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ORIGINAL RESEARCH

An Information Quality Framework for Managed Health Care

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Introduction: Data and information quality play a critical role in the managed healthcare sector, where accurate and reliable information is crucial for optimal decision-making, operations, and patient outcomes. However, managed care organizations face significant challenges in ensuring information quality due to the complexity of data sources, regulatory requirements, and the need for effective data management practices. The goal of this article is to develop and justify an information quality framework for managed healthcare, thereby enabling the sector to better meet its unique information quality challenges.

Methods: The information quality framework provided here was designed using other information quality frameworks as exemplars, as well as a qualitative survey involving interviews of twenty industry leaders structured around 17 questions. The responses were analyzed and tabulated to obtain insights into the information quality needs of the managed healthcare domain.

Results: The novel framework we present herein encompasses strategies for data integration, standardization and validation, and is followed by a justification section that draws upon existing literature and information quality frameworks in addition to the survey of leaders in the industry.

Discussion: Emphasizing objectivity, utility, integrity, and standardization as foundational pillars, the proposed framework provides practical guidelines to empower healthcare organizations in effectively managing information quality within the managed care model.

Keywords: data quality, information quality, information quality framework, managed healthcare, managed health care, data management, data governance

Introduction

Data and information hold an increasingly integral role in health care (Okolo et al, 2024).[1] Doctors and healthcare professionals rely on data to make decisions on patient care, thus making information quality imperative (Syed et al, 2023).[2] Managed care is a type of health insurance that contracts with healthcare providers and medical facilities to offer care to members at reduced costs. Managed care institutions have long relied on information to coordinate benefits and care (Adeniyi et al, 2024).[3]

The primary goal of managed care is to control healthcare costs while maintaining and improving the quality of care. This is achieved through various methods, including forming provider networks, utilizing management techniques, emphasizing preventive care, coordinating care, and implementing financial incentives. This model is currently widespread within the US healthcare system. Thus, for example, preventive treatment is emphasized, and quality data is needed to inform decisions about this treatment. As a result, information quality is a major factor in how healthcare institutions in general, and managed care organizations in particular, efficiently influence patient outcomes (Janakiraman et al, 2023).[4]

The objective of this article is to support the pivotal role of high quality data and information on outcomes within the managed care model, by introducing a comprehensive, justified and original information quality framework for use in the sector. The framework is designed based on existing frameworks for other domains, as well as on a survey of managed healthcare organization executives. This framework will encompass strategies for data integration, standardization and validation, proposing practical steps and guidelines. This framework is specifically for managed health care, filling the void that no other information quality framework specifically designed for this domain has previously been available.

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Based on a survey of industry leaders, such a framework is expected to help facilitate informed decision-making, efficient benefits coordination, and ultimately better patient outcomes within the managed care model.

Following this section, the Further Related Work section and the Methods section, is the Survey Results section. Then we present the framework in the section Information Quality Framework for Managed Health Care. The next section, Justification: Information Quality Framework for Managed Health Care, justifies the framework item by item. Following that are the sections Discussion, Future Work, and finally Conclusion.

Need for Managed Healthcare Information Quality

The current information landscape in managed care institutions presents a complex and challenging scenario. Thus, it is unsurprising that many industry leaders consider data handling a top priority and see a need for standardization in data reporting and maintenance. Despite this recognition, data assessment processes are few and far between in the industry. Moreover, a lopsided majority of organizations have no department or individual designated to focus on information quality and data governance matters (Crossette-Thambiah 2023).[5]

The sector's information quality needs require information to be reliable (Day et al 2018),[6] as well as accessible and secure (Davies and Perini 2016),[7] and exist in the context of an influx of data from diverse sources, including electronic health records, insurance claims, and patient-generated information, creating a heterogeneous data environment. This diversity introduces inconsistencies, inaccuracies, and interoperability issues, making it arduous for managed care institutions to ensure the reliability and accuracy of the data they rely on for decision-making (Khanna et al, 2023).[8] Additionally, the evolving regulatory landscape and data privacy concerns further compound the intricacies of managing information quality. As healthcare professionals strive to provide optimal patient care and coordinate benefits effectively, addressing the current challenges in managed care information quality emerges as a critical imperative for enhancing overall healthcare outcomes and system efficiency.

A managed healthcare sector information quality framework is therefore essential for various reasons, among which are the following.

1. Patient Safety and Quality of Care: Ensuring the accuracy and reliability of healthcare information is critical for patient safety and the quality of care they receive. Inaccurate information can lead to medical errors, misdiagnoses, and suboptimal treatment outcomes.

2. Efficient Operations: Healthcare organizations, including hospitals, clinics, and insurance providers, rely heavily on data for their day-to-day operations. A robust information quality framework ensures that data is consistent and trustworthy, leading to more efficient processes and better resource allocation.

3. Regulatory Compliance: The healthcare sector is subject to various regulations and standards, such as HIPAA in the United States. Maintaining high-quality information is crucial to comply with these regulations, avoid penalties, and protect patient privacy.

4. Data Analytics and Decision Making: High quality healthcare data is foundational for data analytics, which can drive evidence-based decision making (Basile et al, 2023).[9] This includes predicting disease outbreaks, identifying trends in patient outcomes, and optimizing resource utilization.

5. Research and Innovation: Medical research and innovation depend on the availability of reliable data. Researchers need access to accurate healthcare information to study diseases, develop new treatments, and improve healthcare practices.

6. Interoperability: Information quality is vital for healthcare systems to communicate and share data effectively. Interoperability allows for seamless exchange of information between different healthcare entities, improving patient care coordination.

7. Consumer Trust: Patients and healthcare consumers must trust that their personal health information is handled with care and kept secure. A robust information quality framework can help build and maintain this trust.

All these reasons and more have motivated increasing interest in information quality frameworks in the healthcare domain. An important early such framework was instituted by the Canadian Institute for Health Information (CIHI) to facilitate quality across its data repositories, though without specifically addressing the organization as a whole (Long et al, 2001).[10] Website quality control has been addressed by information quality frameworks specifically for websites

(Elliot and Berleant 2021, Parker et al 2006).[11,12] Tao et al describe a framework for health websites.[13] Belen-Sağlam and Taskaya-Temizel provide a framework specifically for diabetes websites.[14] See Ighe et al[15] for discussion and further review. Focusing on broader applications, Fadahunsi et al surveyed frameworks aimed at digital health technologies.[16] In a later study, Fadahunsi et al developed a framework for clinical information.[17] Bai et al report research in progress and propose an abbreviated framework,[18] derived from guidelines applicable across many domains (Kale 2016),[19] for a hospital, but not for a managed care organization. These frameworks illustrate the need for an information quality framework for managed healthcare organizations. This need is addressed by the present article.

Further Related Work

In the modern world's increasingly information based economy, the need of the many organizations in which information is key for information quality is well established. Government and quasi-government organizations have recognized this for decades (National Research Council 2003).[20] In government as in health care, new information technologies and practices require organizations to adopt and adapt (Creswell and Sheikh 2013).[21] Healthcare leaders are concerned about quality, and information quality is a part of this overall effort (Garman and Scribner 2011).[22] Information quality frameworks can assist in this process, while data governance provides the environment that enables a framework to be effective. Governance and frameworks are discussed in following subsections.

Data Governance

Data governance may be the single most important structure for promoting and protecting inforrmation quality. Data governance in health care is important because it enables leaders to have the right information in the right format enabling proper clinical and business decisions to be made. Leaders of data governance initiatives are typically required to do the following:

> Develop policies and procedures to support data governance efforts. Educate all employees in the organization about the importance of data governance and its relations to their roles. Leverage clinical, financial and administrative data to support organizational initiatives. Measure the return on investment on information governance initiatives. (University of Wisconsin 2017)[23]

See also AHRQ (2024).[24]

Organizations are increasingly in need of data governance, which provides leadership, control, and accountability (Hovenga 2013) with respect to information assets.[25] These assets rival corporate financial assets in importance, and are far more than merely technology assets (Fisher 2008).[26] In this context, data governance can increase the value of data and minimize the costs and risks. Orfanidis et al called for a framework to address information quality issues in the Greek healthcare system.[27] It concluded that handling information quality issues is an integral part of the development of an EHR (electronic health record) system and should be addressed from the inception of the project. England's Department of Health later created the NHS Care Records Service to implement data governance structures, policies, and practices (Hovenga 2013).[25]

Abraham, Schneider, and Brocke address what the building blocks of data governance are and where organizations lack knowledge about data governance.[28] The topics they flag for future research include: governance mechanisms, the scope of data governance, consequences of data governance, and antecedents of data governance. Antecedents cover the contingency factors that impact the adoption and implementation of data governance. They note the consequences arising from good (or problematic) data governance.

A data governance program helps healthcare organizations to pinpoint the root causes of information quality issues and identify the best remedy that tackles all the problem dimensions (Eppler 2006).[29] Poor information quality has a tremendous impact on the efficiency and effectiveness of healthcare organizations, at both operational and strategic levels (Khatri and Brown 2010).[30] Many information quality problems are attributable to the lack of effective data governance (Koltay 2016).[31]

A case study conducted in a leading tertiary healthcare organization in the Middle East with more than 2200 beds and 12,000 employees found that applying data governance in health care provides a solid start for data-driven projects such as information quality improvement, data warehousing, healthcare analytics, and business intelligence (Alofaysan et al 2014).[32]

In reviewing this literature, it is apparent that data governance structure has an essential place in organizational development, that more research is needed on how to implement a data governance plan, and that data governance is an important component of a comprehensive information quality framework in the healthcare field.

Information Quality Framework Construction

Work on information quality framework development methods and templates forms relevant background to any effort to develop a new framework. Some of these specifically target frameworks in the healthcare sector. Madnick et al introduce a two-dimensional matrix showing the Cartesian product of 19 information quality research topics organized into 4 categories, and 14 information quality research methods, suggesting 14×19 or 266 potential topic and method possibilities.[33] This represents an algorithmic approach to the problem.

Another systematic approach which is less algorithmic, yet less scattershot, is described by Cichy and Rass.[34] The paper surveys information quality frameworks in a comparative way regarding the definition, assessment, and improvement of information quality with a focus on methodologies that are applicable in a wide range of business environments. A decision guide was also created to guide the types of information quality frameworks. The authors argue that requirements for information quality vary from organization to organization based on need. Twelve general-purpose applicable information quality frameworks that contain information quality definitions as well as assessment and improvement processes were systematically surveyed and compared. Most of the frameworks also recognize the relevance of dimensions to be valued by each organization. Timeliness and accuracy appeared to be the most important quality attributes. Most frameworks focused on structured and semi-structured data while fewer mentioned unstructured data. By addressing framework development in general they include the healthcare domain but without insights into the distinct needs of this domain.

In another domain independent approach to framework development, Eppler and Wittig analyzed seven conceptual frameworks on information quality with six criteria in two dimensions to identify common elements, differences and missing components of these frameworks.[35] The paper concluded that information quality frameworks are often domain specific and are either strong in analytic dimensions or pragmatic dimensions, while rarely including both. The authors outline five directions for Information quality frameworks: first, the quest for more generic models. Second, the development of information quality frameworks that show interdependencies between different quality criteria. Third, the inclusion of problem areas and indicators into these frameworks (thus frameworks that go beyond simple lists of quality criteria). Fourth, the development of tools which are based on an information quality framework. And lastly, the development of frameworks that are at the same time theoretical and practical. These practical approaches to creating information quality frameworks are important to corporate and other organizations which rely on pragmatism to operate efficaciously. This article emphasizes the distinction between pragmatic and theoretical philosophies in framework development.

Focusing on the pragmatic approach to framework development, Otto et al suggest a three-layer approach to a data framework consisting of business engineering (strategy, organization, and information systems) as well as two perspectives on data management (governance and execution).[36] The framework aids in understanding which tasks need to be performed for improving organizations' information quality and its reliability. It looks to link data management to business objectives of an organization and to anchor it efficiently within the existing organizational structure. The framework also serves as a basis for information quality maturity assessments. The article concludes that an easy-to-use tool guiding information quality requires further detailing the outlined practices and enriching them with a set of methods and procedure models for the different design objectives within the framework.

Medical registries comprise one part of the healthcare information quality challenge that has attracted attention for some time. The continued growth of medical registries highlights the critical importance of information quality in health care. The value of these registries is directly impacted by the quality of the information they contain, underlining the need for procedures to enhance and maintain data integrity. This was recognized in the review by Arts et al as early as 2002,[37] resulting in recommendations for effective information quality models. The diversity of quality assurance procedures contributes collectively to the overall integrity of the data. Despite the benefit of such efforts, the Arts et al study concluded that a completely error-free system is unrealistic, underscoring the need for ongoing vigilance. This approach

to quality assurance in medical registries can be applied more broadly to medical practices, reinforcing the importance of continuous improvement in healthcare data management.

Methods

The information quality framework provided here was designed using a mixed methods approach focusing on two sources of input. One input was other information quality frameworks from other domains. These served as both exemplars and templates. However, ensuring that the framework was adapted to suit the unique characteristics of the managed healthcare field required focusing on information quality related needs specific to managed health care. The second input met this requirement with a qualitative survey aimed at understanding how managed care organization leaders view information quality and what it means to their work and their organization. The purpose was to seek understanding on how to develop a framework for managed care organizations. Twenty leaders were interviewed 2022 using 17 survey questions designed to elicit narrative responses, in order to better understand the experience and observations of each interviewee within a single interview. The responses were content analyzed to construct a summarizing table for each question, providing quantitative insights into the information quality needs of the healthcare domain.

A total of 18 organizations were represented. Three of these were government entities charged with administering Medi-Cal managed care services in California. Fifteen were in the private sector based in California, ten of which had nationwide operations that spanned from California to New York. All ten of these were large organizations with employee head counts of over 25,000 people. This ensured that the perspectives we obtained were not only regional but also derived from experience nationwide.

Qualifying organizations operated under the managed care model. Leaders were at least director level or above. In addition, four or more of the following selection criteria were required: education level of a masters or higher, 10+ years of experience in the healthcare industry, professional membership(s), written article(s) available on the individual, interview(s) in media outlets, authoring professional or public facing publication(s), participation in healthcare or data and information quality conference(s), and award(s). Within those constraints, interviewees were obtained using the opportunistic recruitment method. Informed consent was obtained in accordance with the IRB-approved protocol, and no extrinsic reward was offered for participation. The resulting set of interviewees is shown in Table 1 below. Data was collected verbally through interviews conducted by video conference.

Additional details on the context, process and parameters of the survey are described by Crossette-Thambiah (2023).[5]

Survey Results

The results of the interviews are summarized one question at a time below.

Table 1 Interviewee Selection Criteria

Selection Criterion	Number of Participants
Education level of masters or higher	20
10+ years of experience in the industry	20
Professional membership(s)	20
Written article(s) about the individual	15
Interview(s) in media outlets	19
Professional publication(s)	5
Relevant conference participation	18
Award(s)	15
Author of public-facing article(s)	18

Question 1: What is your role/title?

Ninety percent of participants were executives at the C level who were tasked with organizational objectives and 90% of the participants were in operational roles that were tasked with overseeing day-to-day operational matters. The remaining 10% were in directorship positions. A breakdown of roles can be seen in Table 2.

Question 2: How long have you been with the organization?

The majority of interviewees had an average tenure with the company of five or more years. The remainder had tenures of less than five years. The breakdown can be seen in Table 3.

Question 3: What are the most important ways in which data is an asset and tool for your department's processes?

Data plays a crucial role in operations. As stated in one interview,

> Our depth and breadth in this company is based on data, and automation tools support the need to retrieve the data, organize it, and be able to transcribe it prior to giving it back to the client in a structured/usable format.

During the interviews many interviewees acknowledged that data management was very important but lacked controls and policies. Key themes from these interviews are as follows:

1. Data management - 60%
2. Decision Making - 20%
3. Influence - 15%
4. Budgets - 5%

Question 4: Do you currently have a data policy that guides the handling of information coming in from various data sources?

During interviews many leaders were not aware that data policy has a contributory impact on quality and governance. Many leaders acknowledged a shortfall in not having a person or department in charge of implementing data policy practices. Over 85% said that they were not aware of a data policy. Yet much effort in their organizations was geared

Table 2 Interviewee Organizational Roles

Role	Number
Chief Executive Officer	16
Chief Operations Officer	2
Sr. Director of Information Technology	1
Sr. Director of Data Intelligence	1

Table 3 Interviewee Time in Organization

Time Frame	Tenure
5–10 years	14
10+ Years	2
3–5 years	2
Less than 3 years	2

towards cybersecurity. Data policy was not an important aspect of their daily operations. Of those who had a policy it was minimal and needed in-depth review. Most organizations lacked a department or person to carry out these activities and update the policy in a timely manner.

Question 5: In what ways is data quality important to your department? Can you rank it from 1–10?

Quality was perhaps the most important aspect of data management. In interviews, all leaders emphasized its importance. They understood that quality was the foundation of data management. 90% of participants rated this with a rank of 10, 5% ranked it 9 and the other 5% ranked it 8. The leaders who ranked it at 8 or 9 had more interest in building their cybersecurity programs.

Question 6: Can you provide some insight into the most important aspect of the data landscape in your department - velocity, volume, value, variety or veracity?

This was a difficult question as many leaders were not familiar with the difference between velocity, volume, value and veracity. This question was somewhat technical in nature and decisions needed to be made at a managerial level related to this question. The interview involved explaining to these leaders what it meant. Results are listed in Table 4.

Question 7: How would you describe the cross departmental coordination of data policy in your organization?

A majority of leaders reported a gap in communication and coordination among data management which impacted data policy activities. Over 90% reported having very poor or no proper coordination among departments. Almost 95% mentioned the need to work on cross-departmental coordination. Many acknowledged failures in leadership related to coordinating data management practices at a higher level. Among the feedback was that leaders with top-level responsibility for infusing these tenets into their leadership activities are too busy to prioritize data. As a result, it trickles down to lower-level staff who do not implement communication mechanisms to discuss data policies. Leaders also acknowledged a lack of personnel or a department responsible for carrying out such activities.

Question 8: How do you ensure the efficacy of implementing and coordinating data policy in the organization? Answers will be rated from 1–5, 1 being the lowest, 5 being the highest.

Given the acknowledgment that data coordination activities were minimal, leaders rated this question with the understanding that coordination of policy was a work in progress. Results are shown in Table 5.

Question 9: In your opinion, do your peers value data quality as much as you do?

In interviews, leaders acknowledged that they knew their peers valued and wanted data quality. Over 90% mentioned that their fellow peers value data quality as much as they do. Data quality had a direct linkage to budget and operational

Table 4 Top Ranked Data Dimension

Aspect Rated Most Important	Percentage of Respondents
Velocity	10%
Volume	10%
Value	60%
Variety	10%
Veracity	10%

Table 5 Efficacy of Implementing and Coordinating Data Policy

Respondents' Ratings	Number of Respondents
5	0
4	1
3	2
2	10
1	7

efficiency and was thus valued very highly. However, cross-functional collaboration was low which led to siloing. Leaders acknowledged needing a coordinating body to eliminate silos.

Question 10: What do you suggest to ensure or improve data quality in your organization?

A majority of the leaders mentioned that they did not have a person or department dedicated to implementing data management practices. 75% mentioned the need to have a designated person or committee to oversee data quality initiatives. "Everyone is so busy, this just goes by the wayside" said one interviewee. It was obvious that while organizations highly valued data quality they needed help with administration. The feedback included a majority of leaders mentioning the need for training, cross-functional collaboration and better data collection tools.

Question 11: Is handling of data a top or secondary priority for you? Answers will be rated from 1–5, 1 being the lowest, 5 being the highest.

Out of the 20 interviewees only one mentioned that this was a secondary priority. Nineteen out of 20 rated this to be 5 and one person rated this to be a 4. When asked why they said 4, they noted that cybersecurity was more important to them.

Question 12: What might you propose for a standard for data quality in managed care?

Standardization was a key theme in the feedback to this question. The nature of health care and the different sources of data make it hard to enforce quality standards. In 90% of the responses, leaders mentioned the need for a standard for how data is reported and maintained. When asked for an example, one leader said that they get the same data written in different ways making things difficult to transcribe into the system.

Question 13: Does the department or company have a data quality assessment process?

All leaders remarked that there was no data quality assessment process in their organizations.

Question 14: Is there a designated department or person who is tasked with overseeing data quality/governance in your organization?

All leaders mentioned the need for a department or person to oversee data quality and governance measures in the organization. The need is unmet.

Question 15: Does the company allocate a budget for data quality initiatives?

All acknowledged that there were no budgets allocated.

Question 16: What training or information resources does your organization provide to educate on data quality and data governance?

All leaders acknowledged that there were no training or resources for data quality and governance.

Question 17: Are there any interdepartmental initiatives or committees on data quality?

All leaders mentioned that they did not have an interdepartmental initiative or committees on data quality. Further details about the survey results may be found in Crossette-Thambiah (2023).[5]

The Framework

The framework for information quality in managed care organizations, provided in this section, is justified point by point in the following section. The numbers for the elements of the framework match across the two sections, to clarify the association between each element and its justification.

Information Quality Framework for Managed Health Care

1 Background

In managed care, healthcare providers and facilities deliver services under the supervision of an organization that functions as a health insurer, with the goal of controlling costs. These providers form the plan's network. The primary objective of managed care is to reduce expenses while maintaining high-quality care. It focuses on managing costs, utilization, and quality to ensure effective and efficient healthcare delivery. There are four types of managed care plans:

I. **Health Maintenance Organization (HMO)**: Under this type of plan members are required to see only network providers, usually at a lower premium. These plans also require the member to see the primary care physician before going to a specialist. Members are in most cases not covered for care obtained outside the network. Preventive care is covered when deemed to reduce costs by avoiding more expensive problems later. HMOs reduce cost but also reduce flexibility.

II. **Preferred Provider Organization (PPO)**: These plans offer more flexibility compared to the previous category, however costs tend to be higher. Members can see physicians both in and out of network. Members may be permitted to see specialists without a referral from a primary care physician.

III. **Point of Service (POS)**: Plans of this type are hybrids of HMO and PPO plans. Members may see providers in or out of network, but the share of costs are higher for out-of-network providers. Members may have to see a primary care physician to manage care and provide referrals.

IV. **Exclusive Provider Organization (EPO)**: These plans hybridize HMO and PPO plans but differently. Members are generally required to see an in-network provider. Specialists may be consulted without a primary care physician referral. Costs tend to be higher than with a POS plan.

2 Purpose

The purpose of the guidelines in this framework is to specify the rules and procedures that managed care organizations need to adhere to in order to ensure both the quality of information they use and compliance with regulations. The guidelines provide policy and procedural guidance to managed care organizations. The goal of these guidelines is to enable organizations to ensure the quality of information to better promote the success of managed care plans. Additionally, the framework promotes transparency and uniformity in the process.

3 Dissemination Mechanisms

Information in a managed care organization can be disseminated through a variety of methods such as print and electronic media, including internet, printed matter, storage media, telephone, multimedia and IT systems.

I. Internet – websites that display information typically intended for use by beneficiaries, their families, caregivers and advocates.

II. Printed matter – letters, pamphlets, handbooks, directories, etc., related to programs.

III. Storage media – data stored on detachable memory devices.

IV. Telephone – verbal or text communication by landline and cell phone.

V. Multimedia – information containing both text and images or other human-understandable modes.

VI. IT Systems – internal systems that store and display any of the categories of information disseminated.

3.1 Categories of Information Disseminated

The information to be disseminated depends on the types of data that need to be utilized. Although various details depend on the type of managed care model, there are many commonalities across models. Here follows a range of categories of data.

I. Patient data – medical information about an individual relating to current or past illness, treatment history, genetic data, etc.

II. Statistical and analytical studies – the results of modeling studies, analytical reviews and survey data.

III. Administrative, regulatory and compliance – programmatic, administrative and regulatory information.

IV. Public health claims and risk studies – information on public health surveillance.

4 Information Quality Goals

The development of data and information policies in managed care organizations is crucial and should be governed by the following goals.

I. Provide members and providers with accurate and timely information.

II. Commit to making data and information securely available for the intended audience.

III. Maintain consistency with data and information sources to retain integrity.

IV. Ensure that transparency and appropriate governance are adhered to in maintaining data and information resources.

4.1 Overview of Quality Assurance Policies and Practices

Managed care organizations should commit to providing high quality information. The intended audience must be able to accurately review the information presented for its intended use. It is important that the information presented is clear, accessible, and relevant without compromising privacy and security. Information quality includes the four major elements of objectivity, utility, integrity and standardization, detailed next. Quality must be ensured and established at levels appropriate to the type of information.

4.1.1 Objectivity. As with other business organizations, it is imperative that managed care institutions maintain accurate and reliable data that is presented in a coherent manner which is easy to disseminate. Objectivity is achieved by using reliable and trusted data sources. Additionally, managed care institutions should also document data sources and enforce information quality standards in contractual agreements to attain the goal of objectivity. Accuracy, completeness, consistency and timeliness are four major components of objectivity.

I. Accuracy is important to ensure error-free information that can be used as a reliable source of information, thus creating trust.

II. Completeness provides data without gaps or missing records.

III. Consistency means information should follow established formats and be cross referenceable.

IV. Timeliness means data is updated as needed to retain validity and relevance.

4.1.2 Utility. The consumption of data by its intended users is critical in managed care institutions. Patient data is just one example. It is important for healthcare providers to stay informed of patient needs, and incorporating new data is vital to achieving utility. Furthermore, revising existing processes and evaluating new requirements as data needs change helps enforce utility in managed care. Provenance, interpretability, usability and relevance are four major components of utility.

I. Provenance - adds value by identifying the origins of the data.

II. Interpretability - how understandable information is relative to its intended audience.

III. Usability – how well the information meets the need for dependability while being readily employed by those who need it.

IV. Relevance – this is the requirement that information presented should contribute to the user's interests.

4.1.3 Integrity. Managed care institutions protect sensitive data to maintain trustworthiness and avoid unauthorized access. To maintain integrity, managed care institutions should work in collaboration with security personnel to protect their data. In liaison with their security departments, managed care institutions should implement programs to educate personnel on safety standards and implement policies on how to securely handle data. The purpose of maintaining integrity is to ensure that data is handled in a proper manner which guarantees no deliberate or accidental disclosure of sensitive data, protects against pernicious actions that can corrupt data and guards against unauthorized access. Managers and the human resources department are responsible for training staff and enforcing policies. Privacy, confidentiality and secure access are the three pillars of integrity. Protecting patient data from unauthorized users, unintentional and unlawful access is necessary. Providing secure access and implementing security measures will prevent unauthorized and unlawful access.

4.1.4 Standardization. In the managed care business model, ensuring standardization of patient data is vital to administering and providing care. Standardization of data elements should be mandated through contractual obligations and managed internally to enable the assessment of any shortcomings. The Chief Data Officer should ensure that standardization procedures are maintained internally with coordination amongst respective departments.

5 Budget

To maintain high information quality standards, it is essential to invest in promoting and enforcing these standards. Adequate budgets should be allocated for relevant personnel and their training. Hiring the right personnel is crucial for administering and coordinating data policies and quality. Managed care institutions can greatly benefit from appointing a Chief Data Officer to lead information quality initiatives and oversee data administration.

Budgets are also crucial for purchasing software and training materials. Without proper training materials and software, many personnel remain untrained and lack the necessary tools to uphold information quality standards. Allocating budgets for quality initiatives will help enforce quality goals. Training enables personnel to understand the importance of information quality and ensures the enforcement of enterprise quality initiatives.

6 Regulatory Compliance

Due to the inherently close relationship between public health and government, managed care organizations must contribute to the administration and development of regulatory decision-making while also enforcing compliance within the organization. Information mechanisms used in regulatory development or compliance should undergo a quality review process and include expert advice. Additionally, compliance personnel should review all proposed regulations from an implementation perspective.

In accordance with the Health Insurance Portability and Accountability Act (HIPAA), all affected information and data must strictly follow the necessary protocols. Patient data, in particular, should be rigorously protected according to HIPAA guidelines. These protocols should include appropriate consultation with relevant regulatory departments regarding data protection and transmission.

7 Reporting Requirements

All formal reporting should undergo a quality review process prior to submission, managed by the respective department. Periodically, the Chief Data Officer, in coordination with the Chief Information Officer, should conduct internal reviews to identify necessary updates for maintaining the quality and traceability of review processes. Additionally, managed care institutions should perform yearly audits to validate data integrity, ensuring that data security and retention comply with legal requirements. To assist in developing reporting metrics, managed care institutions should post their information quality standards online.

8 Software Tools

Security must be set up to prevent data breaches, and software installation and monitoring must comply with established security requirements. All software applications must pass security requirements and be certified as HIPAA compatible.

Additionally, IT tools should be monitored to measure objectivity and integrity. Yearly audits should be conducted to ensure that software configuration and operation comply with security and regulatory needs.

9 Data Governance Committee

The organization should implement a data governance structure in an information quality framework, because managed care institutions stand to gain significant value from instituting such a plan. To achieve this, data governance committees are essential, as they play an integral role in coordinating and implementing data across the enterprise. This framework will enable internal teams to collaborate more effectively and eliminate silos that can lead to data management problems. Consequently, the governance committees should establish the following measures to ensure successful implementation.

I. Data stewardship that ensures proper data management.
II. Ownership of data for the purposes of quality enforcement.
III. Measurement criteria for information quality.
IV. Purpose and scope of data being handled.
V. Standardization for claims and patient data.
VI. Monitoring of data handling processes.
VII. Performance criteria.
VIII. A quality subcommittee to review quality issues.
IX. A data security subcommittee.
X. A data governance document framework and policy manual.

10. Identifying Information Quality Issues

Diagnosing information quality issues is imperative for maintaining the quality of administration and patient care. Any information quality issues discovered during audits should be reviewed by an information quality subcommittee to address and rectify the problems. Additionally, identifying root causes and developing solutions for any problems should be integral components of the success criteria for resolving these issues.

11 Data Security

The purpose of data security is to ensure confidentiality, integrity and availability of data across the enterprise. Data security standards should be established by a security subcommittee established by the governance committee. The security standards should identify policy, standards, control and procedures. These guidelines should be used in the yearly auditing process. The security subcommittee is needed to oversee this need.

12 Human Resources

The human resources (HR) department is critical to ensuring guidelines for information quality assurance. Data should be valued as an enterprise asset and the HR department should promote this tenet. The role of HR should be to conduct the following.

I. Ensure that qualified personnel have the appropriate level of information quality education, training and knowledge.
II. Facilitate hiring qualified personnel who can perform information quality activities.
III. Implement enterprise training on information quality.
IV. Enforce information policy that furthers training of personnel, including providing training to keep them up to industry standards.
V. Facilitate development of personnel knowledge and skills that promote efficient and effective data management.
VI. Provide activities to engage the entire enterprise in information quality management, security and other aspects of data governance.
VII. Promote knowledge management best practices in information quality and data governance.

Justification for the Framework

The elements of this section each justify the associated, same-numbered subsections of the framework itself.

Justification: Information Quality Framework for Managed Health Care

1 Justification: Background

This element of the framework introduces managed care and sets the stage for understanding relevant aspects of managed care organizations. Providing this background helps motivate the framework for information quality in the managed care industry (Kerr et al, 2008).[38] This parallels other information quality frameworks such as the one for the US Department of Treasury that also have background sections.[39]

2 Justification: Purpose

The EIA guidelines provides an account of the purpose and intent of information quality guidelines.[40] Likewise, it is included here to help support and clarify the objectives of this framework.

3 Justification: Dissemination Mechanisms

It is critical for any organization to identify its information and its intended purpose. Dissemination is the targeted distribution of information. This section of the framework identifies types of information and how they are distributed. Identifying the information being disseminated helps enable the organization to address the types individually when appropriate, facilitating the monitoring and improvement of the quality of the information. Information being disseminated in managed care organizations can be distributed by internet, printed material, storage media, multi-media, telephone and systems (cf. OMB 2002 section IV.2).[41] The justification for this section is to allow for clarity on information sources so that users can better understand the various forms of data transmittal (OMB 2002 section III.2).[41]

I. Internet – managed care institutions have websites where information about the organization, policies, procedures and contact information is provided. These information streams are important for patients and caregivers. In interviews, a number of respondents indicated a need to have more provider information online.

II. Printed material – provider billing, patient prescriptions, diagnosis charts and legal documents are often printed and scanned for records.

III. Storage media – depending on the environment, patient data and records as well as operational data may be stored on devices for later use.

IV. Telephone – doctors' offices frequently discuss patient information via telephone communication.

V. Multimedia – depending on the environment, patient data or managed care processes may be stored in multiple forms.

VI. IT Systems – claims, patient data, care data and operational data are stored in systems that provide information for many operational purposes.

3.1 Justification: Categories of Information Disseminated

The categories of information disseminated helps identify the type of information being disseminated. In managed care institutions, the primary data is about patients. This patient data typically consists of diagnosis, treatment plan and other information pertaining to the patient. Typically, in managed care institutions the business analysis, data analytics or member services unit maintains statistical and analytical studies on patients, diseases, care programs, etc. This supports how these institutions create treatment plans and coordinate preventive care. The administrative departments keep programmatic and administrative data needed for these institutions to process their daily operations. ASPE helps justify this section.[42]

4 Justification: Information Quality Goals

Setting information quality goals is vital to measuring the value that the information provides to users. Goal setting is also crucial to understanding information quality dimensions. These goals enable management to allocate resources to implement them. The majority of information quality guidelines mention goals. A good example is from the US Office of Assistant Secretary for Planning and Evaluation (ASPE 2023) which has a section in its information quality guidelines dedicated to goals.[42]

Managed care organizations primarily serve members and providers. These groups rely heavily on quality data for them to provide care, understand health metrics, and make informed decisions. To that end, providing timely and accurate information is essential. Furthermore, a commitment to ensuring that this data is delivered securely and made available should be a goal established to maintain the privacy and protection of sensitive information. Consistency facilitates managing and maintaining and updating information, all necessary for effective dissemination. Governance should be established to ensure that all goals are properly addressed. In its commitment to providing high quality information, a governance initiative is important to maintain structure and transparency. These four major quality goals were derived after interviews where respondents rated their importance. It is typical for information quality guidelines to list such goals. Examples include the Energy Information Administration (EIA 2024)[40] and the US Dept. of Health and Human Services (ASPE 2023).[42]

4.1 Justification: Overview of Quality Assurance Policies and Practices

The unique challenges faced by managed care organizations necessitate a tailored framework that addresses the specific dimensions of objectivity, utility, integrity, and standardization. These dimensions are common in information quality frameworks (EIA 2024; OMB 2022; ASPE 2023)[40–42] and can contribute as well to the enhancement of information quality in the healthcare domain.

4.1.1 Justification: Objectivity. Objectivity requires maintaining accurate and reliable data, and in patient care that can have life and death implications. Objectivity is intricately tied to dimensions of accuracy, completeness, consistency, and timeliness, which are directly tied to providing reliable and coherent data. Thus these components allow for trust to be built in the information being presented.

4.1.2 Justification: Utility. Users of information have a purpose. Utility, the second major goal, emphasizes the purpose-driven consumption of data. For the consumption of data to be purpose driven the origins of the data should be documented. Most interviewees in the survey mentioned the need to identify source data for reporting. Thus identifying the source and keeping data lineage documentation is vital for understanding its provenance and enabling it to serve its intended purpose.

Utility as a goal is found in other frameworks as well, such as in the Consumer Financial Protection Bureau's information quality guidelines (CFPB 2024).[43]

4.1.3 Justification: Integrity. An important focus is protecting patient data in the healthcare domain. Protecting patient data, much of it governed by applicable law, is critical in health care. Therefore it is important that managed care institutions implement effective safeguards to protect information.

In today's world many organizations pay a hefty price when there are data breaches. Data breaches cost organizations millions each year. Given the high costs associated with data breaches, ensuring secure access, including checking for correct privileges and appropriate implemented safeguards such as firewalls, is imperative.

During interviews, respondents stated the importance of secure access and correct privileges for information to be disseminated. User groups should be understood in terms of utility, and the correct access privileges should be given for the information they need to be disseminated in the proper manner. Internal systems should also have safeguards such as firewalls to prevent any nefarious actors from accessing sensitive data.

The emphasis on integrity parallels its focus in other frameworks as well, such as the Consumer Financial Protection Bureau's information quality guidelines (CFPB 2024).[43]

4.1.4 Justification: Standardization. In the managed healthcare industry there are multiple ways information can be disseminated. Standardization becomes vital to overcoming challenges to information dissemination such as the varied use of terminology, thereby supporting the setting of information quality goals. Thus, standardization is vital to setting information quality goals.

In the interviews the need for standardization in managed care organizations was noted. In an example, a respondent mentioned that a specific utilization terminology was being referred to in many different ways, causing confusion. Resolving such issues will support consistency across the diverse ways information can be disseminated in managed care organizations.

5 Justification: Budget

Assigning a monetary value to information quality sets a precedent that it is valued as an organizational asset. Budgets are essential to allocating funds for personnel to implement information quality policies and governance committees. To administer and set information quality goals budgets must be set for resources, purchase of software, equipment, etc. Setting yearly budgets enables goals to be implemented with the right tools. In today's world, many organizations are forgoing the process of allocating budgets for information quality operations, significantly impeding positive outcomes. In the interviews, question 15 was, "Does the company allocate a budget for data quality initiatives?" a majority of the interview respondents mentioned the lack of personnel assigned to information quality improvements in the enterprise. As a result, there was a lack of leadership to enforce standards and processes. Budgets were frequently mentioned in interviews due to lack of funding and consequently many quality initiatives were not implemented.

6 Justification: Regulatory Compliance

Health care is strongly impacted by requirements for compliance. Regulatory compliance includes the processes that support an organization's adherence to regulations, laws and other mandated requirements for how an organization operates. Compliance mandates help to protect patients, their privacy, and society. For example managed care institutions work daily with electronic health records, hence the need to strictly enforce privacy protections. Managed care institutions are heavily regulated by compliance regulations, and failure to protect data can lead to significant penalties. A majority of interviewees mentioned the link between compliance and the nature of the business that was being conducted.

There are five major laws in the US that regulate the industry. They are as follows.

- Health Insurance Portability and Accountability Act (HIPAA) – this law aims to protect the privacy, security, breach notification and enforcement of healthcare system information. The law applies to all healthcare providers and comprises all media, electronic paper and anything oral. It allows patient rights to access their own information and disclosure of how they use the information.
- Anti-Kickback Statute and Stark Law – this law aims to protect patient's medical treatment decisions free from the influence of hidden financial arrangements. Because improper financial decisions can impact health decisions, this law helps to ensure that patients get the treatment they need regardless of financial outcomes.
- Patient Safety and Quality Improvement Act (PSQIA) – this law aims to include peer reviewed assessments for medical errors. The law was promoted by patient safety organizations. It acts to facilitate gathering of data of adverse medical events and to advise providers on how to mitigate it. This is a voluntary reporting system that is established to solve patient safety and healthcare quality issues.
- Affordable Care Act (ACA) – the goal of the ACA is to enable health care for all. Additionally, the ACA has also mandated measures to control the cost of health care.
- The Health Information Technology for Economic and Clinical Health (HITECH) Act – this law aims at requiring cybersecurity measures and promoting the proper use of electronic health records.

7 Justification: Reporting Requirements

Managed care organizations often need to provide reports to various entities. For example, the reimbursement process for services provided to Medi-Cal recipients requires the organization to submit quarterly and yearly reports. There are many compliance-related reporting requirements that must be implemented. To meet these requirements, managed care organizations must identify the necessary information sources for their reports. Many interviewees mentioned that these requirements are crucial for defining and enforcing data metrics that enhance information quality, which in turn directly affects the reimbursement payments for services rendered. Thus, to manage these various reporting needs, a quality assurance process is essential. The quality assurance process allows personnel to audit data and set standards, promoting accuracy and timeliness in the information presented to the respective entities.

Reporting requirements are relevant to promoting information quality and are found in information quality frameworks in other domains, such as for the Consumer Finance Protection Bureau (CFPB 2024).[43] For managed care

organizations, reporting requirements are the foundation for understanding the effectiveness of programs and health outcomes. Many of the interviewees mentioned the need for reporting guidelines in facilitating information quality.

8 Justification: Software Tools

Software used for administrative and service purposes is crucial to the mission of managed care organizations. This was evident from interviews where participants noted that managed care information quality guidelines should highlight the software handling the data. When discussing question 10, many interviewees mentioned that software was a crucial component of quality guidelines.

Furthermore, the information accessed through software tools must be handled by the right personnel with the correct privileges. Thus it is essential that all software meets security standards to enable compliance-based technology operations. For example, nurses should be able to see patient charts, but administrative staff should not have access to these charts for privacy reasons. During interviews, respondents frequently mentioned the lack of full controls on information and the need for these controls. Without proper controls, an organization cannot ensure the security of the information being accessed. Specifying yearly audits in the information quality framework will ensure and maintain the appropriate granting of the appropriate access points to the intended users.

9 Justification: Data Governance Committee

Data in managed care organizations constitutes an asset, and a foundation of support for how decisions are made to provide care. Thus, there is a need to create a management layer to protect these assets. A 2015 survey published by the American Health Information Management Association found that nearly a third of participants had made no headway in promoting data governance as a business imperative, and for another 24%, governance was not a priority for their leadership (Butler, 2015).[44] Clearly, the practice of managing data to ensure it meets organizational quality standards is often overlooked.

Leaders play a key role in fostering a culture where information quality is prioritized. At the very top, leadership recognition is key to creating a governance plan. In interviews with leaders a governance process was often emphasized as an overarching goal to govern information quality and security issues. Thus, participation from leadership is essential in facilitating the necessary interdepartmental coordination and engaging personnel to implement a comprehensive governance plan.

Such a plan rests on several information quality management principles: measurement, scope, purpose, and standardization. While leaders identify objectives to address the "why" of good data management, key to establishing an effective data governance program, the governance committee can enable reaching those objectives by overseeing information quality and security. The committee monitors quality issues and coordinates their resolution, often through a dedicated subcommittee. Given the sensitive nature of the data being collected, it is also crucial that the governance committee oversees a separate subcommittee focused on data security.

In many interviews, the absence of data governance programs highlighted significant gaps in managed care. This underscores the critical need for robust data governance initiatives that understands data ownership and designates data stewards to ensure the integrity, quality, and security of information across an organization.

10 Justification: Identifying Information Quality Issues

Effective information quality management is crucial in healthcare settings. This ensures that the sources of the data are provided, data meets formatting requirements and preconditions, secure collaboration is enabled, effective tools for maintenance are recommended, and information lifecycle accountability is provided for.

However, poor information quality can lead to adverse outcomes in the treatment of patients and create other challenges. When source data is not correct, it leads to patient frustration and mistreatment. It can also create an environment of distrust in technology and result in a decrease in efficiency and effectiveness. Additionally, policymakers who rely on data sets can make poor and ineffective policy decisions or recommendations when informed by low quality information.

To address these issues, good data governance is recommended. This can resolve information problems in a timely and appropriate manner. A subcommittee tasked with reviewing and rectifying information quality issues should be

established to ensure that good information quality standards are being practiced at all times. The governance committee should oversee this specialized subcommittee. This specialized subunit reporting to the governance committee would improve the efficacy of data management operations in managed care institutions, while the governance committee is tasked with general oversight of information quality operations. A subcommittee tasked with oversight of specific information quality issues could more readily address problem resolution details including specification, coordination, and communication.

This recommendation is supported by interviews where a number of respondents highlighted the need for an information quality subcommittee to review and resolve issues in this domain. By implementing such a structure, organizations can better manage data quality, reduce errors, and ultimately improve patient care and policy decisions.

11 Justification: Data Security

A critical aspect of information quality is supporting data security. Inadequate data protection poses a significant risk to managed care institutions. The ongoing threat of malicious actors constantly looms over organizational operations. Fostering a security-conscious culture centered on patient safety is essential for safeguarding data in managed care organizations. By elevating security to an enterprise-wide concern overseen by the data governance committee, this crucial issue gains the attention it deserves. A team focused on data protection, reporting directly to the governance committee, will facilitate the implementation of best practices across the enterprise. Establishing such a team as a data security subcommittee to review protocols and develop guidelines will better equip the organization to defend against cyber threats, human error, and unforeseen incidents. This recommendation is supported by interview feedback, where participants emphasized the need for a comprehensive data security strategy. Furthermore, in response to question 10, numerous participants highlighted the importance of implementing a robust data security framework.

12 Justification: Human Resources

The HR department plays a crucial role within the organization in fostering a culture of information quality. HR, with its responsibilities spanning recruitment, benefits management, employee satisfaction, company culture implementation, and training, is uniquely positioned to influence this aspect of organizational culture.

The human resources department In most organizations is instrumental in safeguarding human capital as an enterprise asset, as well as mitigating associated risks. Data should also be recognized as a valuable enterprise asset, and associated risks should be mitigated (Storey et al, 2012).[45] To this end, HR should provide comprehensive training on data value, information quality policies, and associated procedures for all employees. New hires must be introduced to the organization's information quality policies and practices, while existing staff should be kept informed of evolving activities in this area. HR can also contribute significantly to leadership development, which is essential for sustaining information quality initiatives (McAlearney 2008; Shipton et al 2008; Sfantou et al 2017).[46–48]

Given its central role, HR is pivotal in facilitating and coordinating quality-related activities and initiatives. The HR department, working closely with the Chief Data Officer, should assist in implementing quality initiatives. This need was highlighted in numerous interviews, where respondents emphasized the role of HR in guiding such initiatives and integrating quality into the organizational culture. Notably, many interviewees pointed out that a lack of HR leadership often resulted in insufficient emphasis on information quality within their organizations.

Discussion

Managed care organizations primarily serve two groups: members and providers. Both rely on high quality information for effective care provision and other operations. Thus timely and accurate data is crucial for informed decision-making in health care. Additionally, managed care organizations must prioritize data security and availability to protect sensitive information.

The framework presented in this article is grounded in established principles and identified needs, and addresses the unique challenges managed healthcare organizations face in ensuring information quality. Setting clear information quality goals (eg ASPE 2023; CFPB 2024),[42,43] allows organizations to assess the value that information provides to users, as well as helping to identify key dimensions and metrics that contribute to that value.

Despite recognizing the value of information quality, many organizations face significant impediments to implementing fundamental quality initiatives. These include siloing of departments, limited leadership support, funding constraints, and even the absence of designated ownership responsibility for specific sets of data.

We identified four primary goals for information quality in managed care.

1. Objectivity: Emphasizes accuracy and completeness of data. Leaders stressed the need for timeliness and consistency in data they received.

2. Standardization: Requires consistency in data. Standardization is challenged by discrepancies in healthcare data reporting. The lack of adequate standardization of data from diverse sources creates this problem and hinders efforts to solve it. This problem and steps to its solution occur in other domains as well (Oyoo and Berleant 2021).[49]

3. Utility: Focuses on data relevance and interpretability. This is a cornerstone of quality information. It is pivotal for developing preventive models in health care, supporting advanced analytics for predictive modeling, and other applications of the data.

4. Integrity: Ensures the trustworthiness and reliability of data. This goal often presents challenges especially as managed care organizations are not always the originators of the data they use. Incorporating data provenance measures, while not a complete solution, helps significantly.

Additional important factors include (i) data security and privacy are increasingly critical in society's evolving information environment, as without robust measures in these areas it is difficult to ensure data integrity, and (ii) effective information dissemination is crucial for effective information management.

Improving information quality in managed care organizations requires a multifaceted approach. By focusing on key goals, addressing implementation barriers, and tackling data management challenges, managed care organizations can enhance their ability to provide high-quality care and make informed decisions. An information quality framework for the domain in question can provide a path to addressing information quality issues.

Future Work

The findings of this study illuminate critical aspects of information quality in managed care, and lay the groundwork for future research and initiatives. Several avenues for future work suggest themselves based on the identified challenges and opportunities.

Leadership and Governance

Understanding the role of leadership in shaping information quality practices within managed care organizations is crucial. Future research should focus on identifying effective governance structures and leadership models that can drive and sustain information quality initiatives. Effective governance is the cornerstone of implementing key data management principles such as objectivity, utility, integrity, and standardization. It plays a vital role in optimizing various aspects of information management, including decision-making processes, data security, and trust. Good governance also enhances the efficiency of data-related operations, ensures regulatory compliance, and facilitates continuous improvement in data policy and practice. The elements of a well-designed governance structure that incorporates quality elements as guiding principles, and an understanding of design alternatives, is essential.

The impact of leadership and governance on information quality extends beyond mere data management. It influences the organization's ability to make informed decisions, maintain patient trust, operate efficiently, and adapt to changing regulatory landscapes. As such, investigating effective leadership and governance structures in the context of information quality in the managed healthcare domain is not just beneficial for information quality, but is crucial for the overall success and sustainability of managed care organizations in today's data-driven healthcare environment.

Interdisciplinary Collaboration

Future studies should examine ways to reduce departmental silos in managed care organizations. Research on interdisciplinary collaboration models and their effects on information quality could offer insights for a more integrated data management approach. This work may reveal strategies to enhance cross-functional cooperation and improve overall data handling practices.

Financial Implications

Assessing the return on investment, cost-effectiveness, and potential financial benefits associated with improved information quality could provide valuable information for managed care organizations seeking to justify and allocate resources to such initiatives. However the complexity of the organization environment makes it unclear how to do this reliably. Thus further investigation into appropriate methodologies for this task is needed.

Technological Solutions

With the rapid evolution of technology, future research is needed focusing on innovative technological solutions to enhance information quality. This may involve the integration of automated assistants for data standardization (Oyoo and Berleant 2021),[49] advanced analytics, artificial intelligence, and machine learning algorithms for real-time data validation, ensuring the ongoing accuracy and relevance of the data. More broadly, the societal impact of generative AI needs to be examined for impacts, current and future, on managed health care, managed healthcare information, and information quality frameworks for managed healthcare organizations.

Ownership and Accountability

The issue of ownership in information quality is crucial and warrants further investigation. Future research should explore the establishment of dedicated roles or departments responsible for overseeing information quality. Currently, data ownership is a significant challenge because departments often assume others are responsible for information quality, leading to confusion about where the responsibility begins and how it should be implemented. A thorough examination of accountability structures and their impact on the successful implementation of information quality programs would provide valuable insights.

Regulatory Compliance

The dynamic regulatory environment necessitates ongoing evaluation of how new policies affect information quality practices in managed care. It is crucial for long-term success that organizations understand how to adapt to these changes while maintaining high information quality standards and ensuring compliance. This adaptability is key to balancing regulatory requirements with effective data management practices.

Longitudinal Studies

Longitudinal studies tracking the implementation and effectiveness of information quality programs would yield valuable insights. These studies should assess changes in information quality metrics, organizational culture, and patient outcomes over time. Such research would provide a comprehensive view of how quality initiatives evolve and impact healthcare delivery in the long term.

Systematic Review

Systematic Literature Reviews (SLRs) have gained prominence as a rigorous approach to analyzing literature. By adhering to formal standards such as PRISMA and Kitchenham (2004), SLRs conform to a formal protocol resulting in high-quality reviews.[50,51] These reviews serve as solid foundations for future research, enabling updates, related studies, structured cross-review comparisons, and importantly, meet the essential scientific criteria of reproducibility and replicability.

In the context of information quality frameworks, SLRs would be particularly valuable, as such reviews could be specifically designed to refine and justify an information quality framework or a part of a framework. This would benefit not only the managed care domain but also any field where an information quality framework exists or would be advantageous to create.

Conclusion

The future of healthcare information quality demands coordinated efforts and the implementation of robust quality programs and standards. This study advances the field by introducing a novel information quality framework that provides managed care organizations with clear guidelines for prioritizing and effectively implementing quality standards. By addressing key challenges and offering a structured approach, this framework paves the way for organizations to enhance their information quality practices. Ultimately, this leads to more informed decision-making and improved patient outcomes within the managed care sector. The information quality framework serves as a practical tool for organizations that, in an increasingly complex healthcare landscape, are striving to optimize their data management practices.

Abbreviations and Terminology

Data quality and information quality are used interchangeably in this article and in most other contexts. In a strict sense, data quality is present when data is valid and complies with all the technical rules associated with its attributes, while information quality occurs when data quality is present and is presented to the right person at the right time in a usable and meaningful manner. Except in technical discussions among data engineers both terms generally denote the more expansive characterization.

Ethics Statement

This study (protocol #21-103-M1) was approved by the Institutional Review Board of the University of Arkansas at Little Rock, which stated, "Your protocol has been approved as Human Participant Research."

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