IMPORTANCE OF PRIORITIZATION OF HEALTH CARE DATA QUALITY IN

MANAGED CARE LEADERSHIP


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Grace Crossette-Thambiah


M.P.P, University of Southern California, 2011
B.Sc., DeVry University, 2008

This dissertation "Importance of Prioritization of Health Care Data Quality in Managed Care Leadership," by Grace Crossette-Thambiah, is approved by:

Dissertation Advisor:

_____

Daniel Berleant

Professor of Information Science

Dissertation Committee:

_____

Nitin Agrawal

Professor of Information Science

_____

Elizabeth Pierce

Associate Professor of Information

Science

_____

Edi Tudoreanu

Professor of Information Science

Program Coordinator:

_____

John Talburt

Professor of Information Science

Graduate Dean:

_____

Brian Berry

Associate Professor of Chemistry

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**Abstract**

As we progress towards the fourth industrial revolution, where emerging technologies such as artificial intelligence, machine learning, and the Internet of Things (IoT) are becoming more dominant, the quality of data becomes even more crucial. These technologies rely immensely on data to generate insights and make accurate predictions. Poor quality data can lead to incorrect or incomplete insights, resulting in erroneous decision-making that can have significant consequences. It is essential that data quality is addressed early in the development of these technologies to ensure that they operate successfully and provide accurate insights that can lead to positive outcomes. As such, data quality should be a priority for organizations that are looking to leverage these emerging technologies to gain a competitive advantage in their respective industries.

Data holds an integral role in healthcare. Doctors and healthcare professionals rely heavily on data to make decisions on patient care thus making data quality imperative. Managed care institutions who administer health plans also rely heavily on data quality to coordinate benefits and care. The disparate sources of data these institutions receive make it difficult to manage quality. In the managed care model, preventative treatment is highly emphasized thus needing data to inform these decisions. As a result, data quality is a major factor in how managed care institutions dictate patient outcomes.

However, there are gaps in the understanding on the importance of data quality in managed care within its leadership. Leadership in managed care often have different tasks or priorities which lead to data quality being deprioritized. The lack of internal coordination in managed care often leads to silos. Leadership is not aware of other department's data platforms or its management. There are also misunderstandings on

who owns the data and how it is being used. The information technology department is often mistakenly thought to be the managing and administering the data.  Sadly, without its correct owners who understand the background of the data, the information technology department is at a standstill on what to do with its data sources. Leadership who is responsible for setting priorities should lead the direction of proper data management principles.

This study was aimed at understanding if leadership in managed care organizations understood the importance of data quality and prioritized it. The study results will guide the formation of an information quality guideline for managed care. Leadership's input is crucial to developing such a plan. Interviews with leaders will help inform on whether data quality is prioritized and how guidelines can be established. The guidelines will detail how managed care institutions can govern their data sources with the partnership of the business and the information technology department.

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2. This permission to collect data is restricted to UA Little Rock Principal Investigators (PIs).
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4. PIs and all research staff are required to follow all FERPA policies.  For questions about FERPA policies contact Malissa Mathis (mktrantham@ualr.edu).
5. All submissions, including modifications and extensions are reviewed to ensure that the protocol meets current requirements for protection of human participants.
6. Unanticipated problems or new information about risk must be reported within 2 business days to the IRB.  The Adverse Event reporting form is located at https://ualr.edu/irb/home/irb-forms/

Best of luck with your study.

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**Introduction**

   As the world continues the revolution of smart technology, the need for quality data is imperative. The role of data in organizations has grown from a back-end function of reporting to an enterprise asset. Organizational value is underscored by data objects and their quality. Furthermore, this new transformation is bolstered by the advancement of artificial intelligence which is being used by organizations to predict and analyze performance and a multitude of other things. As a result, data and its reliability have become foundational pillars of enterprise effectiveness.

   Healthcare institutions stand to gain value in the fourth information revolution. The ability to use digital data to the fullest degree possible to improve the quality of care and predict outcomes is an innovative approach to care management. Managed care is a health care delivery system organized to manage cost, utilization and quality. It contracts with healthcare providers and medical facilities for the delivery of health care services. The purpose of managed care is to link the beneficiary (member) through services with a managed care plan. These managed care plans aim to focus on prevention and care management. Consequently, this requires data from contracted entities to assess member health outcomes and preventative measures.

   The multiple data sources in managed care environments make managing data quality a significant organizational challenge. The complex landscape of data objects adds confusion and does not facilitate understanding of how it can be utilized. Enterprise data projects are faced with low success rates and are subject to higher scrutiny by senior leadership. Beyond a lack of trust in data quality from one in three business leaders, poor data quality costs the United States $1.3 trillion per year (IBM, 2017). In managed care,

data quality is salient and often determines how care can be coordinated. A data governance plan would aid in the management of data objects and greatly improve quality by identifying issues. In many instances, the combination of other pressing organizational issues and differing leadership priorities can prevent the establishment of reliable data governance practices. The lack of awareness in the corporate landscape impacts the ability to govern data, which in turn impacts overall data quality within organizations. When leadership does not adequately govern the data, there is a direct impact on data quality. Unless leadership recognizes and prioritizes data quality many organizational initiatives cannot be optimally completed. Leadership plays a huge role in creating an organizational culture that emphasizes data quality. By empowering the organization to enforce data quality it helps promote big data driven decisions. Becoming a big data enabled organization requires a culture of empowerment, trust, transparency, and inquiry. "These qualities allow analytics to be woven throughout the fabric of an organization which elevates and reiterates the investment and commitment to analytics" (Bolling & Zettelmeyer,2014). Implementing data quality practices sets the foundation for organizations to thrive with big-data analytics which is partly the ongoing information revolution.

Leadership in organizations plays an important role in setting practices for data processes. However, they do need to be empowered by the organizational culture to make such decisions. "It is vital to empower leaders to have the capacity to promote data-driven decision and analytics. One way this can be accomplished is through the creation of C-level individuals such as Chief Data Officers or Chief Analytics Officers" (Stadolnik, 2014). Prioritizing data quality and establishing standards is the first step in implementing a successful data driven organization. This initiative should be driven by leadership. By

understanding how leadership prioritizes data quality it can help inform a standard that managed care institutions can follow.  Creating data quality standards in managed care can help with informing data driven decisions. Leadership can provide valuable input through their viewpoints.

Frameworks serve a primary purpose as a reference model to establish protocols and processes. They create a structure that ensures that processes are conducted with validity. This ideology can be applied to governing data quality in managed care. Applying this ideology, it can be argued, promotes data quality. Data frameworks are industry developed tools used to manage data quality.  They are considered best practice guides for monitoring and maintaining business data. Data quality frameworks cover the entire data lifecycle including data creation, acquisition, maintenance and archival.

A good example of a comprehensive data policy plan would be the United States Energy Information Administration. The organization has developed a data policy framework which enables the administration of data quality and also serves as a pseudo-governance plan. The creation of a data framework ensures that data is accurate, reliable and unbiased which enables proper quality of data.

**Research Question:**

**Does leadership prioritize data quality in managed care, and how can we create a framework for data quality in managed care?**

The justification for conducting this research will enable understanding of how leadership prioritizes data and inform a potential standard on how managed care institutions can control data quality. In reviewing literature on the topic, gaps were identified.  By completing this research, the gaps identified could be addressed.

**Literature review**

There are few research articles that speak on this subject of managed care data and leadership priorities. There are more articles that mention data ownership policies and organizational management.

*Leadership*

Leadership is a critical aspect of any organization. Leaders are decision makers who are placed in positions of power to act in the best interest of the organization. One can argue that leadership is the essential backbone to every organization as leaders hold decision making capabilities that have long term impacts. In hospital settings, leadership provides a crucial role in oversight of services. Leadership in healthcare organizations characterizes a system of processes, people and resources that should be driven by high quality leadership. Worthy leadership skills can make a measurable difference in patient care and how employees view their jobs. Quality leaders have been proven to promote innovation, quality and productivity and it also creates a culture of encouragement.

In the developed world, hospital care is faced with workforce challenges, as well as changing consumer expectations and demands. There are a number of constraints which cause issues. "Fiscal constraints, increasing demands for access for care, a mandate to improve patient centered care and issues concerned with levels of quality and safety of healthcare are elements correlate to leadership efficacy" (Daly, Jackson, Mannix, Davidson, Hutchinson 2014). It is a widely recognized fact that leadership plays an important role in facilitating a high-quality health care system that consistently provides safe and efficient care. Leadership participation is key to providing and facilitating high levels of care. However, there are barriers to the participation of care incentives that should be addressed.

One way to address this issue would be to conduct empowerment programs for leadership on methods to administer organizational effectiveness. "Linking development programs to leadership is rare and measuring outcomes is difficult" (McAlearney 2008). That study took four qualitative studies of leadership development to answer the question "What opportunities might exist to use leadership development programs to improve quality and efficiency?" Interviews from over 200 individuals elicited four important opportunities to improve quality and efficiency in healthcare, in the following order: "(1) by increasing the caliber of the workforce, (2) by enhancing efficiency in the organization's education and development activities, (3) by reducing turnover and related expenses, and (4) by focusing organizational attention on specific strategic priorities". These findings highlight opportunities for organizations to improve quality objectives through leadership development initiatives.

The results above have demonstrated the need to have leadership engagement in organizational objectives in hospital settings. Thus, it is important to understand how these findings can inform a blueprint for leadership engagement. The National Association of Healthcare Quality spearheaded the development and validation of a competency model to support healthcare leaders in assessing their strengths and planning appropriate steps for development. The resulting model contained six domains spanning three organizational levels. The three organization levels were tiered to three roles: "1. Roles at all levels which require professional values 2. Mid-level roles which needed performance improvement, communication and self-management 3. Senior level role which required organizational awareness and fostering of positive change" (Garman, Scribner 2011). The model concluded that leadership plays a pivotal role in promoting organizational awareness.

Models provide blueprints that help one navigate unfamiliar landscapes. A model can be used as a rubric to guide organizations on how to navigate leadership potential issues with leadership. "Increased attention to healthcare quality and impending changes due to health reform are calling healthcare leaders at all levels to strengthen their skills in quality improvement initiatives" (Garman, Scribner 2011). To address this need the National Association for Healthcare Quality initiated the development and validation of a competency model to support healthcare leaders in seeing their strengths and identify areas for development. The six dimensions were measured as the following:  Foster's positive change, Communication, Organizational Awareness, Self-Management and Performance Improvement. These dimensions were considered valid components in developing and maintaining a culture of continuous improvement. Additionally, it was concluded that these components were factors associated with data-driven decision making.  These components highlight the need to identify benchmarks in leadership to improve competencies in healthcare quality.

The growing interest in performance has led to other models being developed to measure competency-based performance systems for enhancing both individual and organizational performance in healthcare.  The development of a Health Leadership Competency model, an evidence based and behaviorally focused approach for evaluating leadership skills, covers the professions, which also includes health management. The model identifies three overarching domains subsuming 26 behavioral indicators, or levels, for development and assessment as individuals progress through their careers from entry -level to mid-entry level and advanced stages of lifelong development (Calhoun, Dollett. Sinioris, Wanio, Butler, Griffith 2008).  The three overarching domains: Transformation, Execution and People are broadly defined.

Transformation is a visioning, energizing and stimulating process which is tied to achievement orientation, analytical thinking, community orientation, financial skills, innovation thinking and strategic orientation. Execution is defined as translating vision and strategy into optimal organizational performance. At the core of this domain is accountability, change leadership, collaboration, communication and impact influence, information technology management, initiative, organizational awareness, performance measurement, process management, organizational design and project management. People form an organizational climate inclusive of human resource management, professionalism, self-development, talent development and team leadership. Although the model identifies several aspects or key organizational components, its broad outlook makes it very difficult to measure tangible outcomes. The components, being broad in nature, make it very difficult to pinpoint an outcome that is competency based. Tangible outcomes are especially important in a hospital setting where services are provided.

Quality leadership impacts the performance of staff. In a hospital setting performance is cardinal to preventing fatalities and providing quality care. To explore the relationship between leadership effectiveness and health a study was conducted using the number of patient complaints. The study is based on 86 hospital trusts run by the National Health Service (NHS) in the United Kingdom (Armstrong, West, Dawson 2008). The findings concluded that leadership effectiveness is associated with higher reviews and ratings. It also found that clinical leadership may foster performance outcomes for health care organizations. Patient complaints were a frequently neglected area that gave many clues to how leadership can improve quality. This study showed the impact leadership has on organizational effectiveness. This theory can also be applied to the

impact on leadership understanding and data quality.  Leadership style is the single most important factor in organizational effectiveness.

Integration of care and leadership are directly related. Leadership's role in administering processes and setting standards is vital for the quality of care. "Effective leadership of healthcare professionals is critical for strengthening quality and integration of care" (Sfantou, Laliotis, Patelarou, Sifaki-Pistolla, Matalliotakis, E. Paterlarou, 2017).  Their study aimed to understand the difference between different leadership styles and healthcare quality measures.  Leadership is defined as the relationship between the individual who leads and those who take the choice to follow. Although there are many identified styles of leadership, there are six types who appear to be most common: transformational, transactional, autocratic, laissez-faire, task oriented, and relationship oriented. In the following table they explain the meanings of all six.

| Transformational | "characterized by creating relationships and motivation among staff members. Transformational leaders typically have the ability to inspire confidence, staff respect and they communicate loyalty through a shared vision, resulting in increased productivity, strengthen employee morale, and job satisfaction" |
|---|---|
| Transactional | "acts as a manager of change, making exchanges with employees that lead to an improvement in production" |

| Autocratic | "leadership style is considered ideal in emergencies as the leader makes all decisions without taking into account the opinion of staff.  Mistakes are not tolerated and blame is put on individuals" |
| --- | --- |
| Laissez-Faire | "A leader who does not make decisions, staff acts without direction or supervision but there is a hands-off approach resulting in rare changes" |
| Task Oriented | "Involves planning of work activities, clarification of roles within a team or a group of people, objectives set as well as the continuing monitoring and performance of processes" |
| Relationship Oriented | "Leadership style incorporates support, development and recognition" |

Transformational leadership has a high correlation to the implementation of effective management that establishes a culture of patient safety. The literature emphasizes that empowering leadership is related to patient outcomes by promoting greater nursing expertise through increased staff stability and low turnover. Task oriented leadership style was found to be related to higher levels of quality of care, and additionally, formal leadership style was positively associated with learning from minor and moderate patient safety events, while informal presented no effect.  Transactional leadership style is credited with improving patient satisfaction. This study proves that leadership style does have an impact on organizational culture and quality of care.

Similarly, another study attempted to explore the issue (Alloubani, Almatari, Almukhtar 2014), aiming to understand the nature of the leadership work of hospital

managers in order to examine their roles and perceptions. It also looked at obstacles and problems facing hospital leaders. In this study transformational leadership attributes and behaviors were positively related to organizational outcomes such as teamwork success, effectiveness, staff satisfaction, commitment, extra effort and more. Furthermore, it was also found that transformational leadership processes have been found to enhance followers' work-oriented values and shape self-efficacy of followers. In conclusion it surmised that effective leadership is one of the most crucial factors that lead an organization towards success. The key challenge, however, is to recognize the effects of strong leadership upon the success of the organization.

Although transformational leadership has many positive attributes, not all leaders can lead in a similar way. Collaboration access to functional and organizational boundaries is important to creating effective leadership. Collaborative leadership is a practice where managers work with employees and in collaboration with other teams and departments to accomplish shared goals. This can mean that information is shared widely across all levels of the organization, teams are cross functional, decisions are made as a team, leadership bridges gaps between departments and each employee has a voice in the organization.

While organizations face issues with interdepartmental communications and potential silos, leadership should strive to promote a culture of open communication and partnership. Leadership should be charged with fostering teamwork for the benefit of the organization. "Collaborative leadership can create a fostering culture" according to Okpala (2017) who surveyed collaborative leaders' initiatives and their influence on the quality of care. The outcome of the study indicated that the adoption of collaborative patient care enhances physical access to healthcare services. However, there was a

significant difference between the influence of collaborative leadership initiatives on access to healthcare services. The study concluded that collaborative leadership strategies should be adopted by healthcare leaders to help ensure that patients receive quality care. The disparate ways of managing impacts organizational performance and in turn impacts the quality of patient care.

Accountability and reliability are two very important factors in providing quality healthcare. Creating a structure of accountability and reliability is important in addressing the heterogeneous approaches in healthcare management. The healthcare industry works to improve safety by adopting reliability organization practices (Day, Demski, Pronovost 2018). Leadership in information technology (IT) is especially crucial for the workplace as it is the backbone of healthcare. IT leadership oversees data operations of healthcare systems and data. How does IT leadership play a role in the overall leadership structure? A study conducted to survey delivery outcomes in an e-government environment showed positive results (Prybutok, Zhang, Ryan 2008). A field survey concluded that leadership, strategic planning and market focus had a positive impact on IT operations and leadership, and IT quality had other benefits (Prybutok, et al. 2008).

### *Data Governance*

Data governance can be argued to be the single most important structure that can be implemented in place to promote and protect data quality. Data governance in healthcare is important because it enables leaders to have the right information in the right format enabling proper clinical and business decisions to be made. Leadership leading 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 Department of Health Information Management and Technology 2017 ).

England's Department of Health created the NHS Care records service to implement data governing structures, policies and practices (Hovenga 2013). Organizations are increasingly in need of data governance.  Governance is about power, leadership, control and accountability (Hovenga 2013).  Data governance can increase the value of data and minimize the costs and risk. Data governance requires a holistic view on how to administer proper data practices. This requires understanding its components. Abraham, Scheneider, Brocke (2019) identified six types of dimensions. They comprise of data quality, data security, data architecture, data lifecycle, meta-data, data storage and infrastructure. Antecedents cover the contingency factors, which impact the adoption and implementation of data governance.  Lastly, consequences arise from the effects of data governance. This differentiates between intermediate performance effects and risk management.  The paper addresses what the building blocks of data governance are and where organizations lack knowledge about data governance. Initial question was addressed by developing a conceptual framework of six dimensions, while the second question was answered by analyzing gaps within the framework. By doing so the following fields were flagged for future research: governance mechanisms, the scope of data governance, antecedents of data governance, consequences of data governance, and strengthening the generalizability of findings.  In reviewing this literature, it is apparent that more research needs to be conducted on how to implement a data governance plan.

Separate data sources in hospitals are an issue in hospital administration. Each year, data volumes increase which makes it difficult to control the quality of vital patient data. Understanding the data can lead to better healthcare decisions, which leads to better business practices. One of the mistakes in healthcare is approaching data as technology assets not as corporate assets, when in fact it should be treated as being as important as corporate financial assets (Fisher, 2009). A data governance plan is a remedy for such problems. Data governance can be described as a process of controlling patients' data by instituting a method to govern its input and output with standards. For a data governance plan to be implemented, data quality yields tremendous benefits. Many healthcare organizations are facing data quality challenges due to the complexity of the clinical systems' data structure, massive growth in clinical data volume and the lack of standardization between the clinical systems in terms of naming and modeling. Undoubtedly, poor data quality has a tremendous impact on the efficiency and effectiveness of healthcare organizations, at both operational and strategic levels (Brown and Khatri, 2010).

All data problems are attributed to the absence of effective data governance. A data governance program helps healthcare organizations to pinpoint the root causes of data quality issues and identify the best remedy that tackles all the problem dimensions (Eppler, 2006). For example, electronic health records can be inputted through templates such as dropdown lists or checkboxes. Physicians have complained that this method of data capturing does not allow them to describe the patient's condition properly, and has the potential to impact it negatively.

A case study conducted in a leading tertiary healthcare organization in the Middle East with more than 2,200 beds and 12,000 employees found that data governance was

a primary factor in enabling good quality of care.  The study concluded that applying data governance in healthcare will provide a solid start for data-driven projects such as data quality improvement, data warehousing, healthcare analytics, and business intelligence. The analytical measures of data alerts, data quality improvement, policy violation provenance, rules monitoring, and authority monitoring will increase the reliability and transparency of data governance for all users and regulatory bodies (Alofaysan, Alhaqbani, Alseghyyir, Omar (2014).  Studying and comparing outcomes of different data governance frameworks has an essential place in future organizational development.

**Leadership and Quality of Life**

Internationally, it is widely recognized that leadership plays a crucial role in the quality of life of the healthcare workforce.  A cross-sectional study was carried out over the period July to September 2011 in Hasheminejad Kidney Center, which is one of the largest Urology hospitals in Iran. Two scales were developed for measuring LB and QWL based on a literature review, and HRP was measured using a simple questionnaire with single-item questions for each dimension. The scales were distributed to 403 healthcare employees and 316 valid questionnaires were returned. The data was analyzed using exploratory factor analysis to examine the similarity of the factor structure between scales and collected data (Barzegar, Afzal, Tabibi, Delgoshaie, Koochakyazadi 2012). The study concluded that there were high perceptions of quality of life and leadership. Thus high quality of life can be achieved in hospital settings. Higher employee perceptions were associated positively with leadership. Leadership style, treating subordinates with trust and respect, motivating and in-person recognition of subordinates, and promoting organizational values were identified as strong predictors.

*Data quality*

The collection, representation, and effective use of organizational data are important to an organization because these activities facilitate the increasingly important analyses needed for business operations and business analytics (Storey, Dewan, Freimer 2012). Poor data quality damages organizational processes.  The solution to this focuses on principles of employee empowerment, decentralization, and mechanisms to measure and reward individuals for their data quality efforts.

*Frameworks*

Data quality has become an increasingly important issue, and research has provided a large body of data quality knowledge that has expanded the ability to solve many data and information quality problems (Madnic, Lee, Zhu, Wang 2009). They introduce a framework to characterize using two dimensions: topics and methods. This framework was based on the tenet of pragmatism.  The framework can be viewed as a two-dimensional matrix where each cell represents a topic-method combination.

*(From Madnic et all, 2009)*

Table I. Topics and Methods of Data Quality Research

| Topics | Methods |
|---|---|
| 1. Data quality impact | 1. Action research |
|   1.1 Application area (e.g., CRM, KM, SCM, ERP) | 2. Artificial Intelligence |
|   1.2 Performance, cost/benefit, operations | 3. Case study |
|   1.3 IT management | 4. Data mining |
|   1.4 Organizational change, processes | 5. Design science |
|   1.5 Strategy, policy | 6. Econometrics |
| 2. Database related technical solutions for data quality | 7. Empirical |
|   2.1 Data integration, data warehouse | 8. Experimental |
|   2.2 Enterprise architecture, conceptual modeling | 9. Mathematical modeling |
|   2.3 Entity resolution, record linkage, corporate | 10. Qualitative |
|      householding | 11. Quantitative |
|   2.4 Monitoring, cleansing | 12. Statistical analysis |
|   2.5 Lineage, provenance, source tagging | 13. System design, implementation |
|   2.6 Uncertainty (e.g., imprecise, fuzzy data) | 14. Theory and formal proofs |
| 3. Data quality in the context of computer science and IT | |
|   3.1 Measurement, assessment | |
|   3.2 Information systems | |
|   3.3 Networks | |
|   3.4 Privacy | |
|   3.5 Protocols, standards | |
|   3.6 Security | |
| 4. Data quality in curation | |
|   4.1 Curation - Standards and policies | |
|   4.2 Curation - Technical solutions | |

While this article categorizes frameworks as a method to govern the quality of data there are also other methods to promote data quality. The importance of achieving and maintaining a high standard of data quality is widely recognized by practitioners and researchers (Cichy, Rass 2019). The paper surveys data quality frameworks in a comparative way regarding the definition, assessment, and improvement of data 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 data quality frameworks. The authors argue that requirements for data quality vary from organization to organization based on need. Twelve general-purpose applicable data quality frameworks that contain data quality definitions assessment and improvement processes were systematically surveyed and compared. The frameworks are most applicable in most circumstances in practice. Most frameworks also recognize the relevance of dimensions to be valued by each organization. Timeliness and accuracy appear to be the most important quality attributes. Most frameworks focus on structured and semi-

structured data while few mention unstructured data. The assessments also vary in methods and complexity. The frameworks proved to be a method to help the improvement decision process.

Eppler and Wittig (2000) analyzed seven conceptual frameworks on information quality with six criteria in two dimensions to identify common elements, differences and missing components of these frameworks. The paper concluded that information quality frameworks are often domain specific and are either strong in analytic dimensions or pragmatic dimensions, while rarely do frameworks include both. The authors outline five directions for Information quality frameworks: first, the quest for more generic models. Second, the development of IQ 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 quality criteria lists). 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 data quality frameworks are important to corporate systems which rely on pragmatism to operate with efficaciousness.

Data quality impacts corporate data efficiency and decision making. The success of corporate data is built on agility and flexibility. This is enabled by a quality data framework policy. Understanding the layers at which corporations operate can help prepare an informed data quality plan. Otto, Wende, Schmid and Osl (2007) suggest a three-layer approach to a data framework consisting of business engineering (strategy, organization, and information systems) as well as two perspectives of data management (governance and execution). The framework aids in understanding which tasks need to be performed for improving corporate data quality and its reliability. It looks to link

corporate data management to business objectives of an organization and to anchor it efficiently within the existing organizational structure. The paper concluded that an easy-to-use tool guiding data quality requires further detailing the outlined practices and enriching them with a set of methods and procedure models for the different design objects within the framework. The framework also served as a basis for data quality maturity assessments.

The same approach can be implemented for medical practices. In the last couple years, the number of medical registries has increased sharply. The value strongly depends on the quality of data contained in the registry. To enforce and optimize data quality companies have instituted special procedures. Analyzing the changes has given insight into effective frameworks. Arts, Keizer and Scheffer (2002) reviews these frameworks to recommend models for impactful data quality frameworks. The authors concluded that regardless of the frameworks being implemented to reduce errors in the medical registry, it was unrealistic to expect an errorless registry. In the review of these processes, it was found that the assurance of data quality can entail many different procedures. Procedures were selected for our framework when they were practically feasible and when they seemed likely to prevent, detect, or correct frequently occurring errors.

However, is the same claim applicable to all aspects of healthcare? Data quality issues are universal and, in some instances, may be different based on the industry. The Greek healthcare system has been experiencing data quality issues with its electronic health care records. The study calls for a framework to prevent data quality issues (Orafandis, Bamdis, Eaglestone 2004). It concluded that an analysis and design of data quality issues are an integral part of the development of an EHR system and should be

addressed from the inception of the project and that establishing the basic framework and

piloting the EHR concept.

**Method**

The study that was undertaken used qualitative survey aimed at understanding how leadership emphasizes and prioritizes data quality. This was an exploratory research initiative to understand leadership's tenets in regard to data quality. The hope was to seek understanding on how to develop a framework.

This will be part of the justification for synthesizing a framework/plan/approach/method for achieving/measuring/ensuring data/information quality in the domain of managed health care. I then synthesized such a resource. The method drew on existing similar work already extant in the field of energy information as well as other works for other domains. The following was sought.

1. Find out how top management views the problem.

2. Understand and show that it is important (and if leadership says it is, that helps but it is not the only way to show importance).

3. Give the plan/framework/etc. That the field can use in the future to improve its ways.

Next, I elaborate on step 1 above, followed by step 2, and finally provide details below on step 3.

*Participants*

To clearly understand how leadership places importance on data quality and to get a better perspective if they do value data quality, leadership in multiple managed care organizations were asked to interview. Since this is an exploratory research initiative, a sample size of twenty would be acceptable, in similar studies there have been similar sample sizes as well. Validation of findings was done by looking at the consistency of the

answers that were provided. Additionally, since a framework was to be developed a validation mechanism was implemented as a justification method.

Interviews were aimed at understanding interviewees' insight into what data quality means to their respective departments and to them. Using the United States Energy Administration's data policy plan as an example for a comprehensive data policy, I interviewed stakeholders to ascertain how a framework could be developed for managed care institutions. Results from the project led to developing a curricular module providing guidance on how managed care institutions can develop comprehensive plans for communicating data policy. The curricular module became a slide deck consisting of educational material on the importance of data quality in managed care and methods to incorporate data quality. The proposed module is 1-2 sessions of training. The questionnaires for the interview are listed below.

**Questionnaire**

1. What is your role/title?

2. How long have you been in the company?

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

4. Do you currently have a Data Policy that guides the handling of information coming in from various data sources?"

5. In what ways is data quality important to your department? Can you rank it from 1-10?

6. Can you tell me about some insight into the most important aspect of the data landscape in your department - velocity, volume, value, variety and veracity?

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

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

9. In your opinion, do your fellow peers value data quality as much as you do?

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

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

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

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

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

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

16. What training or information resources does your organization provide to educate on data quality/ data governance?

17. Are there any interdepartmental initiatives/committees on data quality?

**Interview Process**

A series of searches were conducted on the internet to understand managed care organizations in the United States. To attempt to maximize input an individual was chosen from each state. To make initial contact, in most cases an email or LinkedIn message was sent to potential participants. In some cases, contact was made via a phone call to the individual's office, introducing the research and asking for interviews. Messages were left with the assistant of the individual. Two weeks were given for the applicant to respond, failing which a follow-up communication was sent either via phone, email or phone call.

Unfortunately, getting responses was very difficult and after a month of attempting to get feedback none of them were willing to provide interviews. Responses from some individuals were that they were busy.  Given my background in managed care, I began to reach out to my internal network asking them to introduce me to potential interviewees. These people wrote to their personal contacts asking for their time and introducing my research topic. A total of 40 people were contacted in the greater Los Angeles region. These individuals were sent emails introducing my research and asking for an interview. I also contacted seven individuals who were known to me from my previous place of employment. Additionally, I was also advised to send personalized LinkedIn messages highlighting my research and potential questionnaires. Messages were sent to all 40, however the seven that I already knew did not receive the detailed follow-up information.

Out of the group of 40, responses were received from 13. This brought the total number of interview candidates to 20 individuals. All 20 individuals were based in southern California. A total of 18 organizations were represented.  Fifteen of eighteen organizations were in the private sector. The other organizations were government

entities who were charged with administering Medi-Cal managed care services in California. The individuals who were from the private sector represented organizations not only based in California but also in other parts of the country.   The individuals who were chosen attained a master's degree or higher.

Although based in California these individuals were able to give me diverse perspectives, as 10 of the 15 organizations had nationwide operations that spanned from California to New York.  All ten of these organizations had employee head counts of over 25,000 people. Thus, these were large organizations.  Five of the 18 managed care organizations had employee counts between 3,000 and 10,000. The remaining three had employee head counts of less than 1,000.  Qualifying organizations were those who operated under the managed care operating model.  The network used was my personal network of over 15 years.  These individuals had a significant background in the area of health and managed care.

To ensure that the caliber of the interviewees reflected substantial knowledge of and responsibility in the health care management industry, I sought out leaders who 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 quality conference(s), award(s). Prior to scheduling the interview, an email asking if these individuals were qualified by the above-mentioned selection criteria was sent.  The breakdown of participants by selection criteria is in the table below.

| Selection Criteria | Number of Participants |
|---|---|
| Education level, 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 |

Data was collected verbally through interviews conducted by video conference. As this was during the COVID-19 pandemic when meeting in person was restricted. Notes were taken while interviewees were speaking. On occasion, if consent was given, the interviewers were recorded. Consent was only given twice to record the interviews. Interview sessions were around 30-40 minutes per session. All 20 individuals represented the managed care health industry in the fields of operations, data intelligence or information technology.

Generally, it seems promising that the interview results could be applicable to other domains. During interviews many leaders mentioned a lack of time to coordinate information quality activities. It is likely that the lack of time is a major issue across all industries. Time and its contribution to poor cross functional collaboration can be seen in other industries as well. At the leadership level, it is common knowledge that time is a valuable resource and hence the lack of time to collaborate on information quality activities could certainly be a significant barrier for other industries.

The results of the interviews could likely be applied to other industries in the areas of integrity and objectivity.  The growing issue of security and constant data breaches in many industries is significant and similar to managed care. Organizations have a growing need to protect their data from breaches and are increasingly placing safeguards.  Data privacy is important to building trust in industry and the lack of trust can impact organizational performance.  Integrity can be argued in other industries as being an extremely high priority for prospective information quality guidelines.

Without data integrity, decision makers may make decisions based on incorrect or incomplete information, which can lead to costly mistakes and negative consequences. For example, in the healthcare industry, incorrect or incomplete data can lead to misdiagnosis, incorrect treatment, and ultimately, harm to patients. Similarly, in the financial industry, incorrect data can lead to inaccurate financial reporting, which can result in regulatory violations and legal consequences.

Data integrity is also crucial for maintaining the reputation and credibility of an industry. If data is found to be inaccurate or unreliable, it can damage the trust that customers, investors, and other stakeholders have in the industry. This can lead to a loss of business, decreased revenue, and a damaged reputation.

Objectivity in information quality is essential because it helps to ensure that the information we receive is based on facts and proof, rather than personal biases or opinions. In today's world, where there is an abundance of information available at our fingertips, it can be challenging to separate fact from narrative. Objectivity helps to ensure that the information we use to make decisions is reliable and accurate, which is crucial in

fields such as healthcare, finance, and law, where decisions can have serious consequences.

Moreover, objectivity is a universal value, and its importance can be generalized across industries. Regardless of the field or industry, objective information is essential to making informed decisions. From science to journalism, objectivity is the foundation of credibility and trustworthiness. In journalism, for example, objective reporting is crucial to maintaining the public's trust and ensuring that news outlets are seen as reliable sources of information. Similarly, in science, objectivity is essential to ensuring that research is unbiased and accurate, and that conclusions are based on evidence rather than personal beliefs. Overall, objectivity is a fundamental aspect of information quality that is essential in all industries and fields.

**Findings**

The results of the interview will be detailed question by question in the section below.

*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 percent were in directorship positions. A breakdown of roles can be seen below.

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

*Question 2: How long have you been with the company?*

The majority of interviewees had an average tenure with the company of five or more years. The remaining had a tenure of less than five years. The breakdown can be seen below.

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

**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 did acknowledge 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 weren't aware that data policy has a contributory impact on quality and governance. Many leaders acknowledged a shortfall of 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 towards cyber security. Data policy was not an important aspect of their day-to-day operations. Of those who had a policy it was poorly constructed 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?**

Data quality was perhaps the most important aspect of data management. In interviews conducted, all leaders emphasized the importance of data quality. They understood that data quality was the foundation of data management. 90% of participants rated this a

rank of 10, 5% ranked it 9 and the other 5% ranked it 8. The leaders who ranked it an 8 or 9 had more interest in building their cyber security programs.

**Question 6: Can you tell me some insight into the most important aspect of the data landscape in your department - velocity, volume, value, variety and veracity?**
This was a difficult question as many leaders did not understand the difference between velocity, volume, value and veracity.  I felt that this question was technical in nature and decisions needed to be made at a managerial level related to this question.  I had to spend a lot of time educating these leaders on what it meant. Results are listed below:

| Velocity | 10% |
|----------|-----|
| Volume | 10% |
| Value | 60% |
| Variety | 10% |
| Veracity | 10% |

**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 a process and coordination cross departmental coordination.  Many acknowledged failures in leadership to coordinate data management practices at a higher level. Among the feedback I learned was that leaders who are responsible 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 don't 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? Questions will be rated from 1-5, 1 being the lowest, 5 being the highest.*

Given the acknowledgment that data coordination activities were poor, leaders rated this question with the understanding that coordination of policy was a work in progress. Results are listed below.

| 5 | 0 |
|---|---|
| 4 | 1 |
| 3 | 2 |
| 2 | 10 |
| 1 | 7 |

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

Surprisingly I understood that data quality was a topic of conversation, however, there was a lack of internal coordination. In interviews, leaders did acknowledge that they knew their peers valued and wanted data quality.  Over 90% mentioned that their fellow peers do value data quality as much as them. Data quality had a direct linkage to budget and operational efficiency and was thus valued very highly.  However, cross functional collaboration was poor which led to silos. 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 leaders mentioned that they did not have a dedicated person or department to implement data management practices.  75% of leaders mentioned the need to have a designated person/committee to oversee data quality initiatives. *"Everyone is so busy, this just goes by the wayside"* was a quote from an interviewee that resonated with me. 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?  Question 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.19/20 rated this to be 5 and one person rated this to be a 4. When asked why they said a four, they mostly mentioned that cyber security 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 healthcare 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 told me that they get the same data written in different ways making things very difficult to transcribe into the system.

**Question 13: Does the department or company have a data quality assessment process?** *All leaders mentioned that there is 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/person to oversee data quality/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/ data governance?** All leaders acknowledged that there was no training or resources for data quality/data governance.

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

All leaders mentioned that they did not have an interdepartmental initiatives or committees on data quality.

**Managed Care Information Quality Guidelines**

*1. Background*

Managed care is a type of health insurance that contracts with health care providers and medical facilities to provide members care at reduced costs. These providers make up the plan's network. The primary goal of managed care is to help reduce costs while keeping the quality-of-care high. Managed care is aimed at managing cost, utilization and quality. 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. The type of plans also requires the member to see the primary care physician before going to other specialties. This plan does not cover the member if care is sought outside the network. Preventive care is covered at 100%. HMOs cost less, however offer less flexibility.

II. **Preferred Provider Organization (PPO) -** these plans offer more flexibility. Members can see any doctor whether in or out of network. There may be no requirements to see the primary care physician for a referral. Costs are usually higher.

III. **Point of Service -** these plans are hybrids of HMO and PPO plans. Members are given the flexibility to see providers in or out of the 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 -** these plans combine HMO and PPO characteristics. Members are required to see an in-network provider. Costs are usually higher than a traditional HMO plan but less than a PPO.

## 2.  *Purpose*

The purpose of these guidelines 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 groups. By implementing these guidelines, managed care groups acknowledge that ensuring the quality of information is an important objective which promotes the success of managed care plans. Additionally, it 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 the following: internet, printed matter, storage media, systems, telephone and multi-media.

i.  Internet - websites that display consumer information and intended for use by beneficiaries, their families, caregivers and advocates.

ii.  Printed matter - pamphlets, handbooks and directories related to programs.

iii.  Storage media - data from operations, nurse records.

iv.  Telephone - inquiries made by phone.

v.  Multimedia - any information that provides information about program information to enrollees.

vi.  IT Systems - internal systems that store and display any of the categories of information disseminated.

**3.1 Categories of Information Disseminated**

Depending on the type of managed care model, the information to be disseminated depends on the types of data that need to be utilized. For the purposes of this document a range of categories of data are identified.

i.   Patient data - medical information about the 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. 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 and its timeliness.

**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 data 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 an established format and should be able to be cross referenced.

IV.  Timeliness - ensures data is updated in a timely manner with an established schedule.

**4.1.2 Utility** - the consumption of data by its intended users is critical in managed care institutions. Just one example is patient data. It is important for healthcare providers to

stay informed of patient needs and incorporating this 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 added by identifying the origins of the data.

 ii. Interpretability - this is relative to the intended audience.

 iii. Usability - determines the value the data brings to the enterprise.

 iv. Relevance - implies that information presented should reflect the end user's interests.

**4.1.3 Integrity -** managed care institutions should 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 -** due to the nature of 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 breaches. The Chief Data Officer should ensure standardization procedures are maintained internally with coordination amongst respective departments.

## 5. Budget

In order to maintain data quality standards, it is important to make financial commitments to promote quality and enforce standards. Appropriate amounts should be budgeted for relevant personnel and training needs. The hiring of personnel is important for administering and coordinating data policy and quality. Managed care institutions stand to gain value by creating a Chief Data Officer to lead data quality initiatives and coordinate data administration.

Budgets are also important to purchase software and training materials. The lack of proper training materials and software to administer quality/governance initiatives is an issue, with the result that many personnel go untrained and don't have the right tools to administer information quality standards. Enabling a budget process for quality initiatives will aid in the enforcement of quality goals. Through training personnel will be able to understand the value of data quality and ensure that the enterprise quality initiatives are enforced.

## 6. Regulatory Compliance

Due to the inherently close relationship between public health and government, managed care organizations must contribute to administration and development of regulatory decision making in addition to enforcing compliance within the organization. Any information mechanisms used in regulatory development or compliance should be reviewed by the quality review process and include expert advice.

All proposed regulations should be reviewed by compliance personnel from the perspective of implementation.

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

## 7. Reporting Requirements

All formal reporting should follow a quality review process prior to submission. Reporting requirements should be managed by the respective department. Managed care institutions should post their information quality standards on the internet. These guidelines will be needed for developing reporting metrics. Periodically, the Chief Data Officer in coordination with the Chief Information Officer should conduct an internal review to identify necessary updates to maintain the quality and traceability of review processes. Managed care institutions will need to perform yearly audits to validate the integrity of the data. Audits must review if data security and retention follow legal requirements.

## 8. Software Tools

Software installation and monitoring must comply with established security requirements. Security must be set up to prevent data breaches. All software applications must pass security requirements and be certified as HIPAA compatible. Yearly audits should be conducted to ensure that software configuration and operation complies with

security and regulatory needs.  IT tools should be monitored to measure objectivity and integrity.

### 9. Data Governance Committee

Data governance committees are needed that play an integral role in enabling the coordination and implementation of data across the Enterprise. Managed care institutions stand to gain value in instituting a data governance plan. The purpose of this paragraph is to direct the organization to implement a data governance framework. This would enable internal teams to collaborate and eliminate silos that can lead to data management problems. The governance committees should establish the following.

1. Data stewards that ensure proper data management.

2. Ownership of data for the purposes of quality enforcement.

3. Measurement criteria for data quality.

4. Purpose and scope of data being handled.

5. Standardization for claims and patient data.

6. Monitoring of data handling processes.

7. Performance criteria.

8. A quality subcommittee to review quality issues.

9. Data security subcommittee.

10. A data governance document framework and policy manual.

### 10. Identify Data Quality Issues

Identifying data quality issues is imperative to administering patient outcomes and care. The role of data quality in managed care is further underscored by the nature of the business managed care institutions engage in. Any data quality issues found during

audits should be reviewed by a data quality subcommittee to rectify the issue. Root causes and solution development should be part of the success criteria for any data quality 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 the 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. A subcommittee is needed to oversee this need.

## 12. Human Resources

A critical aspect of ensuring that data quality and information guidelines are being implemented is the human resources (HR) department. Data should be valued as an enterprise asset and this tenet should be promoted by the HR department. The role of HR should be to conduct the following.

1. Ensure that qualified personnel have the appropriate level of education, training and knowledge on information quality.

2. Facilitate the hiring of qualified personnel who can perform data quality activities.

3. Implement enterprise training on information quality.

4. Enforce information policy that enables personnel to be trained and provide training to keep them up to industry standards.

5. Facilitate knowledge and skills to be developed to promote efficient and effective data management.

6. Provide activities to engage the entire enterprise in data quality management and other aspects of data governance including security.

7. Promote knowledge management best practices in data quality and data governance.

**Operational Model of Information Quality in Managed Care**
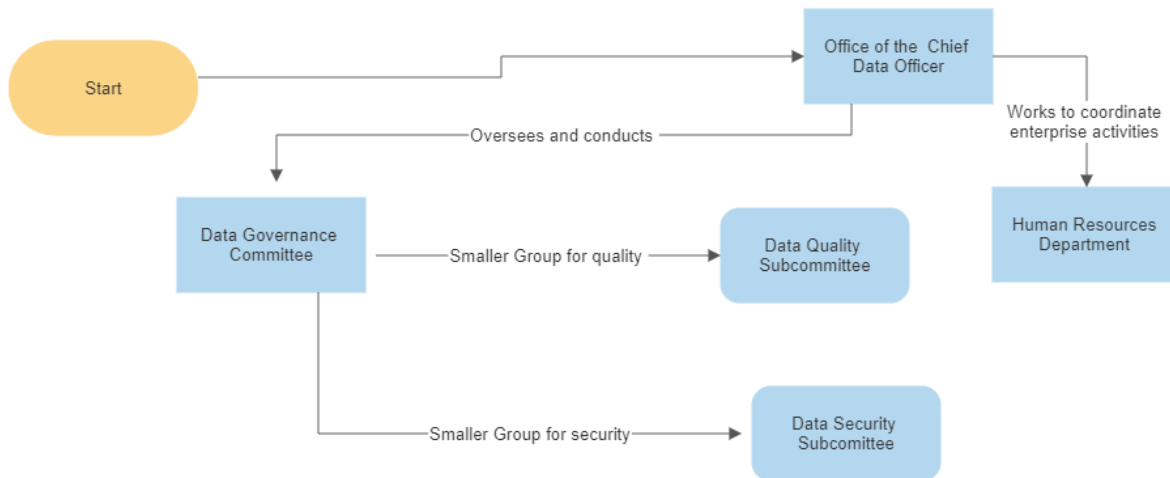


The framework suggested above provides a model for governance of information quality for managed care organizations. The efforts will have to be spearheaded by the Chief Data Officer who will liaison with the human resource department to implement initiatives and quality measures. The data governance committee should include stakeholders who can provide input.

**Justification for Information Quality Guidelines**

1. *Background –* This item is for readers to understand the setup of managed care institutions. Without understanding the background and the intent of what managed care is aimed at accomplishing, it is difficult to understand the objectives of these organizations. Therefore, a background is needed to help understand what managed care is tasked with delivering. Other information quality frameworks such as for the US Department of Treasury (https://home.treasury.gov/department-of-the-treasury-information-quality-guidelines) also have background sections included.

2. *Purpose –* In the EIA (https://www.eia.gov/about/information_quality_guidelines.php) guidelines there are paragraphs about the purpose of information quality guidelines and what their intent is. Similarly, it was included in this framework for the reader to better understand it. It helps clarify the objectives of the document.

3. *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 identifies the types of information and how it is distributed. By identifying the information being disseminated, the barriers of information transmittal are alleviated, and it enables the organization to monitor and improve the quality of its information. Information being disseminated in managed care organizations can be distributed by internet, printed material, storage media, multimedia, telephone and systems (tinyurl.com/yzak5546, section.5.2). The justification for this section is to allow for clarity on information sources so that the reader understands the various forms of data transmittal (tinyurl.com/pcmpx9n4).

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 or records may be stored in devices for later use.*

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

V. *Telephone – doctors' offices frequently discuss patient information via telephonic communication.*

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

## 3.1 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 is the foundation for how these institutions create treatment plans and coordinate preventative care. The administrative departments keep programmatic and administrative data needed for these institutions to process their

day-to-day operations. Dissemination mechanisms are listed in the Office of the Assistant Secretary of for Planning and Evaluation information quality guidelines. The justification for this item was from this quality guide (https://aspe.hhs.gov/reports/hhs-guidelines-ensuring-maximizing-quality-objectivity-utility-integrity-information-disseminated).

## 4. *Information Quality Goals*

Setting information quality goals is vital to measuring the value that the information provides to the user. Goal setting is also crucial to understanding the dimensions and metrics. These goals enable management to allocate resources to implement them. The majority of information quality guidelines mentioned the goals. A good example is the Office of Assistant Secretary for Planning and Evaluation (https://aspe.hhs.gov/reports/hhs-guidelines-ensuring-maximizing-quality-objectivity-utility-integrity-information-disseminated) which has a section in its information quality guidelines dedicated to goals. It mentions two overarching information quality goals.

Members and providers are the primary service groups that managed care organizations serve. These service groups rely heavily on quality data for them to provide care and understand their health metrics. Providing timely and accurate information is essential for decision making. 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 is key to delivering timely information, without consistency it is hard to manage information being disseminated for the purposes of providing timely information to patients. Governance should be established to ensure that all goals are democratized correctly. In its commitment to providing the highest quality of information, a governance initiative is important to

maintain structure and transparency. The 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 US Dept. of Health and Human Services in the document at https://aspe.hhs.gov/reports/hhs-guidelines-ensuring-maximizing-quality-objectivity-utility-integrity-information-disseminated, and the Energy Information Administration which describes this in the document at the location https://www.eia.gov/about/information_quality_guidelines.php.

**4.1.1** Objectivity - rated high among respondents, many agreed that objectivity was cardinal. Maintaining accurate and reliable data in patient care can mean life or death, hence, objectivity was rated the highest. Data presented in a coherent manner that is easy to understand should be established. Along with objectivity the dimensions of accuracy, completeness, consistency and timeliness were directly tied to providing reliable and coherent data which is easy to disseminate. These components allow for trust to be built with the information being presented.

**4.1.2** Utility - users of information have a purpose. For the consumption of data to be purpose driven the origins of the data should be documented. This was mentioned during interviews, most interviewees mentioned the need to identify source data for reporting. Identifying the source and keeping data lineage documentation is vital. Understanding the provenance of information helps enable the information to serve its purpose. In managed care institutions, information is stored in databases and disseminated via reports, systems, or multimedia, therefore it is important that the data can be easily understood, analyzed and properly used. Utility is also listed as a goal in the Consumer Financial Protection Bureau's information quality guidelines (https://www.consumerfinance.gov/open-government/information-quality-guidelines/).

**4.1.3** Integrity - protecting patient data is critical in healthcare. In today's world many organizations pay a hefty price when there are data breaches. Data breaches cost organizations millions each year, therefore it is important that managed care institutions place the correct safeguards to protect information. 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 to be disseminated in the proper manner. Internal systems should also have the right safeguards such as firewalls to prevent any nefarious actors from accessing sensitive data. Integrity is also listed in the Consumer Financial Bureau's information quality guidelines (https://www.consumerfinance.gov/open-government/infsormation-quality-guidelines/)

**4.1.4** Standardization - due to the nature of the business, there are multiple ways information can be disseminated. According to respondents the need for standardization is extremely important. In a particular example provided by a respondent, it was mentioned that a specific utilization terminology was being referred to in many different ways thus causing confusion. Thus, the importance of standardization is vital to setting information quality goals. In interviews it was mentioned heavily that standardization was needed in managed care organizations.

### 5. *Budget*

Assigning a monetary value to data quality sets a precedent that it is valued as an organizational asset. Budgets are essential to allocating funds for personnel to implement data 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 data quality operations, significantly impeding positive outcomes. In question 15 - Does the company allocate a budget for data quality initiatives, a majority of the interview respondents mentioned the lack of personnel assigned to data quality improvements in the enterprise. As a result, there was no leadership to enforce standards and processes. Budgets were frequently mentioned in interviews due to lack of funding and many quality initiatives were not implemented.

## 6. *Regulatory Compliance*

Healthcare is strongly impacted by requirements for compliance. Regulatory compliance includes the processes that support an organization's adherence to regulations, laws and other requirements for how the organization operates. The intent of compliance mandates is to protect patients, their privacy, and society. Managed care institutions work daily with electronic health records, hence the need to strictly enforce privacy protections. Failure to protect data can lead to significant penalties.

There are five major laws that regulate the industry. They are listed below:

- 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 the information is used. Facilities are also required to update and maintain these standards.

- 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 health care quality issues.

- Affordable Care Act (ACA) - the goal of the ACA is to enable healthcare for all. Additionally, the ACA has also mandated measures to minimize the cost of healthcare.

- The Health Information Technology for Economic and Clinical Health (HITECH) Act - this law aims at executing cybersecurity measures and promoting the proper use of electronic health records.

Managed care institutions are heavily regulated by compliance regulations. A majority of interviewees mentioned the link between compliance and the nature of the business that was being conducted.

## 7. *Reporting Requirements*

Managed care organizations are frequently tasked with providing reports to various entities due to the nature of their work. For example, with Medi-Cal recipients there are quarterly and yearly information requirements that need to be provided to the state. These requirements are often used in the reimbursement mechanism for services provided to the patient. Managed care organizations have to identify the sources to build reports to send to the state. The quality of this information is vital as the state pays for the services rendered.

There are also many compliance related reporting requirements that need to be implemented as part of reporting. In order to manage the various reporting requirements a quality assurance process is necessary. In most interviews it was mentioned that reporting requirements were key to enforcing data metrics that improve data quality. The quality assurance process enables personnel to audit and set standards for the data. This promotes accuracy and timeliness in the information being presented to the respective entities.

Furthermore, audits enable the organization to assess and ensure if proper security measures are being taken to protect and safeguard the data. Reporting requirements are the foundation to understanding the effectiveness of programs and health outcomes. In many interviews it was mentioned that quality guidelines need to be highlighted by reporting guidelines. Additionally, the consumer finance department lists a reporting requirement in its information quality guidelines (https://www.consumerfinance.gov/open-government/information-quality-guidelines/)

**8.** *Software Tools*

Software used for administrative and service purposes is crucial to the mission of managed care organizations. All software being used should meet security standards to enable compliance-based technology operations. During interviews, respondents frequently mentioned the lack of controls on information and the need for controls. Lack of controls means that an organization is not ensuring the security of information being accessed. Furthermore, the information that is accessed through these tools has to be accessed by the right personnel with the correct privileges. For example, nurses should be able to see patient charts, but an administrative person should not be able to see patient charts for privacy reasons. Yearly audits will ensure that the right access points are given to the intended audience therefore promoting the information quality goal of utility. Utility is an important factor in software administration and use in managed care. The justification for this item results from interviews where participants noted that managed care information quality guidelines should emphasize the software which handles the data. During interviews when discussing question 10, many interviewees mentioned that software was important in quality guidelines.

**9**. *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 by the American Health Information Management Association (AHIMA) found that nearly a third of participants had made no headway in promoting data governance as a business imperative, and for another 24 percent, governance was not a priority for their leadership

(https://library.ahima.org/doc?oid=107716#.ZFg99XbMJD8). Clearly, the practice of managing data to ensure it meets organizational quality and integrity standards is often overlooked. Leaders play a key role in fostering a culture where data quality is prioritized. At the very top, leadership recognition is key to creating a governance plan. In conversations with leaders a governance process was highly emphasized as a overarching goal to govern data quality and security issues.

Participation from leadership is the link to engaging personnel to institute an interdepartmental governance plan. Identifying objectives is key to a data governance program. Data stewards are vital to interdepartmental coordination of data quality standards. Ownership of data is crucial to the ownership and management of data. Coupled with these two fundamental principles, the measurement, scope, purpose and standardization are the foundation to information quality management. It addresses the "why" of good data management. The governance committee is also the principal keeper of coordination and resolving issues with quality by monitoring any issues and overseeing a subcommittee to review quality issues. Due to the nature of the sensitive data that is being collected it is also important that the governance committee oversees a subcommittee that monitors the security of data. In many interviews the lack of data governance programs brought to light the gaps in managed care. The justification for this item came from interviews where leadership stressed the need for a data governance program.

## 10. *Identifying Data Quality Issues*

Poor data quality can lead to adverse outcomes in the treatment of patients. Good data governance relies on any issues being resolved in a timely and appropriate

manner. When source data is not displaying correctly due to error, it leads to patient frustration and mistreatment.  It can also create an environment of distrust in technology and result in a decrease in efficiency.  Additionally, policy makers who rely on data sets can make poor and ineffective policy decisions or recommendations because of the lack of good quality information. Good data quality management ensures that the source of the data is provided, and that data meets formatting and preconditions, allows for secure collaboration, has effective tools for maintenance and has lifecycle accountability.

To ensure that good information quality standards are being practiced at all times, a subcommittee to govern quality issues should be established. The governance committee should oversee a specialized subcommittee for reviewing quality issues and rectifying them in a timely manner. The reason for a subcommittee is being recommended is because the governance committee is tasked with oversight of data quality operations, however, a specialized subunit reporting to the governance committee that reviews issues and resolves them would improve the efficacy of data management operations in managed care institutions. Issues need specification, coordination and communication, and a subcommittee tasked with oversight of such specific issues could allocate the right number of resources for such an effort. The justification from this item came from interviews where a number of those interviewed highlighted the need for a data quality subcommittee to review and resolve issues in this domain.

## 11.  *Data Security*

A cardinal function of information quality is the security of data. Poor data security is a tremendous risk to managed care institutions.  The constant threat of malevolent actors is always in the background of organizational operations.  Elevating security to an

enterprise issue which is governed by the data governance committee helps bring this issue to the fore. Creating a patient safety focused culture of security is the foundation to protecting data in managed care organizations. By establishing a data security subcommittee that reviews security protocols and institutes guidelines, the enterprise will be more able to take an effective stance against nefarious actors, carelessness and accidents.  A specialized group of personnel dedicated to data protection that reports to the governance committee will enable the administration of proper data practices in the enterprise. The justification for this item comes from interviews where participants mentioned the need for a comprehensive strategy to govern data security. In question 10, many responses mentioned the need for a proper data security framework.

## 12.  *Human Resources*

To facilitate a culture of information quality in the enterprise, the department is tasked with hiring, recruiting, managing benefits, ensuring employee satisfaction, implementing company culture and training employees is critical. Typically, in any organization every human resource department plays a vital role in advocating for the protection of enterprise assets such as human capital and mitigation of any risks. Data being an asset should be regarded the same. It is important that HR administers training for all employees on the value of data and its quality policies and procedures. Every new employee must be trained on the organization's tenets on data quality.  In liaison with the Chief Data Officer, the HR department must help with administering quality initiatives.  In interviews, many respondents mentioned the need for HR to help steer initiatives. HR thus plays a pivotal role in facilitating and coordinating quality activities and initiatives.  In a number of interviews, it was mentioned that human resources needed to coordinate

quality into the culture of the enterprise. The lack of human resource leadership frequently

did not allow for quality to the emphasized adequately in the organizations.

**Managed Care Data Quality Training**



MANAGED CARE DATA
QUALITY TRAINING



WHAT IS
DATA
QUALITY?

The Data Management Body of Knowledge
(DMBoK ) defines Data Quality (DQ) as "the
planning, implementation, and control of
activities that apply quality management
techniques to data, in order to assure it is fit for
consumption and meet the needs of data
consumers." .

2

# WHY IS DATA QUALITY IMPORTANT?

| PRODUCTIVITY | COMPLIANCE | REVENUE |
|---|---|---|
| Promotes confidence from users | In healthcare its pivotal to maintain good data quality to measure compliance regulations | Bad data can lead to penalties and loss of revenue |

3

# HOW IS DATA QUALITY MEASURED

**ACCURACY**

Data accuracy is the level to which data represents the real -world scenario and confirms with a verifiable source. Accuracy of data ensures that the associated real -world entities can participate as planned.

**COMPLETENESS**

Completeness measures if the data is sufficient to deliver meaningful inferences and decisions.

**CONSISTENCY**

If the same information stored and used at multiple instances matches. It is expressed as the percent of matched values across various records. Data consistency ensures that analytics correctly capture and leverage the value of data

**INTEGRITY**

Data integrity ensures that all enterprise data can be traced and connected.

**UNIQUENESS**

Data uniqueness is measured against all records within a data set or across data sets. A high uniqueness score assures minimized duplicates or overlaps, building trust in data and analysis.

**VALIDITY**

The value attributes are available for aligning with the specific domain or requirement.

SOURCE: COLLIBRA.COM

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## HOW CAN YOU MEASURE YOUR DAILY DATA FLOW?

### COMPLETENESS?

Is the data I am looking at complete? Are there any incomplete datasets?

### ACCURACY

How correct is the data I am viewing?

### UNIQUENESS

Is there duplicates in the data I am seeing?

### VALIDITY

Does the Data fit the description? Do the definitions make sense?

### CONSISTENCY

Is the data I am looking the same across the organization?

### INTEGRITY

Can I see the data with a clear picture of it impacts the organization? It is traceable? Does it tell a good story?

5

## THE COST OF BAD DATA

- IBM estimates the yearly cost of poor – quality data in the US is $3.1 Trillion
- Hurts the reputation of the company
- Undermines the company
- As much as 50% of the IT budget may be spent in information scrap and rework

- Gartner estimates $12.9 million to be the yearly cost of poor – quality data.

- Bad data quality in healthcare costs 314 billion annually.

- Business cost of bad data may be as high as 10 – 25% of an organization's revenue
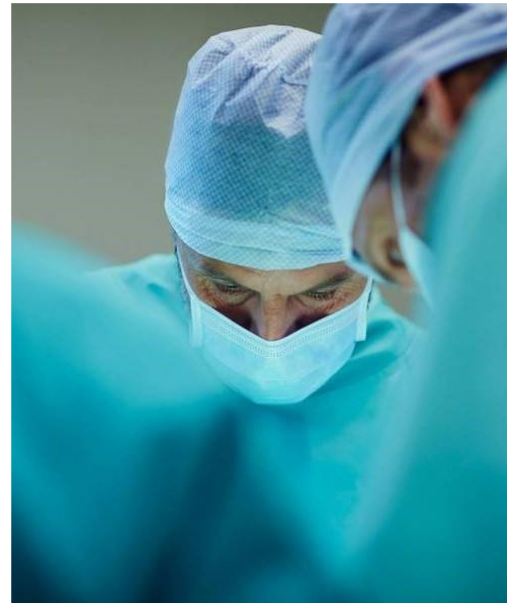


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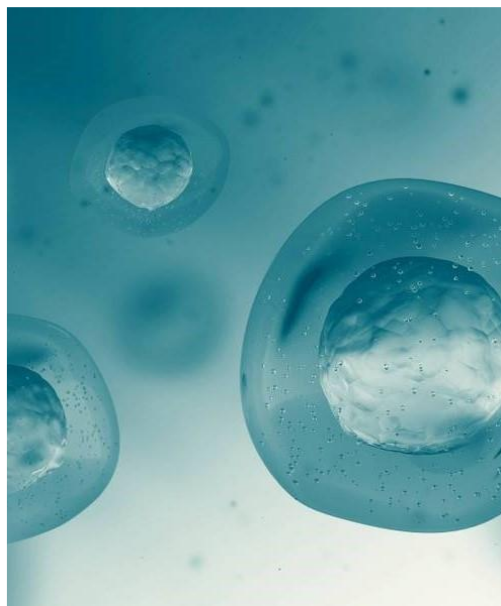
# EXAMPLES OF "BAD" DATA

**Friday Afternoon Measurement Spreadsheet**

In this example, look at the last 100 customer orders and identify how many records are error-free.

| Record | ATTRIBUTE 1 Name | ATTRIBUTE 2 Size | ATTRIBUTE 3 Amount | ATTRIBUTE 15 | Perfect record? |
|---|---|---|---|---|---|
| 1 | Jane Doe | Null | $472.13 | | No |
| 2 | John Smith | Medium | $126.93 | | Yes |
| 3 | Stuart Madnick | XXXL | Null | | No |
| 4 | Thoams Jones | | | | No |
| | | | | | |
| 100 | James Olsen | 24 Lockwood Road | $76.24 | | No |

Number of perfect records = 67

SOURCE THOMAS C. REDMAN

© HBR.ORG

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## DATA QUALITY IN HEALTHCARE



### PATIENT CARE

Good data is indispensable to managed care institutions. Patient care is based on good data and therefore very important

### DECISIONS

Good data enables healthcare leadership to make decisions on business operations

### EFFICIENCY

Good data promotes efficacy in delivering quality patient care and operational excellence

8

# HOW CAN I ENSURE QUALITY OF DATA IN MY ROLE?

In a recent publication, Forbes notes that 84% of CEOs are concerned about the integrity of the data on which they're basing their decisions

9

**ACCORDING TO A GARTNER SURVEY, COMPANIES ESTIMATE THAT BAD DATA COSTS THEM NEARLY $13 MILLION PER YEAR.**

## DATA QUALITY CHECKS

- Identifying any duplicates, looking out for any overlaps
- Checking that mandatory fields appear?
- Identifying any null and missing values to fix the completeness of data
- Ensuring that business rules define the data
- Checking how up to date the data is
- Validating the     data  you see
- Reporting any inaccuracies

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# BENEFITS

| BETTER DECISIONS | INCREASED SCALABILITY | PRODUCTIVITY |
|---|---|---|
| Opportunity to build | Freedom to invent | Few competitors |
| Addressable market | Serviceable market | Obtainable market |

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# HOW CAN YOUR ORGANIZATION ACHIEVE DATA QUALITY

| Control of Data | Data Requirements |
|---|---|
| Avoiding Duplicate Data | Integrity guidelines |
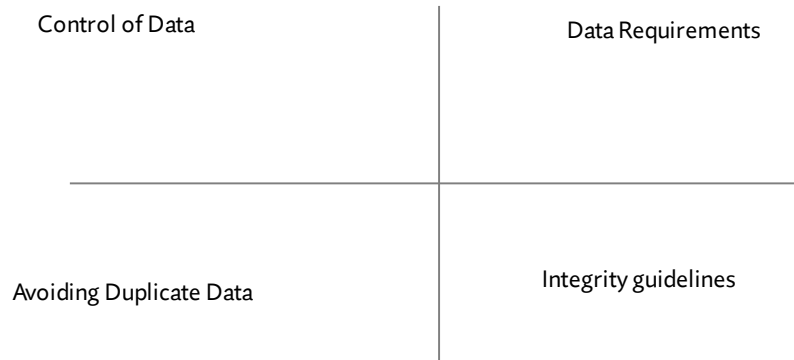
# WAYS TO ENFORCE DATA QUALITY IN MANAGED CARE ORGANIZATIONS

It is imperative that data quality is prioritized, and measures are taken to promote processes
Data quality can prevent fatalities and provide better quality of care

# DATA GOVERNANCE COMMITTEE

**Data Governance Committee**

**Subcommittee on Data Quality**

| A DATA GOVERNANCE COMMITTEE CAN HELP ESTABLISH QUALITY GUIDELINES |
| --- |
| Eliminate interdepartmental silos |
| Data Stewards |
| Establish ownership |
| Data security and quality |

**Enabling Budgets**

**Regulatory Compliance**

**Software Tools**

15

To facilitate a culture of data quality in the enterprise, the department tasked with hiring, maintaining a budget, recruiting, managing benefits, ensuring employee satisfaction, implementing company culture and training employees is important

Human resources plays a vital role in advocating for the protection of enterprise assets, data being an asset should be regarded the same

HR should be the leader in enforcing a comprehensive strategy to implement data quality initiatives and enforce quality

HR AS A PARTNER

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## INFORMATION QUALITY GOALS

**OBJECTIVITY**

**STANDARDIZATION**

**UTILITY**

**INTEGRITY**

**ACCURACY**
**COMPLETENESS**
**CONSISTENCY**
**TIMELINES**

**CONFORMITY TO A STANDARD**

**PROVENANCE**
**INTERPRETABILITY**
**USABILITY**
**RELEVANCE**

**SECURITY**
**PRIVACY**
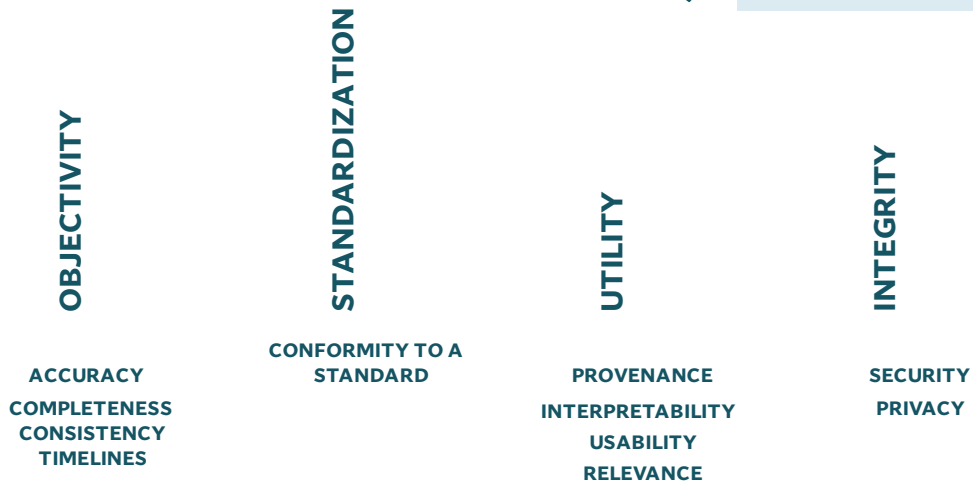
17

## HOW DO I REPORT DATA QUALITY ISSUES?

- Asses if your organization has a data governance committee
  - Bring to their attention the discrepancy
  - Detail the issue with the proper requirements
- Become a data steward
- Report the issue to a manager
- If you or have a question about the data, ask yourself the following questions
  - What is the objectivity of the data
  - What is the utility of this data
  - Is their data integrity
  - Should there be a standardization?

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## SUMMARY

Data Quality is the foundation for organizational success and should therefore be highly prioritized. In healthcare data quality can mean life or death and therefore its imperative that quality control measures are set in place.
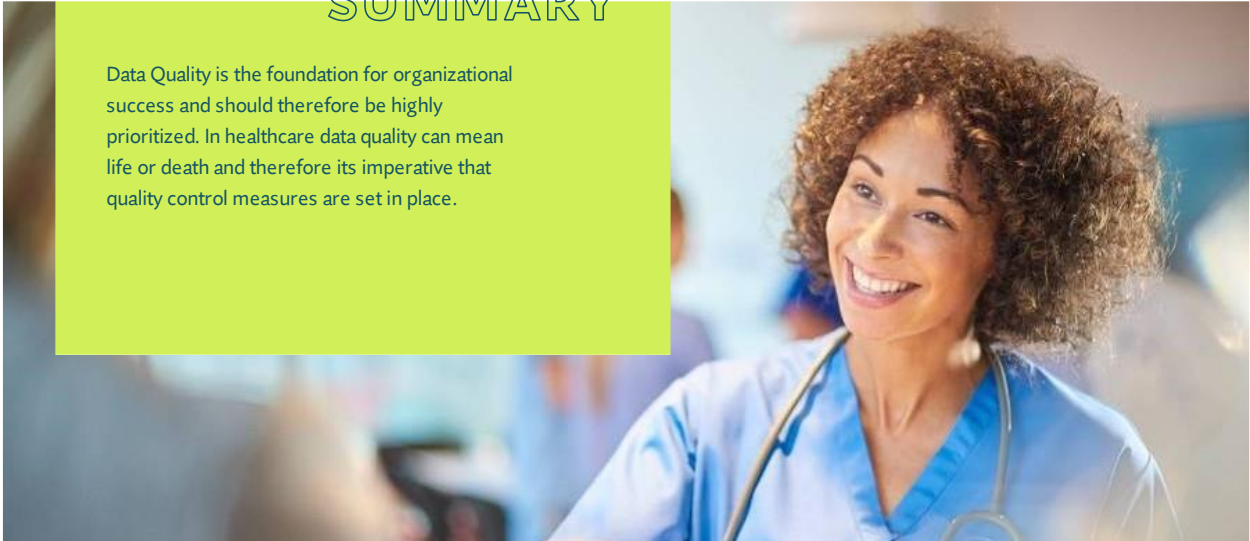
19

## THANK YOU

Grace Crossette - Thambiah

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**Conclusion**

The majority of the interview responses indicated that varying priorities of leadership resulted in the lack of data quality stewardship in Managed Care Organizations. The varying priorities of leadership lead to a lack of coordination of data management activities in the enterprise. Responses to the importance of data quality indicated that leadership did value data quality but lacked the time and resources to implement initiatives. The general consensus was that data quality was very important to their respective departments. However, because of internal silos no knew how to collaborate and create cross functional communication.

Another finding was that most managed care organizations lacked an overall data governance framework. Department budgets were not allocated for data management activities. The study understood that the lack of monetary allocation also contributed to the problem of why data quality was not prioritized. For data governance activities to be implemented there needed to be resources, without a budget many of these organizations were not able to hire resources to implement activities. A data governance framework is vital to eliminating silos and promoting quality initiatives. Leadership was also not aware that the resources within its departments were not well informed about data quality.

The study established that the four major goals of information quality in managed care were objectivity, standardization, utility and integrity. Standardization was new to the domain because of its direct link to the way health care data has discrepancies in its reporting. The myriad of data points being funneled through managed care organizations without a standard was a failure point. Reconciling the integrity and objectivity of this data was often a challenge. In many circumstances these organizations had the daunting task

of trying to reconcile the data. Unfortunately, these efforts didn't lead to fruition as many were not able to understand the utility behind it. Since managed care organizations are not the originators of the data, it makes it very difficult to comprehend the relevance of what is being reported.

Objectivity was key to most organizations; the accuracy and completeness of data is the foundation of a successful organization. Many leaders mentioned the need for timelines and consistency in the data they were receiving. The utility of data dealt with its relevance, without understanding its interpretability it was hard to base value on the data. Utility was key in developing many preventative models in healthcare. The evolution of advanced analytics has resulted in healthcare institutions relying on data to develop predictive models that rely on relevance and provenance. Lastly, security and privacy were the top layer of the foundation needed to main data quality. Without security and privacy, it was hard to vouch for the integrity of data quality.

In conclusion, it can be established that data quality was highly valued by organizations, however, there were many barriers that prevented these organizations from implementing fundamental data quality initiatives. Barriers such as silos between departments, lack of leadership and funding played heavily into reasons of why no programs were implemented. Another issue was ownership, there wasn't a single department or person designated to carry out these activities.

The future of data quality in healthcare relies on coordination and implementation of data quality programs and standards. This study contributed in the aspect of managed care organizations and data quality. The framework detailed in the study sets forth a guideline to how managed care organizations can implement and prioritize data quality

standards. Furthermore, this study also brought together how leadership in managed care organizations prioritize healthcare and their perspective on how to improve data quality.

By examining how leadership prioritizes data quality in managed care, this research shed light on the extent to which managed care organizations are able to effectively leverage data to inform decision-making. It also identified barriers to achieving high-quality data and inform strategies for improving data quality and use. In addition, this research also contributed to a broader understanding of the importance of data quality in healthcare and the role of leadership in promoting and ensuring data quality. It addressed the gap in literature in which looked at healthcare leaders in managed organizations and their perspectives on data quality.

**Appendix**

**Question 1:  What is your Role/Title:**

| Interviewee | Response |
|---|---|
| Person 1 | Chief Executive Officer |
| Person 2 | Chief Executive Officer |
| Person 3 | Chief Executive Officer |
| Person 4 | Chief Executive Officer |
| Person 5 | Chief Executive Officer |
| Person 6 | Chief Executive Officer |
| Person 7 | Chief Operations Officer |
| Person 8 | Sr.Director of Information Technology |
| Person 9 | Chief Executive Officer |
| Person 10 | Chief Executive Officer |
| Person 11 | Chief Executive Officer |
| Person 12 | Chief Executive Officer |
| Person 13 | Chief Executive Officer |
| Person 14 | Chief Executive Officer |
| Person 15 | Chief Operations Officer |
| Person 16 | Chief Executive Officer |
| Person 17 | Chief Executive Officer |
| Person 18 | Sr. Director of Data Intelligence |
| Person 19 | Chief Executive Officer |
| Person 20 | Chief Executive Officer |

**Question 2:**

*How long have you been with the company?*

| Interviewee | Response |
|---|---|
| Person 1 | 5 years |
| Person 2 | 7 years |
| Person 3 | 7years |
| Person 4 | 2 years |
| Person 5 | 9 years |
| Person 6 | 10 years |
| Person 7 | 6 years |
| Person 8 | 15 years |
| Person 9 | 6 years |
| Person 10 | 4 years |
| Person 11 | 5 years |
| Person 12 | 5 years |
| Person 13 | 1 year |

| Person 14 | 8 years |
|-----------|---------|
| Person 15 | 9 years |
| Person 16 | 9 years |
| Person 17 | 7 years |
| Person 18 | 7 years |
| Person 19 | 8 years |
| Person 20 | 10 years |

**Question 3:**

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | Our depth and breathe of this company is based on data and for automation tools to 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. |
| Person 2 | Data is critical for Production Planning, Pacing & Performance Management. |
| Person 3 | Data for us is an asset in determining the RAF and potential revenue for a member at a health plan while also identifying potential conditions that the member may need to be seen by a provider which allows us to support those services in the member being timely seen by a physician. |
| Person 4 | Data is the life blood of our department. Our entire job is based on data management from the initial loading of user data to all the way to the outputting back to clients. We have a hand in every step of that process |
| Person 5 | Data provides support to current state, historical and future state potential for business decisions, operationally and from the client perspective. Storing data securely is essential for my organization. We don't have a proper data warehouse that's an important step in how we govern data. Reporting is very important in health care. We do need data for reporting purposes. |
| Person 6 | Data allows us to make better decisions and see specific sets of data. It is very important for my decision-making capabilities. Our reporting and analytics rely on data heavily. Data integration is vital for our company. Integration informs our analytics. |
| Person 7 | Data can be used to influence future decisions but could also be used to expand the market. My budgets and finance operations rely very heavily on data. Without data we would be lost. Claims relies on data and certainly our nurses. Data is a |

| | |
|---|---|
| | part of everything in this company. It's a fundamental aspect of our daily work. |
| Person 8 | Through my tenure with this company, I have learned that data is very important for decision making capabilities. Data security is key and crucial to maintain patient privacy. |
| Person 9 | As the CEO data is very important to me. It helps me gauge current and future state. I am able to make valuable business decisions because of data. |
| Person 10 | It helps our clinical staff understand patient care plans, outcomes and helps us understand how to perform preventative medicine. I will say it's critical. It's a fabric that interwoven into all our work streams. |
| Person 11 | There is no questioning on how data is important for this organization. Simply put it, its at the heart at what we do. Without data there won't be a foundation to build important business functions. Management of this data is a core principle we are struggling with in this organization. |
| Person 12 | Very important, I would say. It's at the core of everything we do. Securing data is very important, putting in proper controls is something I am currently working on. |
| Person 13 | I have definitely seen how data is important, so far, I have noted that how data is perceived depends on the person here. But for me coming from my experience its very important. Data informs our analytics and having a good data warehouse is important. I am working with IT on this currently. |
| Person 14 | Extremely important, bad data could cost us millions. I use data to make decisions on a daily basis. This organization has had its fair share of how to prioritize its data. At times it's been challenging on how to implement data management practices. |
| Person 15 | My fellow peers may not agree with me, but I think data is very important. On the financial side, it helps drive decisions on facility expansion. The handling of data is quintessential to the success of this company. |
| Person 16 | Crucial to my day to day. I need it to make operating decisions. I don't know how I can base justifications without data. |
| Person 17 | Very important to me and my organization. In terms of care, I have so many staff who use this data for treatment plans. It's the very core of what we do. |
| Person 18 | In my 7 years of being here I cannot stress how important data is for this company. It's used for operational purposes here and its fundamental in every way. Given today's unique world I think we are grappling with how to protect data. It's been a challenge. |
| Person 19 | Data is very important we have to get reimbursed for our expenses from the state. Its very very important. Where it gets tricky is that we don't have a centralized system to collect data. |
| Person 20 | It's a centralized process at this company that we recognize is very important to aid in decision making capabilities and patient |

| | care. Everyone here knows that data is the backbone of this company. Its extremely important, especially in healthcare. |
|---|---|

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

| Interviewee | Response |
|---|---|
| Person 1 | We have multiple that are managed by our security and compliance team. |
| Person 2 | We have Company policies regarding business need to know & specific HIPAA regulations regarding the protection of PHI. |
| Person 3 | Yes, and it is reviewed annually. |
| Person 4 | Due to the nature of the and sensitivity of our data we have lots of security policies around how our data is stored, how and who can access it, as well as companywide yearly training for handling it. Every step is tightly handled and secured. |
| Person 5 | Yes, client provided or delivered data is all handled with PHI precautions. For reporting, version control with data source identification. |
| Person 6 | No |
| Person 7 | Not to my knowledge |
| Person 8 | Yes we have some but it does need some work, its not a complete product. Poor policy |
| Person 9 | Not to my knowledge. |
| Person 10 | No |
| Person 11 | Not really, we have a couple security policies and that's it. |
| Person 12 | No we currently don't have a comprehensive plan. |
| Person 13 | Policies are related to data retention. We are investigating ways to mine data for other. uses. |
| Person 14 | We have some but its is not comprehensive, its not well thought out. Due to regulatory guidelines we added some but its not thorough. |
| Person 15 | No |
| Person 16 | No, we have to work on it. |
| Person 17 | No |
| Person 18 | No |
| Person 19 | Nothing on data policy |
| Person 20 | No, this is a gap for us. |

**Question 5**

*In what ways is data quality important to your department? Can you rank it from 1-10?*

| Interviewee | Response |
|---|---|
| Person 1 | 10 |
| Person 2 | 10 |
| Person 3 | 10 |
| Person 4 | 10 |
| Person 5 | 10 |
| Person 6 | 10 |
| Person 7 | 10 |
| Person 8 | 10 |
| Person 9 | 10 |
| Person 10 | 9 |
| Person 11 | 10 |
| Person 12 | 10 |
| Person 13 | 10 |
| Person 14 | 10 |
| Person 15 | 8 |
| Person 16 | 10 |
| Person 17 | 10 |
| Person 18 | 10 |
| Person 19 | 10 |
| Person 20 | 10 |

*Question 6: Can you tell me about some insight into the most important aspect of the data landscape in your department - velocity, volume, value, variety and veracity?*

| Interviewee | Response |
|---|---|
| Person 1 | Velocity |
| Person 2 | Veracity |
| Person 3 | Value |
| Person 4 | Value |
| Person 5 | Value |

| Person 6 | Volume |
|----------|--------|
| Person 7 | Value |
| Person 8 | Veracity |
| Person 9 | Value |
| Person 10 | Variety |
| Person 11 | Value |
| Person 12 | Value |
| Person 13 | Value |
| Person 14 | Velocity |
| Person 15 | Value |
| Person 16 | Value |
| Person 17 | Value |
| Person 18 | Variety |
| Person 19 | Value |
| Person 20 | Volume |

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | As a leader I recognize that we fail in cross functional collaboration. There are big silos in my team. No one talks to each other. |
| Person 2 | Definitely very poor minimum viable product when it comes to data quality. We don't talk to each other. Projects are prioritized based on importance but we don't have rubric. |
| Person 3 | Very poor, I have spoken to HR about this, something needs to be done but we are so busy its hard to coordinate such activities. |
| Person 4 | We don't have cross functional collaboration. |
| Person 5 | Good question, just the other day we came across an issue that led to financial penalties, this could have been resolved if these departments communicated with each other, but we don't do that here. |
| Person 6 | Poor, we need to work on it. |
| Person 7 | Don't have a policy or process to improve interdepartmental coordination. We don't have a good process, there are gaps. |
| Person 8 | It's a failure point for us. |
| Person 9 | Not very good, we need to set up working groups and committees, we are so busy we don't talk to each other. |
| Person 10 | Not very good, finance is the only department that does a good job talking to each other. There are gaps we need to address. |
| Person 11 | Depending on the department, some departments talk to each other, but some just don't talk at all. Let me be honest with you, there are a lot of interdepartmental issues that lead to |

| | communication issues here. I need HR to help me. I can't do it alone. |
|---|---|
| Person 12 | Not good, we need to improve. |
| Person 13 | In a typical world we should be excelling at cross functional collaboration but here we fail. I don't have a person managing governance related activities.  Its hard to coordinate all these things with my workload. |
| Person 14 | I think we do a decent job I would say, but we need to improve. There is a lot we can do to improve communication, but we don't do much.  Managers need to talk to each other. Collaboration does need improvement. |
| Person 15 | Not the greatest, communication is poor. Our communication department deals with so much externally that we can't focus on internally. I think this is a failure point for us. I really need someone to help coordinate these activities. We are too busy to take on more. |
| Person 16 | It does need work. We need to promote collaboration.  I would say the claims department does a great job communicating but the others are in silos. This is not the best situation to be in as it can lead to bad outcomes. |
| Person 17 | Definitely needs work. I need the help of HR. |
| Person 18 | We need to set up committees and promote collaboration. I need to foster a culture of collaboration. I have spoken to HR about this. It's a very important issue for me. |
| Person 19 | Not the best, it does need work. Need to promote a working group for the 2$^{nd}$ quarter so that we eliminate silos. |
| Person 20 |  A huge area in need of improvement.  I am in talks with HR to help me with this.  HR needs to work on this. |

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

| Interviewee | Response |
|---|---|
| Person 1 | 4 |
| Person 2 | 1 |
| Person 3 | 1 |
| Person 4 | 2 |
| Person 5 | 2 |
| Person 6 | 1 |
| Person 7 | 1 |
| Person 8 | 2 |
| Person 9 | 2 |
| Person 10 | 3 |
| Person 11 | 1 |

| Person 12 | 2 |
|-----------|---|
| Person 13 | 1 |
| Person 14 | 2 |
| Person 15 | 2 |
| Person 16 | 3 |
| Person 17 | 1 |
| Person 18 | 2 |
| Person 19 | 2 |
| Person 20 | 2 |

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | I think my peers that should care do. Everyone's job is to respect and follow the policies, but my value of my roadmap items are based on the accuracy of data. So I might care a bit more than most. |
| Person 2 | Yes. Data is critical to any company's success.  From R&D to Development to Production to Finance to L&D, and everywhere else—we cannot afford to work in the dark. Operational inefficiencies, lost revenue & costs would be catastrophic without good data. |
| Person 3 | We all need clean and complete data to succeed. |
| Person 4 | Other parts of the company definitely care more about the quality of data as much as I do. |
| Person 5 | Mostly do |
| Person 6 | Yes, its important but we lack a coordinating body for cross functional collaboration. |
| Person 7 | Sometimes, it depends. For example, IT thinks a lot about data quality. |
| Person 8 | It really depends on the understanding of subject matter expert. |
| Person 9 | Yes, but it depends on the type of project. |
| Person 10 | Sometimes, yes, but it's completely situational. |
| Person 11 | Our claims department really values data, they are the team that promotes such cross departmental coordination. |
| Person 12 | Not really, it depends on my staff. Some department heads do , some don't. |
| Person 13 | Absolutely, our team definitely sees the value but again we are too busy to coordinate such activities. |
| Person 14 | I am not sure, sometimes I think some of my peers do but the others are just busy. There are definitely a lot of silos that prevent us from talking to one another. Reporting guidelines are a important along with security we do have to work on this. |
| Person 15 | Yes, I think everyone can vouch for that. |
| Person 16 | Depends on who you ask, sometimes yes, sometimes no. |

| Person 17 | We need to meet more often to understand my peers, we are in such a silo its hard to tell at this point. Integrity is extremely important we need to work on this. |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Person 18 | Yes, but we don't have the tools or resources to collaborate. There are gaps, interdepartmental coordination is very poor. We don't know about data security and reporting guidelines we are very new to this evolving field. This is something I need to work on with my team. |
| Person 19 | I can say my fellow peers definitely do. But we don't talk. Because we don't talk I barely know what they are thinking. We are too busy, we need someone to help coordinate these things. I can't even get someone to help me with understanding the data from another department. It's a gap. Because we are reporting data to the state we do need guidelines. |
| Person 20 | Yes, we have briefly spoken about it, I know they value data but we all so overwhelmed. I have spoken about establishing committee but no one has the time to do such things.  A committee on data governance and quality. |

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | Policies are located in central location<br><br>Training is done annually or bi-annually thru a portal<br><br>Quizzes on the training<br><br>Management support and reconciliation<br><br>Retro reviews on all projects of their success and failure to have a constant improvement pipeline<br><br>Regulatory owners on healthcare changes and policies delivered by CMS with community of practice meetings |
| Person 2 | Communication & collaboration leading to better documentation. |
| Person 3 | More automation with checks that can allow for immediate data clean up. |
| Person 4 | Most of the data quality lies on the client to give us good data the best way to improve that is to hold them to a higher standard in the data they give us. |

| Person 5 | Improved collaboration, improved communication and companywide best practices with recommendations |
|---|---|
| Person 6 | Data validation and security, key elements. We do need this. Additionally, we also do need reporting guidelines, its very important that this is looked into. We need budgets to have a someone lead a data governance initiative that is very important to me. |
| Person 7 | A centralized team that can help coordinate these activities. |
| Person 8 | Eliminating silos can be a good start. We struggle with that here. We need a team or someone to help us in the area of security, quality issues and reporting guidelines with the state. This will be a good start. Sources are important to run analytics. This is important for us. |
| Person 9 | Automation checks but first we need to establish a rubric. Security and standardization are very important. Also a data governance framework to establish reporting guidelines. We need to have a chief data officer manage such things. |
| Person 10 | I think a team dedicated to understanding what the data is and how to standardize is very important. Recently there was a breach- I also think security is important along with a team or someone to run governance activities. |
| Person 11 | Have HR lead quality initiatives with respective partners. |
| Person 12 | We don't have a budget aligned; this would be a good start to resolving these issues. We don't have source data. That's the foundation of a good analytics department. That's a failure for us. |
| Person 13 | Having a Chief Data Officer manage governance initiatives. That's very valuable in healthcare, it establishes leadership and eliminates silos. |
| Person 14 | Improving means we really need to look into our data, understand the objectivity of it, we don't have a good blueprint. A data governance body will be a monumental step in my opinion that will help in addressing reporting, software, compliance and quality issues, I do need to allocate budgets for this. We need a dedicated team. We need more people to work on understanding source data. |
| Person 15 | Having quarterly quality meetings with respective leadership teams. This will help with discussing any issues and problem solving. Establishing a governance body to oversee software, reporting, data quality issues and security is very important. I can't have my organization spend thousands in security breaches. |
| Person 16 | Create a regional framework led by managed care organizations to establish guidelines and processes. This way there is standardization across the board. We also need to look at software and its success. Reporting for analytical |

| | performance along with standardization is a good practice. I don't have anyone here to help me with these things. |
|---|---|
| Person 17 | The CEO should play an important role in emphasizing data quality and allocate budgets for initiatives. We do need help in the area of compliance, software and reporting. Standardization is another element. Having a HR partner to manage these activities along with a person would help a lot. |
| Person 18 | Definitely having a team managing these activities. We don't have quality goals. We need a steering committee to help with these activities.  HR would be a good start. |
| Person 19 | Right now, there are so many silos, HR needs to spearhead campaigns to help eliminate silos. Software installed here needs proper input and security. Data cannot be housed with bad software. |
| Person 20 | Establish a blue-ribbon commission, that would help. We need help from government entities to establish a standard that will help with governance, reporting, compliance and software needs. We do need HR's help on this. |

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

| Interviewee | Response |
|---|---|
| Person 1 | 5 |
| Person 2 | 5 |
| Person 3 | 5 |
| Person 4 | 5 |
| Person 5 | 5 |
| Person 6 | 5 |
| Person 7 | 5 |
| Person 8 | 5 |
| Person 9 | 5 |
| Person 10 | 5 |
| Person 11 | 5 |
| Person 12 | 5 |
| Person 13 | 5 |
| Person 14 | 5 |
| Person 15 | 5 |
| Person 16 | 5 |
| Person 17 | 5 |
| Person 18 | 4 |
| Person 19 | 5 |
| Person 20 | 5 |

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

| Interviewee | Response |
|---|---|
| Person 1 | Everything in 4 RASICs should be mandatory. Though all people are responsible for the quality of data and making sure PHI rules are upheld; it is always good to have a solid owner of data operations and data controls. |
| Person 2 | Clear definitions—who owns the data, what is the purpose of the data, who needs access to it, how to deliver the data, what cadence, etc. Uniformity of Data—Health Plans capture a variety of data elements & there is a lack of consistency therein. |
| Person 3 | Automation with more prompt alerts for data managers on internal and external teams. |
| Person 4 | Data quality standards would be a hard for health care, there is lots of different systems with all kinds of different levels of current tech stack. The biggest thing would be a standard digital format for medical records/data. The next thing would be the possibility for remote access to systems communication between systems. For both data retrieval as well as data updating. |
| Person 5 | Standardization, we are sinking with the varying sources of data that mean the same thing, but because we don't have standardization its hard. |
| Person 6 | The use of only one system instead of multiple system where there are issues with the transferring and data reconciliation. |
| Person 7 | As more organizations move to full electronic tracking of patients it is important that different systems can talk to each other. There should be standardization of key metrics in order for us to learn from the data across various systems/users. |
| Person 8 | Data quality is very important to me, as an organization I know we are failing at this. For me ensuring that we have one system to keep conformity is very important. Transparency is key but who do have transparency when you have so much disparity? |
| Person 9 | Regulations in healthcare have made it very difficult but that the nature of the business of managed care. Although regulations are very important they also make it difficult to govern our data sources. I would say keeping a systemic process of key metrics. Having a single system would definitely help. |
| Person 10 | Undoubtedly standardization. My team cannot understand the purpose of the data without standardization. Its important. |
| Person 11 | I need someone who can manage these activities in the organization. Not having a person designated to manage quality of the data is a failure point. I would say getting someone is important to establishing guidelines in my organization. |

| | |
|---|---|
| Person 12 | Definitely standardization, I have doctors' offices send us data but we can't understand the purpose of this data because there is no standardization. I think its very important to establish it. |
| Person 13 | Establishing controls in data is very important to me. We don't have controls. But I cannot maintain controls without conformity. The various sources of data being reported adds confusion. I think have a standard across the board is the first step. |
| Person 14 | Consistency is key. Having proper timelines is what I need for my company. Along with security and why the data is needed. |
| Person 15 | That's a hard question because it requires feedback from stakeholders. What I would propose is to first have a steering committee being led by someone who is tasked with carrying out quality-related activities. Incorporating this feedback will help understand how to maintain a quality standard. |
| Person 16 | Establishing a single point of entry with process that dictates how data can be read and utilized. Currently the process is discombobulated and that makes it hard to govern the data. |
| Person 17 | Security controls are important to me, we have so much in insurance for data breeches, we are hemorrhaging money. I would like to work with cyber security to implement controls and maintain a guidebook. |
| Person 18 | Good question, I really need someone to help coordinate standards, we don't have standardization. |
| Person 19 | A good timeframe and standards is what I would recommend. Currently, we are all over the place and its not helpful to the way we are running this business. |
| Person 20 | Standardization- so important right now to me. I can't tell you how many meetings I have had where I cannot get someone to tell give me straight answer.  A coordinated way of standardization is what I would propose. |

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

| Interviewee | Response |
|---|---|
| Person 1 | No |
| Person 2 | Not to my knowledge |
| Person 3 | No |
| Person 4 | We have to work on that, No |
| Person 5 | No |
| Person 6 | No |
| Person 7 | No |
| Person 8 | No |
| Person 9 | No |
| Person 10 | We don't have one |
| Person 11 | No |
| Person 12 | Unfortunately, no |

| Person 13 | No |
|-----------|-----|
| Person 14 | Sadly, no |
| Person 15 | No |
| Person 16 | No |
| Person 17 | No |
| Person 18 | No |
| Person 19 | No |
| Person 20 | No |

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | No |
| Person 2 | No, we don't have one |
| Person 3 | No |
| Person 4 | No |
| Person 5 | No – do need a person or department to oversee this work. |
| Person 6 | No- we do need a person to run this. |
| Person 7 | No |
| Person 8 | No- I don't and I need to have someone run these efforts. |
| Person 9 | No |
| Person 10 | We don't have one and I need to talk to the team about it. |
| Person 11 | Sadly, no |
| Person 12 | Unfortunately, no |
| Person 13 | No |
| Person 14 | Sadly, no |
| Person 15 | No- that's a gap |
| Person 16 | No- would love to have dedicated resources. |
| Person 17 | No – spoke to my colleague the other day about designating someone for these work streams. |
| Person 18 | No |
| Person 19 | No |
| Person 20 | No- we are in need of one |

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

| Interviewee | Response |
|-------------|----------|
| Person 1 | No |
| Person 2 | No |
| Person 3 | No |
| Person 4 | No |
| Person 5 | No |

| Person 6 | No |
|---|---|
| Person 7 | No |
| Person 8 | No |
| Person 9 | No |
| Person 10 | No |
| Person 11 | Sadly, No again |
| Person 12 | Unfortunately, no |
| Person 13 | No |
| Person 14 | Failure point for us, no |
| Person 15 | No- that's another gap |
| Person 16 | No |
| Person 17 | No |
| Person 18 | No |
| Person 19 | No |
| Person 20 | No |

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

| Interviewee | Response |
|---|---|
| Person 1 | None to my knowledge |
| Person 2 | Nothing |
| Person 3 | Nothing |
| Person 4 | Nothing |
| Person 5 | Nothing |
| Person 6 | Nothing |
| Person 7 | Nothing |
| Person 8 | Nothing |
| Person 9 | Nothing |
| Person 10 | Nothing |
| Person 11 | Nothing that I am aware of |
| Person 12 | None so far |
| Person 13 | No |
| Person 14 | Nothing |
| Person 15 | Nothing |
| Person 16 | None |
| Person 17 | Nothing |
| Person 18 | Nothing |
| Person 19 | Nothing |
| Person 20 | Nothing |

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

| Interviewee | Response |
|---|---|
| Person 1 | None to my knowledge |
| Person 2 | Nothing |
| Person 3 | Nothing |
| Person 4 | Nothing again |
| Person 5 | Nothing |
| Person 6 | Nothing |
| Person 7 | Nothing |
| Person 8 | Nothing |
| Person 9 | Nothing |
| Person 10 | Nothing |
| Person 11 | Nothing that I am aware of |
| Person 12 | Nope |
| Person 13 | None |
| Person 14 | Nothing |
| Person 15 | Nothing |
| Person 16 | None |
| Person 17 | Nothing |
| Person 18 | Nothing |
| Person 19 | Nothing |
| Person 20 | Nothing |

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