

Data Governance in Healthcare ELT Processes: Challenges and Solutions Explore the Challenges of Data Governance in ELT Processes within Healthcare and Propose Best Practices for Compliance and Quality Assurance

Saurabh Gupta

gup.sau@gmail.com

Abstract

This research discusses the issues and solutions surrounding medical ELT data management. As healthcare becomes data-driven, strong data governance protects privacy, enforces standards, and maintains data quality. Research reveals that healthcare organizations face obstacles despite advances. Problems include insufficient resources, ambiguous regulations, and unstandardized control methods. The paper proposes robust healthcare security policies, automated compliance solutions, and regular personnel training. It emphasizes testing innovative technologies in real life and standardizing data management. This will assure patient data accuracy, quality, and safety in a fast-changing data environment.

Keywords: Data management, data governance, ambiguous regulations, automated compliance and data accuracy.

INTRODUCTION

Healthcare information managed to ensure accuracy, security, and compliance. Data control uses Extract, Load, and Transform (ELT) to manage enormous amounts of healthcare data from extraction to transformation [1]. A central database stores and formats data from various sources for ELT analysis. Healthcare IT is required because patient data is sensitive and regulated by HIPAA and GDPR [6]. Poor data management in these operations may result in mistakes, noncompliance, and data breaches, all of which can have significant legal and financial ramifications.

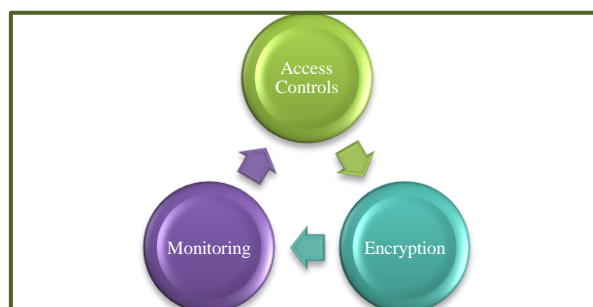


Figure 1 Data Privacy and Security

Securely storing healthcare data on ELT systems is difficult. To secure huge, sensitive healthcare data from hackers, we need strong access limits, encryption, and monitoring [2]. The accuracy and stability of medical device, EHR, and external system data are challenging to ensure. Mismatched data might impair medical treatment and decision-making. Healthcare ELT systems also struggle with regulatory compliance. HIPAA's strict privacy and security requirements require healthcare organizations to audit their data processing [4, 5]. This study investigated ELT healthcare data control best practices to generate solutions. This includes rigorous data quality checks, periodic audits, and the use of cutting-edge technologies like AI and ML to improve data management and compliance [3].

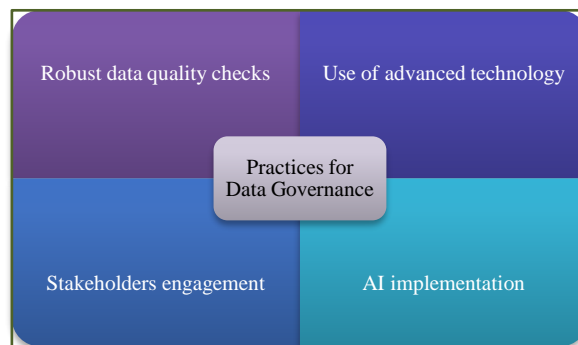


Figure 2 Practices for Data Governance

Problem statement

Healthcare uses Extract, Load, and Transform (ELT) techniques to handle vast amounts of data from medical devices, EHRs, and other systems. Data operations are tough to manage due to safety, security, and compliance. Poorly managed ELT processes may lead to erroneous patient data, security breaches, and HIPAA and GDPR violations [1, 9]. Healthcare data is growing more sophisticated, yet accuracy across sources remains a barrier [5]. Few comprehensive methods meet healthcare ELT process control needs, including compliance and data quality assurance, despite their importance [3, 7]. This study identifies healthcare ELT data management challenges and offers solutions.

Research Questions

- What are the challenges in managing ELT data in healthcare?
- How do hospitals guarantee ELT operations comply with data protection laws?
- How can healthcare ELT systems improve data quality and follow best practices?

Research objectives

- To identify and scrutinize the ELT data management challenges faced by healthcare firms.
- To evaluate the methods and technologies Healthcare facilities safeguard privacy during ELT operations.
- To propose best practices for improving healthcare ELT processes.

LITERATURE REVIEW

Healthcare facilities create data and utilize digital technologies; data management is vital. ELT operations threaten data quality, security, and compliance, making data management even more important.

Governance challenges for health data

Securely storing healthcare data on ELT systems is difficult. Since healthcare data includes personal, medical, and financial information [13], medical gadgets, EHRs, and cloud apps complicate healthcare

data security. Data quality, essential for healthcare decisions, is another concern. ELT methods have the potential to damage, duplicate, or misread data, compromising medical treatment and results. Bad data quality may lead to inaccurate conclusions, longer treatment wait times, and higher corporate costs [8, 10]. Integrating HIS, lab, and outside data sources is common in healthcare. This hinders data uniformity and accuracy. Data collection requires ELT methods, but poor management may compound these challenges.

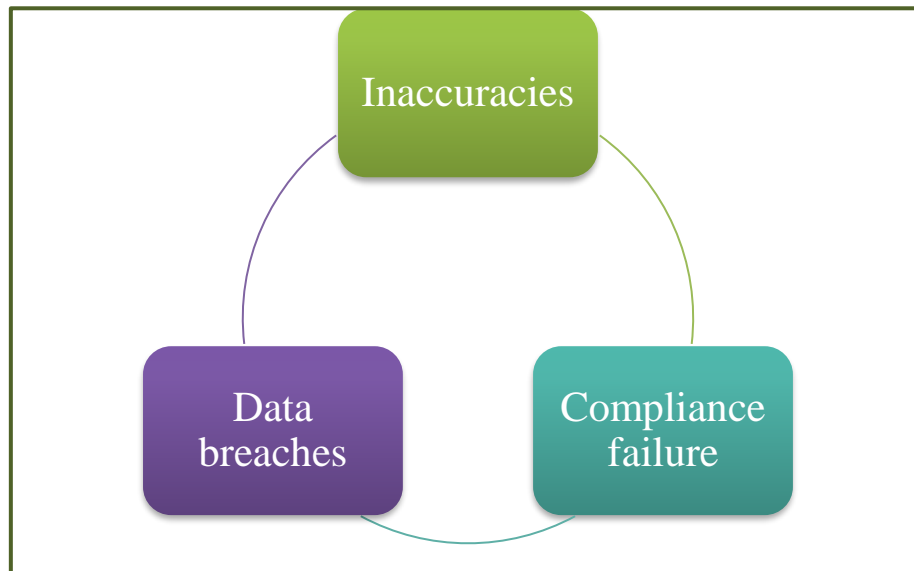


Figure 3 Consequences of Weak Data Governance

ELT procedure compliance

Healthcare law compliance is another ELT data control issue. Healthcare companies keep patient data private, accurate, and accessible by law [11, 15]. ELT must meet HIPAA and GDPR standards for data security. Due to the complexity of current data settings [15], many healthcare firms fail to meet these legal requirements. As healthcare providers use more cloud platforms, third-party apps, and big data analytics, system compliance gets harder. Quality checks and visible data reporting promote ELT compliance. ML and AI-based compliance checks may help healthcare companies spot data management vulnerabilities before they become illegal. Despite the advancements in technology, the use of sophisticated control systems to manage the complexity of ELT processes and ensure compliance remains rare [12, 14].

Best healthcare data management approaches

There are numerous effective methods for enhancing the control of healthcare ELT data. To preserve data quality during ELT [11], highlight data standards, processes, and validation testing. To secure data, [10] advocate encryption, strict access limitations, and continuous monitoring. These activities ensure adherence to standards and protect private health data from both healthcare and non-healthcare risks [18]. AI and ML enhance ELT data management. These solutions may automatically identify data mistakes, monitor real-time legal compliance, and improve decision-making by assuring data quality. AI-powered data control systems may improve patient outcomes by reducing human mistakes and enhancing healthcare data [17].

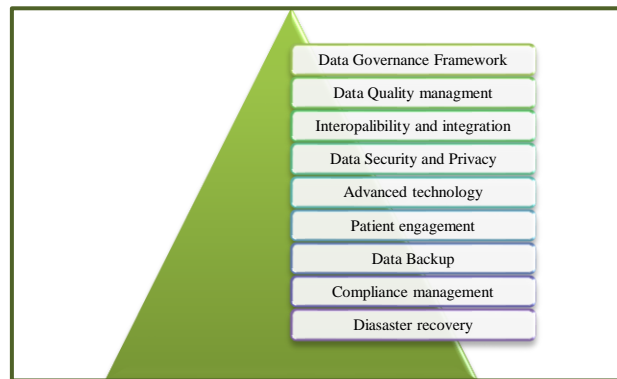


Figure 4 Best healthcare data management approaches

MATERIALS AND METHODS

This study uses a systematic literature review technique to assess the healthcare data control literature on ELT procedures. Systematic literature review analysis is notable for discovering scientific literature patterns, trends, and gaps. This way, observe all healthcare ELT data control challenges, best practices, and emerging technology.

Data Collection

This study used Google Scholar and Dimensions for its bibliometric analysis. Chose these because they have numerous peer-reviewed information systems, data management, healthcare articles, meeting transcripts, and reviews. The keywords we used were "data governance," "ELT processes," "healthcare," "data quality," "data privacy," "regulatory compliance," and "artificial intelligence."

To verify data quality and relevance, these factors were used:

- Expert-reviewed 2010–2019 articles.
- Research into healthcare data management.
- Information about data-combining techniques like ELT.
- Publications cover healthcare data quality, protection, and legal compliance.

The non-expert papers and studies not relevant to healthcare or ELT were removed.

Data Analysis

The present study used thematic analysis to organize, assess, and group patterns and subjects. After completing the systematic literature review analysis, we examined the selected publications related to ELT healthcare data management.

Limitations

Systematic literature reviews and theme studies demonstrate research trends and core ideas, despite their challenges. Keywords have the potential to obscure valuable studies on data control difficulties or other languages. Thematic analysis is subject to bias and depends on the researcher's interpretation, but it provides valuable qualitative data.

RESULTS

Thematic and Systematic literature review studies assess healthcare ELT data control research. Subject analysis revealed four major themes, covering the literature's main issues and remedies. Privacy, security, compliance, quality monitoring, and new technology-based data management are priorities. These themes improve ELT process management and healthcare data.

Theme 1: Data privacy and security

ELT operations handling patient data put hospitals in danger of data breaches, hacking, and unauthorized access. Healthcare data extraction, loading, and modification need encryption, multi-factor identification, and continuous monitoring [18]. Anonymizing and de-identifying patient data throughout transformation is crucial, particularly when shared with third parties for research or analytics.

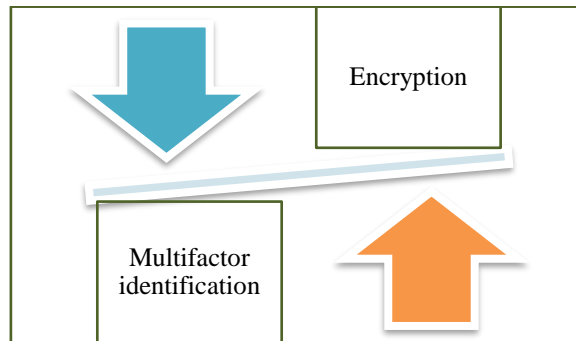


Figure 5 Data privacy and security

Theme 2: Regulatory Compliance

HIPAA and GDPR compliance is another important issue for healthcare businesses. ELT procedures must guarantee healthcare data privacy, accuracy, and accessibility [19]. Numerous studies demonstrate that rule violations may result in penalties, image harm, and financial losses [12, 13]. ELT compliance requires tracking and monitoring systems [19]. The goal of automatic compliance solutions, which use ML and AI to identify violations in real time, is to assist individuals in adhering to the law.

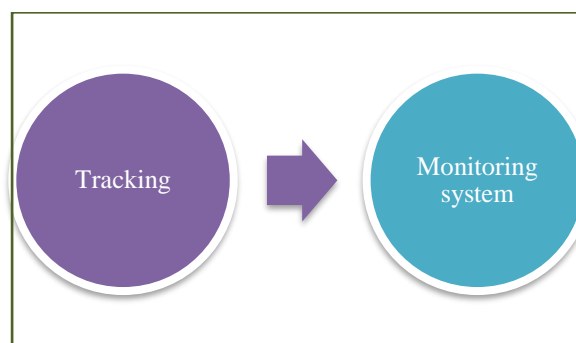


Figure 6 Regulatory Compliance

Theme 3: Data Quality

Reliable healthcare data impacts patient care and clinical choices. The investigations found that EHR, medical device, and database data complicate ELT data management. Missing or inconsistent data might impair clinical findings, reporting, and healthcare operations [20]. ELT data quality management literature includes data standards, validation testing, and automated error-detection systems. Thematic research also found that healthcare businesses require data stewards and thorough data cleaning to ensure ELT data quality and reliability [17].

Theme 4: Emerging Technologies and Data Governance

AI and ML improve data control and evaluate data quality, compliance, and security in ELT procedures. Many studies demonstrate AI-powered technology can quickly find data patterns, outliers, and compliance concerns [9, 13, and 18]. This improves ELT efficiency and reduces errors [20].

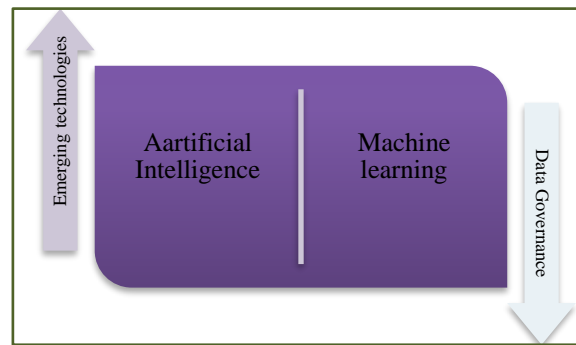


Figure 7 Emerging Technologies and Data Governance

DISCUSSION

The research highlights healthcare ELT data management challenges. The report emphasizes the importance of new technology, data privacy, compliance, and quality management. Research supports the design's security and privacy. This validates past research on proactive patient data protection [20]. However, smaller organizations often apply security measures differently. Healthcare companies found HIPAA and GDPR compliance to be challenging. Automated compliance solutions are expensive and complicated yet promising [21]. The research proposes industry-wide real-time compliance inspection and monitoring mechanisms.

Inconsistently combining data from multiple sources may lower healthcare information accuracy, affecting patient care. Although advantageous, robotic data checkers show the necessity for human supervision to assure data accuracy [17]. Bitcoin and AI may enhance data control. These technologies provide new solutions, but they're expensive, and the regulations aren't always clear, making integration difficult. [20].

CONCLUSION

This paper concludes by examining all the major challenges and opportunities of data management in healthcare ELT procedures. Prioritize data privacy and security, adhere to regulations, uphold data quality, and embrace emerging technologies. The findings show that healthcare businesses must prioritize data management systems with sophisticated security and legal procedures to protect patient data.

Recommendations and Future Research

This study highlights healthcare ELT data management challenges and opportunities. To improve data management, businesses should utilize encryption, privacy by design, and regular monitoring. Automation and standardization boost regulatory compliance. Data quality needs human and automated verification. Businesses should investigate AI and block chain and educate personnel on data control. Research should examine AI-powered data governance technologies, block chain use, standardized data governance frameworks, and AI's moral impacts, particularly on data bias and transparency. Healthcare institutions may enhance data governance by studying and implementing these standards. This will ensure patient data accuracy, quality, and safety in complex situations.

References

1. K. Abouelmehdi, A. Beni-Hessane, and H. Khaloufi, "Big healthcare data: preserving security and privacy," **Journal of Big Data**, vol. 5, no. 1, pp. 1-18, 2018.
2. P. Y. S. Barbosa, "Privacy by evidence: a software development methodology to provide privacy assurance," 2018.
3. S. Carter, "Developing Clinical Judgment through the Implementation of Information and Communication Technology, such as the Electronic Healthcare Record (EHR)," Gardner-Webb University, 2018.
4. L. A. Celi, J. D. Marshall, Y. Lai, and D. J. Stone, "Disrupting electronic health records systems: the next generation," **JMIR Medical Informatics**, vol. 3, no. 4, e4192, 2015.
5. G. Chiozzi, M. Kiekebusch, N. Kornweibel, U. Lampater, M. Schilling, B. Sedghi, and H. Sommer, "The ELT control system," in **Software and Cyberinfrastructure for Astronomy V**, vol. 10707, pp. 213-229. SPIE, July 2018.
6. M. J. Denney, D. M. Long, M. G. Armistead, J. L. Anderson, and B. N. Conway, "Validating the extract, transform, load process used to populate a large clinical research database," **International Journal of Medical Informatics**, vol. 94, pp. 271-274, 2016.
7. B. A. Kohrt, M. J. Jordans, E. L. Turner, K. J. Sikkema, N. P. Luitel, S. Rai, and V. Patel, "Reducing stigma among healthcare providers to improve mental health services (RESHAPE): protocol for a pilot cluster randomized controlled trial of a stigma reduction intervention for training primary healthcare workers in Nepal," **Pilot and Feasibility Studies**, vol. 4, pp. 1-18, 2018.
8. P. Kostkova, H. Brewer, S. De Lusignan, E. Fottrell, B. Goldacre, G. Hart, and J. Tooke, "Who owns the data? Open data for healthcare," **Frontiers in Public Health**, vol. 4, pp. 7, 2016.
9. C. S. Kruse, R. Goswamy, Y. J. Raval, and S. Marawi, "Challenges and opportunities of big data in health care: a systematic review," **JMIR Medical Informatics**, vol. 4, no. 4, e5359, 2016.
10. J. Liu, J. Li, W. Li, and J. Wu, "Rethinking big data: A review on the data quality and usage issues," **ISPRS Journal of Photogrammetry and Remote Sensing**, vol. 115, pp. 134-142, 2016.
11. J. Lu and M. Keech, "Emerging technologies for health data analytics research: a conceptual architecture," in **2015 26th International Workshop on Database and Expert Systems Applications (DEXA)**, pp. 225-229, IEEE, Sept. 2015.
12. G. Melibari, "ELT teaching quality and practice in Saudi Arabia: A case study of the perspectives of ESP and EGP students, teachers and managers at the ELC in Umm al-Qura University," 2016.
13. A. Reddan, "A critical analysis of quality management approaches in IT projects in Ireland and the relationship to successful project implementation," Doctoral dissertation, Dublin Business School, 2015.
14. W. Rimmer, "The experience of initial management training in ELT," **ELT Journal**, vol. 70, no. 1, pp. 78-87, 2016.
15. A. K. Saiod, D. van Greunen, and A. Veldsman, "Electronic health records: benefits and challenges for data quality," in **Handbook of Large-Scale Distributed Computing in Smart Healthcare**, pp. 123-156, 2017.
16. L. Sebastian-Coleman, **Navigating the Labyrinth: An Executive Guide to Data Management**, Technics Publications, 2018.
17. S. A. Senthilkumar, B. K. Rai, A. A. Meshram, A. Gunasekaran, and S. Chandrakumarmangalam, "Big data in healthcare management: a review of literature," **American Journal of Theoretical and*

- Applied Business*, vol. 4, no. 2, pp. 57-69, 2018.
18. P. Surarapu, R. Mahadasa, and S. Dekkati, "Examination of Nascent Technologies in E-Accounting: A Study on the Prospective Trajectory of Accounting," **Asian Accounting and Auditing Advancement**, vol. 9, no. 1, pp. 89-100, 2018.
 19. Y. Wang and T. A. Byrd, "Business analytics-enabled decision-making effectiveness through knowledge absorptive capacity in health care," **Journal of Knowledge Management**, vol. 21, no. 3, pp. 517-539, 2017.
 20. Y. Wang, L. Kung, W. Y. C. Wang, and C. G. Cegielski, "An integrated big data analytics-enabled transformation model: Application to health care," **Information & Management**, vol. 55, no. 1, pp. 64-79, 2018.
 21. P. M. Wright, A. J. Nyberg, D. J. Schepker, O. Cragun, and C. Hymer, "Inside the C-Suite: The CEO, the Board, and the ELT," 2017.