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Article

Policy framework for integrating data interoperability at public hospitals in South Africa

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Abstract: The implementation of data interoperability in healthcare relies heavily on policy frameworks. However, many hospitals across South Africa are struggling to integrate data interoperability between systems, due to insufficient policy frameworks. There is a notable awareness that existing policies do not provide clear actionable direction for interoperability implementation in hospitals. This study aims to develop a policy framework for integrating data interoperability in public hospitals in Gauteng Province, South Africa. The study employed a conceptual framework grounded in institutional theory, which provided a lens to understand policies for interoperability. This study employed a convergence mixed method research design. Data were collected through an online questionnaire and semi-structured interviews. The study comprised 144 clinical and administrative personnel and 16 managers. Data were analyzed through descriptive and thematic analysis. The results show evidence of coercive isomorphism that public hospitals lack cohesive policies that facilitate data interoperability. Key barriers to establishing policy framework include inadequate funding, ambiguous guidelines, weak governance, and conflicting interests among stakeholders. The study developed a policy to facilitate the integration of data interoperability in hospitals. This study underscores the critical need for the South African government, legislators, practitioners, and policymakers to consult and involve external stakeholders in the policy-making processes.

Keywords: data interoperability; policy frameworks; patient data; health information systems; data sharing; public hospitals; South Africa

1. Introduction and background

In today's rapidly evolving digital landscape, data interoperability is becoming increasingly valuable across various sectors as industries such as education, transportation, and healthcare undergo digital transformation and adopt new systems and software. Data interoperability, according to Jaleel et al. (2020), is crucial for the healthcare sector to establish a fully integrated and efficient ecosystem that securely exchanges health data across various disparate healthcare systems and applications. In essence, a policy framework is a prerequisite for any form of interoperability in the healthcare landscape. Ntafi et al. (2022) concur that the establishment of policy frameworks for data interoperability is of paramount importance in the rapidly evolving digital health ecosystem. Similarly, Kautsch et al. (2017) attest that policy and legal frameworks are crucial in the healthcare sector to promote data interoperability, as they provide a secure, standardised, and reliable environment for data exchange both within and across systems and healthcare facilities. Ultimately, these regulations are essential for establishing the standards and protocols, guiding implementation, encouraging collaboration, and ensuring strict compliance within the healthcare domain. Consequently, Katehakis et al. (2018) and Oemig and Snelick

(2017) stress the importance of hospitals, clinics, and other healthcare organisations worldwide establishing policy and legal frameworks to ensure the effective implementation and adoption of data interoperability among and between health information systems (HISs).

Given that policy frameworks are fundamental to data interoperability in healthcare settings, many public healthcare facilities in African countries continue to struggle with integrating data interoperability among health information systems. This challenge is largely due to the lack of, or non-compliance with, existing policy frameworks related to data sharing and system integration. Similarly, Mamuye et al. (2022) argue that many public healthcare facilities in African countries still lag behind in achieving true interoperability primarily due to the absence of well-designed policies, guidelines, and procedures governing health information exchange between systems. For instance, Bagyendera et al. (2023) affirm that achieving interoperability and integration among diverse health systems in Uganda remains a challenge due to several factors, including the absence of policies, guidelines, and standards. Bagyendera et al. (2023) assert that achieving data interoperability and integration among diverse health systems in Uganda remains a significant challenge due to the absence of policies, guidelines, and standards, particularly in rural or underserved areas where infrastructure and resources are already limited.

Adeniji et al. (2022) contend that the challenges in achieving effective data interoperability within and between Nigerian healthcare systems are primarily attributed to the absence of cohesive policy frameworks, clear guidelines, and uniform standards to direct the implementation process. Furthermore, Dlodlo and Hamunyela (2017) state that the Namibian healthcare system struggles to incorporate data interoperability in health information systems, due to the absence of guiding policies and Information and Communication Technology (ICT) regulations. To put it in perspective, South Africa, like many other African countries, struggles to integrate data interoperability across the health ecosystem due to a lack of policy guidelines and frameworks, as well as other factors such as inadequate infrastructure and insufficient resources. The Department of Health and the Council for Scientific and Industrial Research (2014) articulate that the lack of cohesive policy frameworks, standards, and non-compliance with regulatory requirements obstructs efforts to achieve data interoperability in numerous public hospitals, healthcare facilities, and primary care clinics across South Africa. Indeed, there is no doubt that the absence of policy frameworks, non-compliance, and legal uncertainty leads to inconsistencies in deploying data interoperability, diminishing the overall effectiveness of these technologies.

Wilson et al. (2021) advocate the view that data interoperability plays a key role in realizing Universal Health Coverage (UHC) by ensuring that patients receive equitable and consistent care across various healthcare settings. In South Africa, achieving interoperability among public hospitals is a pressing concern. To meet its UHC objectives, South Africa must address the challenges posed by fragmented health information systems (Department of Health, 2017). As a consequence, data interoperability could facilitate the seamless integration of services between public and private healthcare providers, ensuring that all patients, regardless of their location or financial status, receive the same quality of care. Despite the critical role of data

interoperability, many public-sector hospitals and most institutional care facilities in Gauteng Province, South Africa, continue to struggle with scaling efforts to achieve and maintain data interoperability across diverse systems. Experts believe that poor policy compliance, unclear policies, and the absence of policy frameworks exacerbate this challenge (Chetty, 2015; Department of Health, 2017). These regulatory gaps often lead to fragmented and siloed systems that are unable to share data efficiently, resulting in inefficiencies and poor health outcomes. The Department of Health (2017) stresses that the absence of policy and legal frameworks and clear guidelines discourages investment in data interoperability, limiting the ability of South African public hospitals to leverage digital health innovations to bridge the healthcare gap. Despite South Africa's formulation of the National eHealth Strategy and Health Normative Standards Framework, there is still a need for the development and implementation of policies, frameworks, and guidelines to achieve data interoperability in healthcare. Given that these frameworks lack clear policies and guidelines for achieving data interoperability in public hospitals and no prior study has proposed a policy to address this gap, this study seeks to develop a policy for integrating data interoperability into health information systems at public hospitals in Gauteng Province, South Africa.

2. Problem statement

Policy frameworks are fundamental for the successful integration of data interoperability in any healthcare organization. The driving force behind this study is the pressing issue faced by many public sector hospitals in Gauteng Province, South Africa, which struggle to integrate data interoperability within their health information systems. Bhartiya and Mehrotra (2014), along with the Department of Health (2017) emphasize that the absence of well-defined policy frameworks severely hinders data interoperability in public sector hospitals, particularly in Gauteng Province, South Africa. Nevertheless, without clear, actionable policies to guide the integration of data interoperability in health systems, hospitals face numerous challenges in facilitating the seamless exchange of data across various departments and institutions. This lack of data interoperability results in fragmented healthcare processes, delayed access to patient health information, and uncoordinated care, ultimately undermining the overall effectiveness of public healthcare services in the province.

Tsegaye and Flowerday (2021) attest that the persistent fragmentation in South African health information systems leads to disjointed care, which compromises patient safety and outcomes. While numerous studies in South Africa have identified challenges related to policy frameworks impeding the integration of data interoperability in hospitals—such as the lack of clear guidelines or actionable strategies—there remains a critical gap in offering practical, solution-oriented frameworks. To the best of the researcher's knowledge, no prior studies have proposed a policy framework specifically aimed at assisting public hospitals in successfully integrating data interoperability. This gap is significant, as it contributes to operational inefficiencies and challenges in delivering effective patient care. Addressing this gap is the driving force behind this study, which aims to develop a policy framework to

facilitate the integration of data interoperability in public hospitals in Gauteng Province, South Africa.

3. Conceptual framework

The study used a construct derived from institutional theory. Peters (2022) defines institutional theory as "the exploration of how social choices and behaviors are influenced and directed by the institutional environment, which encompasses the established norms, rules, and structures that govern interactions within a society". According to DiMaggio and Powell (1983), this theory explains how pressures from an organization's external environment can influence the adoption of certain practices and actions. The Institutional Theory views regulations, laws, standards, rules, and policies as coercive pressures that compel organizations to comply with government and regulatory requirements. David et al. (2019) concur that institutional theory is often used to explain the adoption and diffusion of formal organizational structures, such as written policies, standards, and emerging organizational forms. Coercive isomorphism was used as a framework for lens policy frameworks governing data interoperability in public hospitals. This coercive pressure ensures that data interoperability adoption meets societal and governmental expectations for transparency and accountability in healthcare (Guerrazzi, 2020). Developing a policy for data interoperability that ensures ethical and responsible usage will be critical to maintaining healthcare organizational legitimacy. This indicates that external forces like policies, standards, and regulations, in addition to technological capability, drive the adoption of data interoperability in healthcare.

4. Literature review

Policies, guidelines, and clear strategies are necessary ingredients for data interoperability. Fishlock (2020) asserts that healthcare policies delineate the objectives, strategies, and actions necessary to accomplish specific healthcare goals within a society. According to Lee et al. (2021), laws, public policies, and standards are vital to serve as the bedrock for the effective implementation and adoption of interoperability initiatives. The Department of Health (2015) emphasises that policies are essential for achieving full data interoperability between systems in healthcare organizations. To ensure effective implementation, healthcare employees and providers are legally required to develop and adhere to relevant documented policies and procedures (DoH, 2012). Similarly, the Department of Health and Human Services (2019) highlights the importance of healthcare policies and procedures in advancing data interoperability and improving patient access to health information. According to the World Health Organization (WHO) (2012), policies and strategies that support data interoperability form the foundation of its legitimacy. Therefore, the existence of comprehensive policies, procedures, and well-defined strategies that detail how healthcare stakeholders and authorities can achieve data interoperability and allocate resources is essential for the successful implementation of interoperability (Department of Health and Human Services, 2019).

Given that data interoperability within or between healthcare organisations relies on well-defined, documented policies, procedures, and clear strategies, it is critical for

health policymakers, governments, and regulators to establish and approve robust strategies supported by these policies to ensure legal compliance and consistent practices (WHO, 2012). The absence of effective healthcare policies, poorly enforced standards, and clear strategies in hospitals or other healthcare organisations may cause interoperability efforts to fall short of their intended goals during planning and implementation (WHO, 2012). Similarly, Subbarao et al. (2022) concur that the absence of well-structured policies and clear strategies can result in ineffective implementation and obstruct seamless data exchange between healthcare facilities. Recognising the importance of data interoperability in healthcare, public healthcare leaders and stakeholders must develop and approve clear strategies and supporting policies to establish interoperability within health systems.

5. Research methodology

The present study was conducted at six public sector hospitals located in the Gauteng Province of South Africa. The pragmatism paradigm served as the guiding philosophical foundation to address the problem under study. The study employed a convergent parallel mixed-methods design, integrating components of both quantitative and qualitative approaches to provide a holistic understanding of policy frameworks governing data interoperability in public hospitals. Data were gathered concurrently, analysed independently, and subsequently integrated to facilitate comparison and synthesis of the results (Creswell and Plano Clark, 2023). This methodology offered a more comprehensive understanding of the phenomenon by triangulating information from various viewpoints and perspectives.

A multi-level sampling technique was employed to select participants with relevant knowledge and experience about data interoperability and health information systems. The quantitative phase of this study involved a survey of 114 clinical and administrative support staff, using an online questionnaire to assess their knowledge and understanding of policy frameworks surrounding data interoperability of health systems. The questionnaire comprised Likert-scale items and closed-ended questions to enable statistical analysis. On the contrary, the qualitative phase involved semi-structured interviews with 16 key informants, including administrative managers, clinical managers, IT managers, and records managers involved in health information systems management. An interview guide was created with open-ended questions aimed at getting in-depth answers about participants' experiences. Document analysis was conducted to review policies and procedures, manuals, compliance reports, and standard documents related to data interoperability. The total sample size for this study was 160, as illustrated in **Table 1**.

Table 1. Breakdown of the target population.

Clinical and administrative staff	No. of sample surveyed	Management staff Interviewed	Codes	No. of sample interviewed
Doctors	20	Clinical managers	CM	2
Nurses	17	Records managers	RM	3
Administrative clerks	23	IT managers	ITM	5
Network controllers	16	Administrative managers	AM	6
IT technicians	21			

Table 1. (*Continued*).

Clinical and administrative staff	No. of sample surveyed	Management staff Interviewed	Codes	No. of sample interviewed
Revenue clerks	12			
Registry clerks	16			
Ward clerks	8			
Data capturers	11			
Total	144	Total		16

(Source: Field Data 2022).

Quantitative data were analysed using Statistical Package for the Social Sciences (SPSS) software (version 27) to generate descriptive statistics such as counts, frequencies, and percentages. Qualitative data were analysed through thematic analysis. The interviews were conducted in person and via Microsoft Teams. With the consent of the participants, all interviews were audio-recorded, later transcribed verbatim, and coded using the ATLAS. ti software (version 9.0). During the interpretation stage, the results of the individual analyses of the quantitative and qualitative data were combined. Convergence was evaluated by contrasting the themes identified from the qualitative interviews with the quantitative findings. Findings from the analysis of the two data sets' points of convergence and divergence were combined with other insights to provide a more nuanced understanding of the policy framework governing data interoperability in public hospitals. Ethics approval for this study was obtained from the University of South Africa (50119869_CREC_CHS_2022) and the Tshwane Research Ethics Committee (GP_202207_097) before participants were recruited for this study. Verbal and written informed consent were obtained from all subjects involved in the study prior to data collection. Confidentiality and anonymity were maintained throughout the study.

6. Results

This section presents the findings of this study categorized into the following themes: (a) availability of policies and clear strategies for data interoperability in public hospitals; (b) barriers and challenges in implementing data interoperability policies; (c) effectiveness of current policies in facilitating seamless data sharing; (d) risks of lacking a policy framework for data interoperability; and (e) resources required for implementing a data interoperability policy framework.

6.1. Availability of policies and clear strategies for data interoperability in public hospitals

Fishlock (2020) advocates that policies, guidelines, and clear strategies are vital to serve as the bedrock for the effective implementation and adoption of interoperability initiatives. The questionnaire asked respondents to confirm if their hospitals had formal written policies in place to support the development and implementation of data interoperability. As shown in **Figure 1**, the majority of respondents, 75.7% (109), reported that their public hospitals had not established any written policies to facilitate data interoperability. In contrast, 18.1% (26) indicated that

such policies were in place, while 6.3% (9) of the respondents were unaware of the existence of interoperability policies.

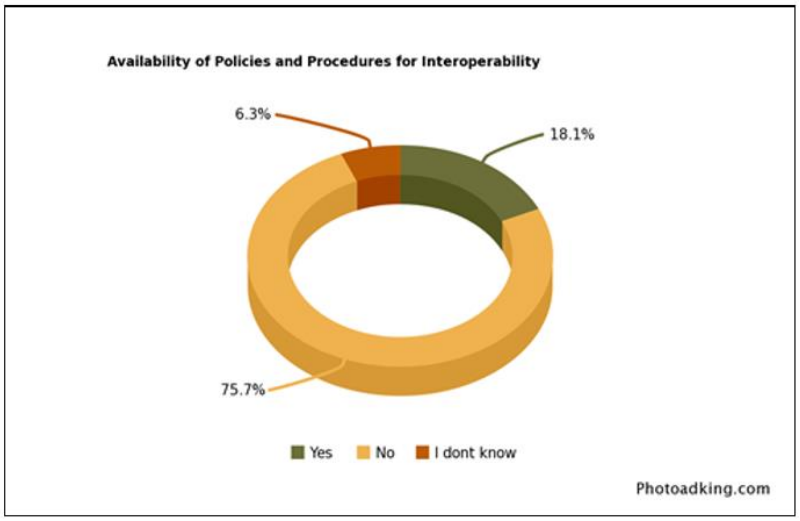

Figure 1. Availability of policies for data interoperability in public hospitals (*N* = 144).

During the interviews, most of the participants acknowledged that their hospitals had not put in place any written policies and procedures governing data interoperability. However, the interviews revealed that they had Standard Operating Procedures (SOPs) compiled and approved by the Department of Health at the head office level. Participant (AM-3) stated that:

Our hospital does not have documented policies and procedures that promote interoperability between systems. As far as I am aware, the Department of Health-Head Office has compiled and approved several Standard Operating Procedures (SOPs) that apply to health information systems to ensure that patient data stored in computer systems is appropriately handled and protected all the time. These SOPs are useful to provide a set of detailed instructions that all clinical and administrative staff in the hospital must follow. Furthermore, we have Procedure Manual 3, which outlines specific instructions and guidelines for handling and recovering data in hospital systems during power outages. And we also have UPFS, which is a uniform patient fee schedule that details how patients are charged. As managers in the hospital, it is our responsibility to ensure strict adherence with these SOPs for data and system management.

Document analysis revealed that public hospitals in Gauteng Province lacked formal written policies to support and enable data interoperability. As a follow-up question, respondents were asked to indicate whether or not their hospitals had implemented a clear strategy that provided a roadmap, specific goals, and steps for achieving data interoperability. **Table 2** illustrates that among the 144 respondents, 24.3% (35) reported that their hospitals had a clear strategy for implementing data interoperability. In contrast, 71.5% (103) stated that their hospitals did not have such a strategy, and 4.2% (6) were unsure.

Table 2. Clear strategy for data interoperability in public hospitals (*N* = 144).

Responses	Frequency (N)	Percentage (%)
Yes	35	24.3
No	103	71.5
I don't know	6	4.2
Total	144	100

(Source: Field Data 2022).

During the interviews, participants disclosed that their hospitals lacked a clear strategy for achieving data interoperability. However, most of them referenced the National Digital Health Strategy (2019–2024). Participant (AM-5) provided the following response:

Currently, our hospital has not taken additional steps or actions to develop a clear strategy or plan for implementing data interoperability among hospital systems. Instead, we are primarily relying on the National Digital Health Strategy for South Africa (2019–2024). This strategy provides a comprehensive framework for addressing existing fragmentation and outlines effective measures for achieving digital health interoperability, aimed at enhancing healthcare services in South African hospitals.

6.2. Barriers and challenges in implementing data interoperability policies

Mueller (2020) stresses that hospitals and healthcare facilities often face substantial challenges and obstacles when trying to implement policy, legal, and regulatory frameworks intended to support the broad adoption of technologies and systems. In the questionnaire, respondents were asked to identify the specific challenges and barriers they believe their hospitals encounter in developing policy frameworks for data interoperability. Most respondents, 34.7% (50), indicated that inadequate resources and funding are major obstacles for public hospitals in developing and implementing policy frameworks for data interoperability. Furthermore, 27.8% (40) cited poor governance and weak leadership as barriers, while 24.3% (35) pointed to a lack of clear guidelines and consistent objectives. Resistance to change was noted by 9.0% (13), and a minority of 4.2% (6) identified insufficient stakeholder engagement, as illustrated in **Figure 2**.

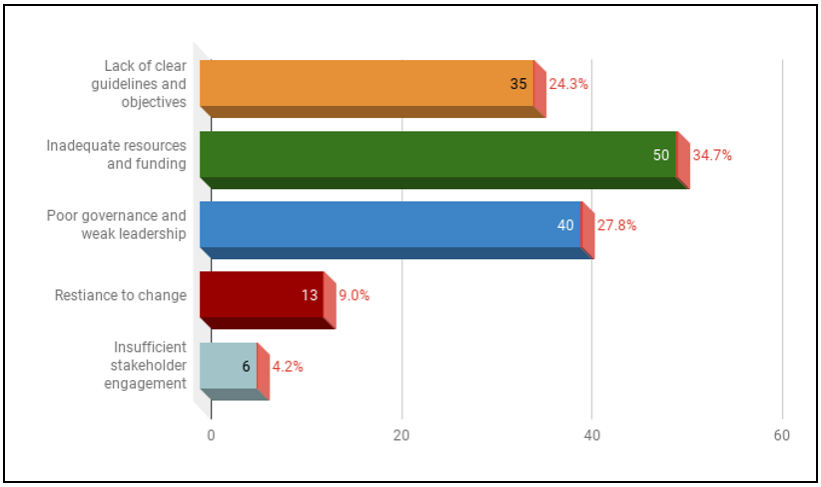

Figure 2. Challenges and barriers to policy implementation (*N* = 144).

During the interviews, several participants identified barriers to policy implementation in public hospitals. Participants (CM-1) and (ITM-2) responded as follows:

Throughout my experience, I believe that a lack of understanding and disagreements between the government and healthcare stakeholders obstruct the development of policies, guidelines, and standards necessary for implementing data interoperability in our hospitals. Additionally, the government's failure to involve external stakeholders such as technology experts, patients, industry professionals, and healthcare practitioners in the policy-making process negatively impacts the effectiveness of data interoperability policies.

In my view, some of the main challenges hindering the implementation of policy frameworks for data interoperability in public hospitals are the lack of resources and capacity from the government and politicians to execute and deliver on policy activities. Additionally, I think the complexity and fragmentation of institutional arrangements complicate the policy process and negatively impact policy implementation. Lastly, resistance from stakeholders also impacts the successful implementation of interoperability policies. In my experience, this resistance is often due to policymakers and promoters not adequately consulting with and advocating among stakeholders.

6.3. Effectiveness of current policies in facilitating seamless data sharing

It is crucial to have policies that effectively address the implementation of data interoperability in hospitals. The questionnaire asked respondents to indicate whether their hospitals' existing or current policies and procedures effectively facilitate seamless data sharing between different systems. As shown in **Figure 3**, the majority of respondents, 72.9% (105), reported that their hospital policies do not support seamless data sharing between different systems, while 27.1% (39) affirmed that they do.

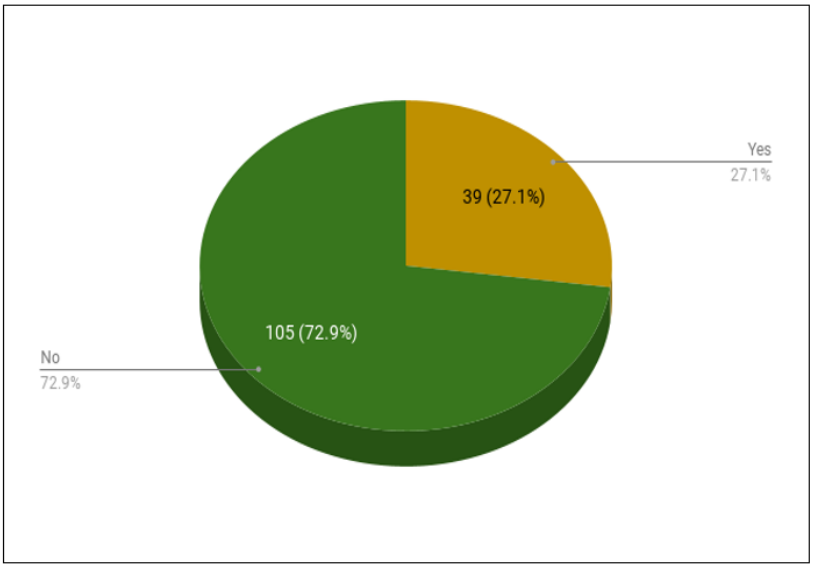

Figure 3. Effectiveness of current policies in facilitating seamless data sharing in public hospitals (N = 144).

In the interviews, most participants expressed that the current policies and procedures in their hospitals do not effectively support seamless data sharing between different health systems. For instance, participant (ITM-2) said:

Uhm… Most of the policies we have in our hospital do not sufficiently address the issue of data interoperability and the processes by which data is supposed to be shared between systems, hospitals, and clinical staff. Instead, they focus primarily on how to manage, access, and store electronic health records for patients, how to protect these records from third-party breaches, and outlining procedures for handling such breaches if they occur.

6.4. Risks of lacking a policy framework for data interoperability

According to Mumtaz et al. (2023), failure to implement robust health policies, governance structures, and standard operating procedures impedes the effective implementation of digital technologies in healthcare, limiting access to health services and increasing the risk of poor health outcomes. In the questionnaire, respondents were asked to identify potential risks that public hospitals could face in the absence of a policy framework for promoting data interoperability. The majority, 35.5% (51), stated that fragmented data systems could result from a lack of such a framework. Additionally, 27.8% (40) cited inefficiencies and redundancies, 26.4% (38) highlighted increased data breaches, 6.3% (9) mentioned delayed implementation of innovations, and the minority, 4.2% (6), pointed to poor data quality and flow, as shown in **Figure 4**.

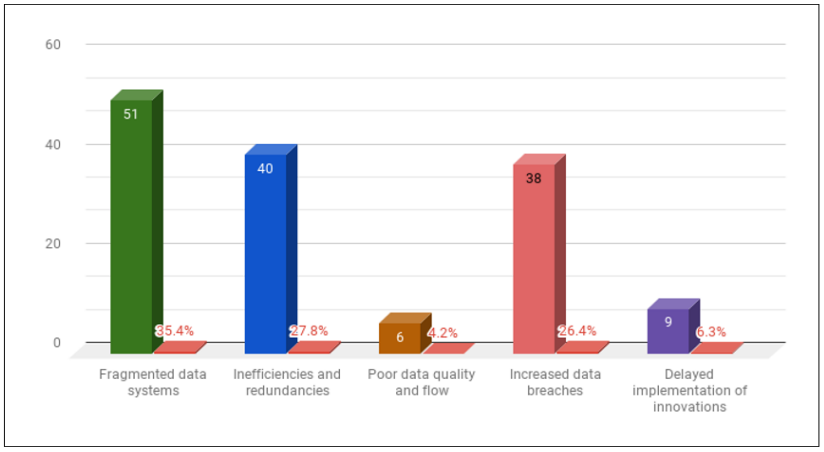

Figure 4. Risks associated with the absence of policy framework promoting data interoperability (*N* = 144).

During the interview, participants raised concerns about security risks and data fragmentation due to the lack of a robust policy framework supporting the adoption of data interoperability. For example, participant (ITM-3) stated:

I believe we will continue to experience data breaches and cyberattacks if there are no policies in place to facilitate the adoption of data interoperability. Data is open to attacks when it is not shared or managed appropriately. Our hospitals are dealing with the most confidential personal information, and without regulations and technology interoperability, it's easy for that information to fall into the wrong hands.

6.5. Resources required for implementing data interoperability policy framework

Rajapakshe (2017) highlighted that essential resources for successful policy implementation include human, time, technical, material, and financial resources. The questionnaire asked participants to select one or more resources they believe are necessary for implementing a robust policy framework for data interoperability in hospitals. Based on the findings, the majority of respondents, 77.1% (111), believe that adequate budget allocation is crucial for public hospitals to develop and implement a policy framework for data interoperability. Furthermore, 62.5% (90) emphasized the importance of allocating technical resources and support, while 54.2% (78) suggested the need for staff training and development. Established governance and processes were suggested by 25.0% (36) of respondents, and a minority 19.4% (28) suggested the significance of long-term strategic plans and goals. **Figure 5** illustrates these findings.

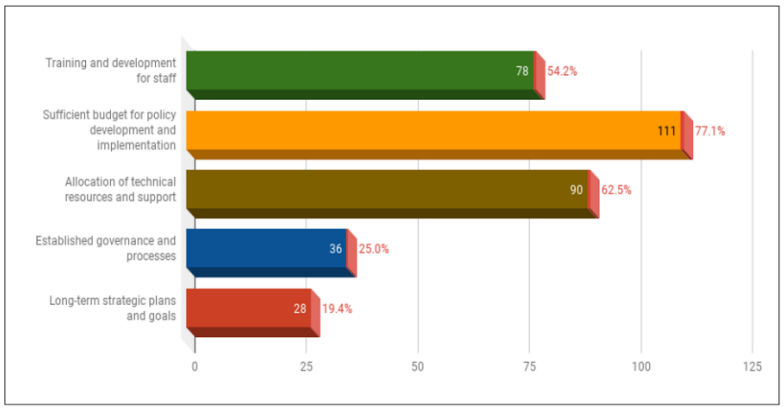

Figure 5. Resources required for implementing data interoperability policy framework (N = 144).

During the interviews, participants highlighted that funding is a key resource for supporting the implementation of a policy framework for data interoperability. For example, participant (RM-3) stated:

I believe adequate funding is essential for policy implementation. Without dedicated budget allocations to support interoperability, it becomes nearly impossible to develop the necessary infrastructure, policies and guidelines, train staff, and maintain systems effectively.

7. Discussion of the findings

The quantitative findings of this study revealed that public hospitals have not implemented policies and procedures to promote data interoperability. Interview responses further supported this, as most participants confirmed the absence of such policies. In contrast, the literature mandates that healthcare facilities must establish formal written policies to ensure the adoption of data interoperability (DoH, 2012). The literature also underscores that the absence of a policy framework and inconsistent enforcement hinders the effective adoption of data interoperability, obstructing seamless data sharing within and between healthcare facilities (Skrocki, 2013). Both the questionnaire and qualitative interviews identified several critical barriers to implementing policy frameworks for data interoperability. Quantitative data identified insufficient resources and funding, unclear guidelines and objectives, poor governance, and weak leadership as key challenges. The qualitative findings supported these results, adding that insufficient understanding and disagreements between the government and healthcare stakeholders, along with a lack of resources, also impede policy implementation.

These findings align with the research of Mulukuntla (2015) and Musabi and Kipkebut (2024), which emphasise that insufficient resources and inadequate funding are significant obstacles to implementing legal and regulatory frameworks for healthcare interoperability. Moreover, the results from both methods consistently showed that existing policies in public hospitals do not adequately facilitate seamless data sharing between different systems and hospitals. The quantitative findings indicated that fragmented data systems, inefficiencies, redundancies, and increased data breaches are potential risks that hospitals face without a proper policy framework

for data interoperability. Participants in the qualitative interviews echoed this concern, expressing fears of data breaches and cyberattacks in the absence of a robust framework. Raghavan, Demircioglu and Taeihagh (2021) warn that the absence of policy and legal support can stagnate healthcare innovation, impeding technological advancements that improve care quality and accessibility, leading to poor health outcomes. Regarding necessary resources, both the qualitative and quantitative findings of this study confirmed that staff training and development, sufficient budget allocations, and technical resources and support are crucial to successfully implementing a policy framework for data interoperability in public hospitals.

8. Recommendations

Based on the analysis and findings, the following recommendations are proposed:

1) Public hospitals should prioritize the development and formalization of written policies that support the integration of data interoperability between health information systems. They must ensure that the policies are aligned with national and international standards.
2) The government must allocate sufficient budget allocations necessary to support the implementation of a policy framework for data interoperability in public hospitals.
3) The government and Department of Health must ensure the strengthening of governance structures by fostering strong political and management leadership capable of driving the data interoperability agenda in public hospitals.
4) The government, legislators, practitioners, and policymakers must consult and involve external stakeholders such as technology experts, healthcare professionals, patients, and industry leaders in the policy-making processes to ensure diverse inputs about data interoperability.

9. A proposed policy for integrating data interoperability into health information systems

The proposed policy is designed to aid the South African government, policymakers, and legislators in integrating data interoperability within public hospitals.

(1) Purpose

The purpose of this policy is to establish a framework for the ethical, efficient, and secure implementation of data interoperability across healthcare systems. It provides guidelines to ensure that adopting interoperability enhances patient care, boosts operational efficiency, and complies with relevant legal and ethical standards.

(2) Scope

This policy is applicable for all hospitals and healthcare facilities, clinical and support staff, and health stakeholders involved in the deployment and integration of data interoperability between systems and hospital operations, including patient care, diagnosis, data sharing and management, and administrative functions.

(3) Objectives

1) To establish guidelines for the integration of disparate health information systems.

2) To ensure responsible and transparent data interoperability, implementation, and adoption.
3) To encourage adherence to ethical and legal standards and regulatory requirements.
4) To enhance data quality and accessibility for improved patient care and operational efficiency.
5) To facilitate the secure and protected seamless sharing of patient data between health ICT systems.

(4) Data interoperability adoption guidelines

(4.1) Conduct assessment

Conducting a thorough needs assessment to determine the areas where data interoperability can improve current operations and processes, such as patient administration, remote healthcare access, patient care, diagnostics, or operational efficiency.

(4.2) Governance and oversight

Establish a technology steering committee within hospitals to supervise the execution and upkeep of projects related to data interoperability.

(4.3) Data security and privacy

Adopt robust data security measures to safeguard health and patient information, networks, and health information systems. Protective measures may include data encryption and decryption, intrusion detection systems, firewalls, zero trust, regular security updates, and other security protocols.

(4.4) Access control and authentication

Implement robust access control and authentication mechanisms such as biometrics, one-time pin, and fingerprints to prevent unauthorised access to electronic health records and systems.

(4.5) Standards and protocol

Ensure that all health IT systems and software comply with national and international standards and protocols for data interoperability and integration, including:

1) ISO
2) HL7
3) CEN
4) FHIR
5) SMOMED
6) CDISC

(4.5) Legislation and regulatory compliance

Ensure strict adherence to legislation and laws applicable to data protection, patient safety, health systems, and interoperability, such as:

1) Protection of Personal Information Act 4 of 2023
2) Constitution of the Republic of South Africa Act 108 of 1996
3) Electronic Communication and Transactions Act 25 of 2002
4) Promotion of Access to Information Act 2 of 2000,
5) Promotion of Administrative Justice Act 3 of 2000
6) Cybercrimes Act 19 of 2020
7) National Health Act 61 of 2003

8) National Archives and Record Service of South Africa Act 43 of 1996
9) State Information Technology Agency Act 88 of 1998
10) Public Administration Management Act 11 of 2014

(4.6) Compliance and enforcement with regulatory requirements

Ensure that all staff and external stakeholders strictly adhere to this policy and implement serious penalties and fines for regulatory non-compliance.

(4.7) Training and capacity building

To effectively use this technology, organize and provide healthcare professionals and staff with comprehensive and unique training, education, and skill development programs based on interoperability standards and best practices.

(4.8) Monitoring and evaluation

Establish robust mechanisms for ongoing assessment and monitoring of data interoperability between systems to make sure they are operating as intended and producing the required results. The effectiveness and influence on healthcare outcomes should be evaluated through routine audits.

(5) Backup and disaster recovery planning

Backup healthcare and patient data on a regular basis and create a comprehensive disaster recovery plan. This ensures data can be recovered in case of system failures, natural disasters, or cyberattacks.

(6) Review and update

This policy must be reviewed and updated annually to keep hospitals up to date with the latest regulations and technology, as well as consistent with the industry's best practices.

(7) Role and responsibilities

1) Technology implementation committee: oversee and ensure that the implementation of data interoperability with the hospital's mission, objectives, principles, and ethical standards.
2) IT personnel: ensure seamless compatibility between systems and built health servers and networks with advanced security features and architecture to ensure data integrity and system reliable.
3) Healthcare professionals: monitor data interoperability between systems and report any concerns or issues related to this technology.
4) Managers: ensure that staff comply with policy and regulatory frameworks and report any non-compliance or misconduct.

8. Contact information

For further information about this policy, ensure to consult:

[Name and surname]

[Title]

[Email address]

10. Conclusion and further studies

This study aimed to develop a policy for integrating data interoperability in public hospitals in Gauteng Province, South Africa. The findings revealed that the majority of public hospitals in Gauteng lack comprehensive policies that promote data interoperability. The findings of this study further revealed critical barriers to

implementing policy frameworks for data interoperability, including inadequate resources and funding, unclear guidelines and objectives, poor governance, weak leadership, and insufficient disagreements between government and healthcare stakeholders. This study makes substantial contributions to policy and practice. Policymakers can gain valuable insights from this study, which offers a comprehensive understanding of the barriers and challenges necessary for effective policy development and implementation of data interoperability. In terms of practice, this study offers evidence-based recommendations that can lead to the successful integration of data interoperability between systems in hospitals. The study sets the groundwork for future research by introducing a novel approach to policy development aimed at supporting data interoperability in public hospitals.

The researchers focused on public hospitals in Gauteng Province due to unique healthcare challenges and diverse levels of infrastructure, making it an ideal case for examining policy frameworks for data interoperability. The Gauteng Province faces significant obstacles, such as inconsistent data standards and inadequate policy frameworks, which reflect broader challenges experienced by many hospitals across the country. However, the exclusion of public hospitals in other provinces may limit the generalizability of the findings, as provinces with differing data standards and policies may confront distinct challenges, potentially reducing the nationwide applicability of the findings. Therefore, future research can expand the scope to include public hospitals from other provinces across South Africa, ensuring a more holistic understanding of data interoperability and policy framework challenges at a national level. This study excluded hospitals from other African countries, which may restrict the applicability of the findings to hospitals facing similar challenges. Future researchers should undertake a comparative analysis involving hospitals from different African nations to pinpoint similar challenges and explore potential solutions that can be applied across diverse healthcare settings.

To further advance the field, longitudinal studies must be conducted to assess the impact and long-term effectiveness of the proposed interoperability policy. Moreover, further qualitative studies must be conducted to understand how different levels of stakeholder involvement influence the development and success of data interoperability policies. This study emphasizes the critical need for the South African government, legislators, practitioners, and policymakers to consult and involve external stakeholders in the policy-making processes.

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