sources to validate the diagnoses of overweight and obesity in Denmark. The researchers compared diagnoses of overweight and obesity with BMI data. The authors found that when a weight problem was coded there was generally good documentation to back up the code, but often there were data indicating obesity or overweight where the appropriate code was missing.

Clearly, the problem of missing and inaccurate documentation is concerning, but the studies above that describe the problem did not clearly document the impact of missing data. A study by Souza et al., one of the best papers, examined the fiscal consequences of missing data [7]. Interestingly, although the study was done in Portugal, the Portuguese health system uses DRGs, which are used in the US and elsewhere. Researchers targeted the impact of missing information on co-morbidities in cardiovascular and respiratory diseases. They used machine learning approaches to examine the effects of different co-morbidities on reimbursement and found that the missing information did potentially affect payments to hospitals. The authors suggested that there should be specific coding rules for comorbidities.

Ahmadi et al., suggested providing specific guidelines on information that should be documented and/or coded [8]. The authors described the development of a national minimum dataset for disabilities in Iran. Guidelines, coding rules, and national requirements may be necessary, but they may not be sufficient to address the problem of incomplete information. Another one of the best papers, by Hannigan et al. [9], evaluated the extent to which data mandated by the government was included in the EHR. In Ireland, as well as in several other countries, ethnicity data is legally required to be recorded in health and social care records so that audits can be done to monitor any discrimination in care based on ethnicity or national origin. While a key focus is Ireland's ethnic minority, known as Irish Travellers, the issue of disparities and equality of treatment of minorities is a concern in many countries. Hannigan et al., did an extensive search of national data sources. They found that while some data were routinely recorded, especially in databases focused on that information, in primary care data there was very uneven recording of the required data. Braund et al., [4] had specific recommendations related to improving the recording of allergies and adverse drug events, but they also recommended education of providers on data that should be recorded. Studies should be conducted to determine the extent to which focused education efforts to improve the completeness of the data recorded in the EHR are effective.

Table 1 Best paper selection of articles for the IMIA Yearbook of Medical Informatics 2020 in the section 'Health Information Management'. The articles are listed in alphabetical order of the first author's surname.

Section

Health Information Management

- Hannigan A, Villarroel N, Roura M, LeMaster J, Basogomba A, Bradley C, MacFarlane A. Ethnicity recording in health and social
 care data collections in Ireland: where and how is it measured and what is it used for? Int J Equity Health 2019;19(1):2.
- Hosseini M, Faiola A, Jones J, Vreeman DJ, Wu H, Dixon B. Impact of document consolidation on healthcare
 providers' perceived workload and information reconciliation tasks: a mixed methods study. J Am Med Inform Assoc
 2019;26(2):134-42
- Souza J, Santos JV, Canedo VB, Betanzos A, Alves D, Freitas A. Importance of coding co-morbidities for APR-DRG assignment: Focus on cardiovascular and respiratory diseases. Health Inf Manag 2020;49(1):47-57.
- Yeung T. Local health department adoption of electronic health records and health information exchanges and its impact on population health. Int J Med Inform 2019;128:1-6.

3.2 Accuracy of Coding and Data Privacy

In addition to concerns about the quality of the documentation and information in the EHR, HIM professionals have been concerned about the accuracy of coding the data that are recorded. Accuracy and comparability of codes across organizations are becoming more important with implementations of data sharing and exchange as well as the growth of Health Information Exchange (HIE) entities and organizations. Standardized terminologies have been advocated to ensure semantic interoperability in HIE [10, 11]. One of those terminologies is LOINC® (Logic Observations Identifiers Names and Codes). Peng et al., [12] described the process of mapping computerized tomography exams to LOINC from 40 sites over a three-year period. They found that while existing LOINC terms provided reasonable coverage of the examinations, it was improved significantly after they created new terms and requested that LOINC incorporate them. The results of this study point out that efforts should be made to study the comprehensiveness of standard terminologies and that we should accept that terminologies need to evolve to improve coverage.

Another traditional HIM concern has been assuring the privacy and security of health information. While the US has the Health Insurance Portability and Accountability Act (HIPAA) regulations [13] and the European Union has enacted the General Data Protection Regulation (GDPR) [14], not all countries have national privacy, confidentiality, and security regulations. To gather data that can lead to national policies in Iran, Sheikhtaheri et al., surveyed HIM professionals in 22 teaching hospitals about their practices regarding privacy and security and patient consent [15]. They found different processes across institutions and, unlike the national rules in other countries, most did not require patient consent for disclosure. These results point to the necessity for more consistency across institutions. Other countries where there are no national policies can use a similar approach to gather comprehensive data that can be used to inform policies.

3.3 New Curricular Areas for Education of HIM Professionals

The topics of data quality, coding accuracy, and privacy and security of health information have traditionally been part of HIM educational programs. However, as the healthcare environment changes, HIM education needs to assess the need to change. Marc et al., employed a novel approach to identify competencies for HIM and Health Informatics [16]. They used a text-mining approach to identify key requirements in job postings internationally. They found that compliance (which would include concerns of privacy and security), clinical expertise, and technology expertise were prominent and that these areas of competence were found in many of the existing organizational competency definitions. However, they also found that business and management expertise were found in many of job descriptions but were not strongly represented in existing competency statements. They also found differences across countries in the relative emphases of these knowledge and skills.

There are new areas that could be considered for incorporation into HIM education programs. The increasing use of mobile technologies in healthcare (mHealth) and the research conducted on their effectiveness, such as the study by Amoakoh et al., [17], will likely lead to patient data from mobile devices being incorporated into the EHR. Managing these data will become more important and will require HIM professionals to have more understanding of the use of such technologies, as well as the challenges of incorporating and displaying the often extensive information from these devices. HIM professionals can also play a significant role in policy development related to the inclusion of these types of data in the EHR.

Now that most large healthcare facilities have transitioned to EHRs the issue of usability of EHRs has been getting increased attention. One aspect of usability of potential interest to HIM professionals is how information is organized and displayed in the EHR. These usability issues may be even more important when engaging in HIE, when clinicians must handle data from multiple organizations. As discussed above, the quality and accuracy of clinical data are critical

to HIE, but HIE may increase the workload of clinicians as they have to integrate data from multiple organizations and information overload may be even more of a risk with HIE than with a record from a single organization. A key area for research for HIM is to assess the understandability and usability of different ways of organizing EHR data. The study by Hosseini et al., one of this year's best papers in HIM described in detail in the Appendix, focused on the Continuity of Care Document (CCD) that documents the essential basic data for HIE [18]. They examined different ways of displaying the data in the CCD and their impact on the perceived workload of clinicians. Perceived workload is important because it is clinician perception that leads to complaints about EHR usability. However, additional research on actual clinician workload, burden. and efficiency of different ways of organizing EHR data is also important to undertake.

The final area that is exemplified by another of the best papers is the use of EHRs outside traditional hospital settings, specifically by public health officials [19]. The Coronavirus pandemic has created heightened awareness of the importance of having real time access to accurate health information, the need for reliable and efficient health information exchange, and the value of having electronic information available to health officials for analytics. The paper by Yeung [19] found that counties where local health departments adopted EHRs had better health outcomes than others. As EHRs become more widely used in general, and especially in public health, research on the impact of EHRs on population health will be more able to be conducted.

4 Conclusion

In this review of a selection of research papers addressing HIM concerns, most of the research focused on information quality (completeness and/or accuracy) in the EHR and on the other areas traditionally of interest to HIM professionals. However, there are newer areas that include mHealth, usability and organization of EHR data, and use of EHRs outside the traditional hospital or ambulatory setting that deserve more research attention.

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Appendix: Content Summaries of Best Papers for the Health Information Management Section of the 2020 IMIA Yearbook

Hosseini M , Faiola A, Jones J, Vreeman DJ, Wu H, Dixon BE

Impact of document consolidation on healthcare providers' perceived workload and information reconciliation tasks: a mixed methods study

J Am Med Inform Assoc 2019;26(2):134-42

Clinicians need access to information about patients' medical history and prior treatment. Obtaining, integrating, and reconciling such information with current health records is a necessary yet labor intensive, burdensome, and cumbersome (mostly manual) undertaking. This study is highly relevant to HIM and informatics and addresses the importance of health information exchange, information usability, reconciliation, and integration.

Challenges in integrating patient information across multiple sources include accurate patient matching and duplicative and/or conflicting information, verification and validation. The authors of this study had previously developed and reported on an information system designed to automate the process of reconciling information across multiple electronic documents (based on the Health Level Seven (HL7) Clinical Document Architecture (CDA) standard). This study evaluated how the review of documents produced by the system impacted clinicians' perceptions of their workload.

This study involved simulated continuity of care documents (CCDs) that were provided to nine healthcare providers to review. The participants had to process and reconcile information that came from multiple sources. The study measured participants' perceived workload, and the accuracy and efficiency of information reconciliation, while reviewing two types of medical records: 1) multiple CCDs for a patient vs. 2) one consolidated CCD generated by the CDA-consolidation system. The authors presented participants

with three case scenarios related to transitions of care: 1) referral, 2) medication reconciliation, and 3) problem reconciliation. Potential challenges to information reconciliation include increased provider burdens, fatigue, and mental workload. Authors audio-recorded open-ended interviews with participants which were transcribed and thematically analyzed. The results showed that the single consolidated CCD was more efficient to review and was perceived to be less burdensome. The findings demonstrated that an information system that consolidated data from multiple sources could help reduce time and effort for clinicians when performing information reconciliation tasks associated with routine care. The study showed that different ways of organizing the cognitive task of information reconciliation, which is necessary with health information exchange, have different effects on perceived workload and time spent. The study concluded that automating retrieval and reconciliation of information across multiple electronic documents could reduce healthcare providers' task complexity and workload.

Yeung T

Local health department adoption of electronic health records and health information exchanges and its impact on population health

Int J Med Inform 2019;128:1-6

In contrast to studies examining the impact on health outcomes of hospital or physician adoption of EHRs and HIE, this research studied the use of EHRs and HIE by local health departments. The outcomes studied were county-wide measures of various population health measures. Using questions about health information technology from the 2013 National Association of County and City Health Officials (NACCHO) Profile and the 2016 County Health Rankings (produced by the Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute), the study examined population-based data across 433 counties in the United States and used multiple linear regression to analyze the impact on population health of the adoption of health information technology by local health departments. For the study, population health was defined as "the health of a population at the county level." It was measured by health outcomes (premature death and health-related quality of life). Findings showed that EHR adoption by health departments was associated with improved population health at the county level. However, HIE adoption did not have a statistically significant effect. The author notes that the implementation of public health HIT is rarely analyzed or reported and she emphasized the criticality of analyzing the effectiveness of the public health IT infrastructure, given emerging threats to the safety of communities and health of populations. The author recommends that future studies focus on the following: 1) analyzing other types of health IT and how those systems impact population health, and 2) identifying barriers in health IT adoption by local health departments.

Souza J, Santos JV, Canedo VB, Betanzos A, Alves D, Freitas A

Importance of coding co-morbidities for APR-DRG assignment: Focus on cardiovascular and respiratory diseases Health Inf Manag 2020;49(1):47-57

The quality of coded clinical data is a central foundational element of health information management. This study examines the extent of and impact on reimbursement of failing to record comorbidities. A topic of high relevance to the HIM domain and its functions including: completeness of documentation, coding, data accuracy, and severity of illness, as well as payments. In this study, All Patient Refined Diagnosis Related Groups (APR DRGs) are used to account for severity of illness and risk of mortality1 by incorporating severity of illness subclasses into the APR-DRGs. The study applied a machine learning approach to assess the APR-DRG classification structure and characterize the impact of co-morbidities on APR-DRG classification of respiratory and cardiovascular diseases. The authors used support vector machine (SVM) models to analyze the impact of removing Charlson and Elixhauser co-morbidities on six years of coded

https://www.forwardhealth.wi.gov/kw/pdf/ handouts/3M_APR_DRG_Presentation.pdf

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clinical data from a nationwide Portuguese inpatient database. They also estimated the amount of hospital payments that could have been lost when co-morbidities are under-reported. Their findings showed that co-morbidities influenced severity of illness (SOI) determination but had little impact on base APR-DRG assignment. They noted that the degree of influence on SOI of each co-morbidity was specific to the base APR-DRG. The authors also found that for those co-morbidities studied, under-coding led to losses in hospital payments. Their results were consistent with overall APR-DRG grouping logics. The results demonstrate the importance of documenting, reporting, and coding co-morbidities given their effect on SOI assignment and, therefore, on reimbursement and hospital funding.

Hannigan A, Villarroel N, Roura M, LeMaster J, Basogomba A, Bradley C, MacFarlane A

Ethnicity recording in health and social care data collections in Ireland: where and how is it measured and what is it used for?

Int J Equity Health 2019;19(1):2

This study focused on the extent of recording of ethnicity data in Ireland, a variable often used in studies on health equity and disparities. This study was part of a larger project which aimed to build the evidence base on ethnic minority health in Ireland. The aim of the study was to identify all

existing national health and social care data collections that contained information on ethnicity and to explore how ethnicity data had been collected and used. The Health Information and Quality Authority (HIQA) is an independent authority in the Republic of Ireland that produces a catalogue of all national collections of routine health and social care data. It should be noted that there is a national policy that ethnicity data be collected in healthcare settings. This research is highly relevant to the HIM domain and functions (i.e., documentation, clinical and socio-demographic data collection, and data quality). More broadly, the study identified data shortcomings and related implications for public policy and public health, which is especially important in designing policies aimed at improving health, achieving health equity, and increasing awareness of racial and ethnic disparities in health care.

The authors reviewed the 2018 HIQA catalogue that includes information on 97 national health and social care data collections (75 national data collections, 10 national surveys, nine data collections with regional coverage, three censuses) and 23 collated sources of health and social care information including national performance and activity reports. The study provides a descriptive analysis of extracted data across all data collections with information on ethnicity. Of the 97 national health and social care data collections in the catalogue, only 14 (14%) collected information on ethnic

or cultural background. Only one of the three national censuses in the catalogue recorded ethnic or cultural background. Eight of the 75 national health and social care data collections recorded ethnic or cultural background and five of the ten national surveys in the catalogue recorded ethnic or cultural background.

The authors did not find any evidence of previous audits examining the integrity of the data collected on ethnicity across data collections. They also found that data collections which recorded ethnicity tended to be focused on potentially high-risk populations and there was no routine recording of ethnicity in primary care settings, where most of the healthcare in Ireland is delivered. They did not find much data on ethnicity for hospital inpatients either, other than psychiatric inpatients and there was no routine recording of ethnicity in cancer registry or cancer screening data. The authors identified that despite strong policy and legal imperatives, there was limited data collection about ethnicity. They recommended improvements that are needed to better address and promote health equity in Ireland, including access to care and adoption of evidenced-based care practices. The COVID-19 pandemic has increased global attention to factors such as race and ethnicity on diagnosis, treatment, and outcomes. This study illustrates that despite clear guidelines to record this type of data, there are still many gaps in documentation.