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Data Quality Challenges in Prostate Cancer Management in Tanzania: Implications for Service Improvement

Martin Johannes Keller[1]*, Fabian Lukas Weiss[1]

[1]Department of Management, School of Economics, University of Cologne, Cologne, Germany.

***E-mail** ✉ m.keller.cologne@gmail.com

Abstract

Accurate and complete clinical documentation is critical for delivering high-quality prostate cancer care, especially in settings with fragile health systems and a rising prevalence of non-communicable diseases. Inadequate data can compromise service efficiency, delay treatment, and negatively affect patient outcomes. This study assessed the quality of clinical notes for prostate cancer patients across five tertiary hospitals in Tanzania during 2022. A sequential mixed-methods design was applied, combining quantitative review of patient records with qualitative interviews. Data were extracted from both electronic and paper-based clinical notes, and in-depth interviews were conducted with 25 healthcare providers to understand the barriers to maintaining high-quality records. Quantitative analyses, performed using SPSS 27, focused on evaluating completeness and accuracy of documentation, while qualitative data were analyzed thematically using a hybrid inductive and deductive approach in NVivo 14. Results indicated significant gaps in the quality of clinical documentation. Although the overall accuracy of recorded variables was high (99.4%, n=1,494), key clinical information was often missing. Clinical stage was recorded in 70% (n=1,052) of cases, and Gleason score in 61.4% (n=923), whereas age, clinical presentation, and treatment type were consistently documented. Interviews revealed several factors contributing to poor data quality, including limited knowledge of documentation standards, fragmented data systems, staff shortages, lack of supervision, and the concurrent use of electronic and paper records. Integration between hospital-based cancer registries and the national Health Information Management System was notably absent. The findings underscore the need for targeted interventions to improve clinical note quality in Tanzanian prostate cancer care. Strengthening personnel capacity, improving system integration, and implementing structural reforms are critical steps toward ensuring comprehensive and reliable documentation, which is essential for effective patient management and improved health outcomes.

Keywords: Prostate cancer, Health systems, Quantitative analyses, Clinical documentation

Introduction

In many low- and middle-income countries (LMICs), routine health information forms the backbone of decision-making within health systems [1, 2]. The reliability of such data is critical, as poor-quality records can distort findings, lead to inefficient allocation of resources, and negatively influence patient care [3–5]. Data quality is not a single measure but a combination of several factors, including completeness, accuracy, relevance, accessibility, timeliness, and consistency [4, 6, 7]. These factors play a key role in ensuring precise analyses, providing actionable feedback, supporting regulatory compliance, and guiding planning, forecasting, quality assurance, and governance processes [7–9].

In Sub-Saharan Africa (SSA), Health Management Information Systems (HMIS) often operate in a fragmented manner, which poses challenges for maintaining data completeness, timeliness, accuracy, and consistency [9, 10]. Structural issues, limited human resources, and inadequate infrastructure exacerbate these challenges [8, 11, 12]. Although the adoption of

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electronic health information systems has improved reporting accuracy and timeliness in several countries, Tanzania continues to lack an integrated cancer registry and a harmonized HMIS [1, 8, 9].

Like other LMICs, Tanzania is experiencing a rapid increase in the burden of cancers and other non-communicable diseases (NCDs) [6, 8]. Access to high-quality data is crucial for managing these conditions effectively and for informing targeted interventions during this epidemiological shift [13, 14]. Prostate cancer, one of the most common cancers among Tanzanian men, particularly depends on accurate clinical records to guide timely treatment decisions. Critical information such as patient age, cancer type, clinical stage, grade, presentation, histopathological results, and treatment history must be well-documented to ensure appropriate care [14–16]. Poor documentation can compromise clinical decision-making and delay care, undermining treatment outcomes [1, 6, 10, 17–20].

Healthcare providers face multiple barriers to maintaining high-quality clinical notes, including limited understanding of the importance of key clinical variables, insufficient training, high workloads, and lack of motivation or incentives [8, 16]. While some studies have explored the quality of clinical documentation in cancer care, comprehensive evidence to guide policy development and improve cancer services in Tanzania remains scarce [4, 21–24]. To address this gap, this study aimed to evaluate the quality of clinical notes for prostate cancer patients treated across five tertiary hospitals in Tanzania from January to December 2022.

Ethics statement

Approval to conduct this research was obtained from the Research and Ethics Committee of Muhimbili University of Health and Allied Sciences (MUHAS), under protocol number MUHAS-REC-05-2023-1671. Before data extraction, hospital authorities formally authorized access to patient clinical records. Prior to interviews, all participants provided written consent to participate in the study. For prostate cancer patients, consent obtained during hospital registration permits the use of their clinical information for research, provided that personal identifiers are removed. To protect confidentiality, participants' identities were anonymized using unique numerical codes in accordance with the General Data Protection Regulation (GDPR) [25]. Additionally, audio recordings of interviews were encrypted, password-protected, and securely stored in a locked cabinet to ensure the privacy and security of participant information.

Materials and Methods

Study design

A sequential mixed-methods strategy was adopted, integrating quantitative and qualitative approaches to data collection [26]. Between June and November 2023, patient-level information was retrieved from both electronic and paper-based clinical records at five tertiary hospitals in Tanzania. Quantitative data were captured using a pre-tested extraction checklist, followed by qualitative in-depth interviews to explore healthcare providers' insights regarding the quality of clinical notes for prostate cancer patients. The detailed study methodology has been reported elsewhere [16].

Triangulation was applied to compare the content of manual and electronic records. In the electronic dataset, duplicate entries were identified by counting cases of repeated patient notes. Data security assessments examined the presence of storage databases, the frequency and protocols for backups, and existing guidelines for safeguarding clinical information. Access permissions and physical security measures were also reviewed. Additionally, although not formally quantified, the study examined consistency between manual and electronic records across hospitals with varying patient volumes. The study adhered to the COREQ checklist for mixed-methods research to ensure comprehensive and standardized reporting (S1 Text).

Study setting

The study selected five tertiary-level hospitals as referral centers offering oncology and urology services for prostate cancer patients in Tanzania. These comprised three publicly owned institutions— Mbeya Zonal Referral Hospital (MZRH), Ocean Road Cancer Institute (ORCI), and the Muhimbili National Hospital (MNH)— along with two faith-based institutions: Kilimanjaro Christian Medical Centre (KCMC) and Bugando Medical Centre (BMC).

Both ORCI and MNH are situated in Dar es Salaam, Tanzania's commercial hub in the eastern zone. In contrast, MZRH caters to the southern highlands region in Mbeya, BMC serves the lake zone in Mwanza, and KCMC covers the northeastern zone in the Kilimanjaro region.

These facilities employ a combination of electronic and paper-based clinical records across various levels of patient care.

Study population

The research focused on healthcare providers directly involved in managing and documenting patient clinical records. Participants were purposefully selected according to their professional responsibilities until no new information emerged. The final group included ten clinicians (urologists and oncologists), nine nurses, and six medical records staff.

Data sources

Multiple sources of information were reviewed, including patient clinical notes, hospital-based cancer registries, and Health Management Information Systems (HMIS) from the selected facilities. The review encompassed clinical notes, pathology reports, hospital registers, tally sheets, and monthly summaries from outpatient (OPD) and inpatient (IPD) services.

Quantitative data collection

A pre-tested extraction tool was employed to capture key variables such as patient demographics, diagnosis, cancer stage, and other relevant information. Data were collected using a validated checklist within Research Electronic Data Capture (RedCap). Records were included if the patient had a confirmed histological diagnosis of prostate cancer and had received care in 2022. Electronic and paper-based records were screened to remove duplicate entries.

Qualitative data collection

The qualitative component was conducted by a team of four MUHAS faculty with expertise in quantitative and qualitative research. Team members received training on study objectives and ethical considerations to reduce bias. A semi-structured interview guide was pre-tested and translated between English and Kiswahili. In-depth interviews, conducted in Kiswahili and lasting 15–30 minutes, continued until saturation was reached (participants 23rd–25th). Written consent was obtained, and interviews were recorded digitally. A research assistant facilitated the interviews while the principal investigator documented field notes concurrently.

Quality control and data management

Data were collected through a password-protected institutional RedCap account, with access restricted solely to study personnel. Any issues identified in the clinical notes were communicated to the respective facility staff to clarify whether they reflected actual deficiencies in documentation or were errors introduced during data entry by the research team. This approach facilitated data validation by distinguishing facility-originated documentation issues from entry mistakes by study personnel.

Data analysis

Clinical notes were considered complete or of acceptable quality if information for key variables was present in 90% or more of the records. Accuracy was assessed by clinical experts, who evaluated whether each variable in the notes corresponded correctly to clinical knowledge. Completeness was calculated as the proportion of clinical notes containing full information for each key variable relative to the total number of notes reviewed. Quantitative analyses included 1,794 outpatient and 806 inpatient clinical records. The data were examined for variable distribution, missing values, and outliers to identify patterns in documentation quality. Descriptive analyses were conducted using SPSS version 27 to evaluate elements of data quality, including completeness and accuracy.

For the qualitative component, thematic analysis followed six stages, combining inductive and deductive reasoning to accommodate both positivist and constructivist perspectives on clinical note quality [27]. In-depth interviews (IDIs) were conducted in Swahili and transcribed verbatim into English by the first author. Transcripts were coded to explore participants' perceptions regarding ownership and content of clinical notes. Audio recordings were reviewed to correct potential transcription errors, and follow-up questions were posed when clarifications were needed before participants left. Codes were organized into sub-themes and themes to reflect issues prioritized by participants. Trustworthiness of findings was ensured through prolonged engagement, observation and triangulation, detailed documentation, comprehensive explanations, and peer debriefing [28, 29].

Results and Discussion

Completeness of clinical notes for prostate cancer management in tertiary hospitals in tanzania

The review revealed that most clinical notes lacked complete documentation of critical variables. In many cases, prostate cancer was diagnosed without recording a Gleason score in the pathology report. Three variables—age, clinical presentation, and type of treatment—showed high or acceptable completeness. Age was documented in 1,493 (99.3%) clinical notes. Clinical presentation and treatment type were recorded in 1,466 (97.5%) cases. Pre-treatment PSA levels were documented in 1,284 (85.4%) clinical notes. In contrast, education level was captured in only 484 (32.2%) records. Documentation of clinical stage was present in 1,052 (70.0%) clinical notes, and Gleason score was recorded in only 923 (61.4%) of cases **(Figure1).**

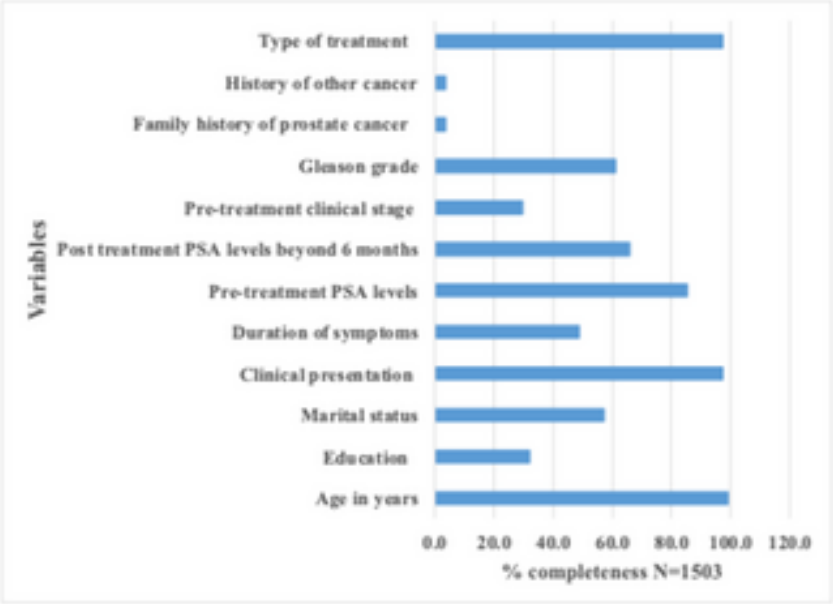

Figure 1. Assessment of the completeness of clinical documentation for prostate cancer care in tertiary hospitals in Tanzania.

A total of 25 healthcare professionals participated in in-depth interviews. The respondents belonged to three professional categories: medical records personnel, clinicians, and nurses. Ten of these individuals were additionally interviewed in their roles as hospital managers. Participants were aged between 38 and 53 years and all had more than five years of professional experience **(Table 1).**

Table 1. Sociodemographic characteristics of participants in the qualitative interviews.

Characteristic	Category	Frequency
Age (in years)	30–40	6 (24%)
	41–50	14 (56%)
	51–60	5 (20%)
Education Level	Diploma	7 (28%)
	Bachelor's Degree	10 (40%)
	Master's Degree	8 (32%)
Professional Cadre	Clinician	10 (40%)
	Nurse	9 (36%)
	Medical Records Officer	6 (24%)
Years of Working Experience	5 years	2 (8%)
	6–10 years	12 (48%)
	More than 10 years	11 (44%)

The analysis of qualitative data revealed several key issues affecting the quality of clinical documentation: inadequate knowledge among staff regarding standards for high-quality clinical notes; poor data integration leading to delays in service delivery; shortages of human resources for health (HRH) negatively impacting note quality; insufficient supervision contributing to suboptimal documentation; the parallel use of electronic and paper-based record systems hindering overall note quality; the importance of secure and proper storage of clinical notes; and the need for robust protection of patient records to ensure high-quality care **(Table 2).**

Table 2. Summary of qualitative findings**.**

Codes	Theme	Sub-theme
• Clinical notes contain missing or insufficient information • Sentences in clinical notes are often difficult to read • Clinical notes are sometimes duplicated • There is a shortage of healthcare personnel • Supervision is inadequate or lacking	Causes of low-quality clinical notes	• Using both electronic and paper-based record systems reduces the quality of clinical notes • The Health Information Management System (HIMS) is fragmented • Important variables are poorly documented in clinical notes
• Permission for handling personal information • Protection of data through secure servers and regular backups • Designation of an officer responsible for data security • Restriction of access to clinical records for unauthorized individuals	• Correctly storing clinical records improves information security.	• Maintaining and organizing clinical records • Controlling access to sensitive data • Safeguarding patient information to ensure high-quality care • Ensuring the overall security of information
• Maintaining coherent and consistent details in clinical documentation • Ensuring precise and trustworthy information in records • Cleaning and validating datasets for accuracy • Errors or omissions when entering variables into electronic clinical systems	• Inadequate supervision leads to substandard clinical documentation.	• Reliability and trustworthiness of data • Unified hospital information management system • Prompt and efficient handling of data

Medical record staff indicated insufficient awareness of the significance of recording essential prostate cancer variables. Inadequate understanding among healthcare professionals, particularly medical record personnel, about the value of documenting specific disease-related variables, leads to suboptimal documentation practices.

There is a clear need for training on improving the quality of clinical notes. “I believe it would be beneficial to provide training on the quality of clinical notes to healthcare providers and medical records staff, as record officers occasionally omit certain variables simply because they are unaware of their importance.” (HCP-2–06).

Referral letters and reports should include thorough information about the patient, examination findings, interventions performed, and the rationale for referral. Participants noted that comprehensive referral reports could minimize delays in care delivery, thereby potentially improving treatment outcomes. Health information management systems (HIMS) lacked interoperability across referring institutions. This absence of system integration forced clinicians to repeatedly obtain patient histories and redo tests already conducted at prior facilities, resulting in avoidable delays in patient care. Additionally, inadequate supervision and absence of dedicated personnel for data validation were highlighted. The simultaneous use of paper-based and digital recording systems was described as detrimental to the overall quality of clinical documentation. This transitional period frequently caused redundant entries and discrepancies in recorded information.

Absence of an integrated platform for sharing clinical notes across hospitals contributes to delays in care provision. “Patients referred to us from other tertiary hospitals for radiotherapy often arrive with incomplete records, requiring us to retake histories from scratch. This process inconveniences patients and slows down service delivery. It is frustrating for clinicians to restart history-taking for patients already managed at another tertiary facility. I would welcome an integrated system that enables access to prior clinical notes detailing previous interventions. Such a system would eliminate delays in care.” (HCP-1–01).

Shortages of human resources for health (HRH), including specialist urologists and oncologists, lead to excessive workloads and heightened stress levels, which in turn contribute to incomplete and substandard documentation, such as abbreviated or illegible entries in clinical notes. Clinicians reported using concise notes to manage time constraints and accommodate large patient volumes. Some entries contained unclear phrasing or handwriting that was challenging to interpret. Follow-up outpatient clinics were identified as a major factor in poor documentation quality in both paper and electronic records. Unscheduled or overcrowded follow-up sessions provided clinicians with justification for rushed documentation. The limited number of available clinicians was cited as a key driver of incomplete records and poorly constructed sentences, as the priority shifted toward seeing all scheduled patients rather than ensuring high-quality documentation and optimal care.

Shortage of HRH negatively affects the quality of clinical notes. “During follow-up clinics in particular, we often resort to brief notes to save time, given the large number of prostate cancer patients awaiting consultation and our limited staffing. Personally, I feel compelled by these circumstances to write summaries in order to see every patient during my shift.” (HCP-2–07).

Accuracy, consistency, and duplication of information in clinical notes for prostate cancer management at a tertiary hospital in Tanzania

Duplication of entries was common in the electronic system, with 1,097 clinical notes recorded twice. This issue was largely linked to the shift from paper to digital records, comprising 848 (56.4%) manual notes and 655 (44.6%) electronic notes, resulting in some notes being entered duplicate and yielding a total of 2,600 clinical notes reviewed. Inaccuracies were detected in the records, including incorrect assignment of patient gender or diagnosis—for instance, certain prostate cancer cases (a condition exclusive to males) were erroneously recorded as female. The overall accuracy rate for information in clinical notes was 1,494 (99.4%). Errors such as gender and diagnosis mislabeling were noted in **Table 3**. These problems were associated with a disjointed health information management system (HIMS) and mistakes arising during the transfer of data from manual to electronic formats.

Table 3. Accuracy of information and duplication in clinical notes.

Hospitals	Total Clinical Notes	Clinical Notes Meeting Criteria	Clinical Notes Missing Key Variables	Duplicate Clinical Notes	Documentation Errors (e.g., Sex, Diagnosis)	Accuracy (%)
Hospital 1	746	431 (57.8%)	315 (42.2%)	0	4	99.1 %
Hospital 2	653	378 (57.9%)	275 (42.1%)	4	3	99.2 %
Hospital 3	558	323 (57.9%)	235 (42.1%)	0	1	99.7 %
Hospital 4	458	265 (57.9%)	193 (42.1%)	0	1	99.6 %
Hospital 5	185	106 (57.3%)	79 (42.7%)	3	0	100 %
Total	**2600**	**1503**	**1097**	**7**	**9**	**99.4 %**

Hospitals face challenges in maintaining high-quality clinical notes due to insufficient supervision and the absence of dedicated staff for managing data. Without a structured schedule for monitoring documentation and data cleaning, records often remain incomplete or contain inaccuracies. Proper data cleaning is critical for both paper-based and electronic records during data entry. Participants suggested that deploying data officers alongside regular oversight could enhance the quality of prostate cancer documentation.

A healthcare provider emphasized the importance of supervision and cleaning sessions, noting that without them, clinicians tend to write brief and incomplete notes: "If there is no one ensuring that clinical notes are complete, we continue documenting minimally. Regular sessions for reviewing and cleaning data, along with supportive supervision, would help improve how patient information, including for prostate cancer, is recorded" (HCP-5–21).

The shift from manual to electronic clinical notes introduces additional challenges. Re-entering data often leads to duplication and inconsistencies. Despite differences in patient numbers across tertiary hospitals, the key information in clinical notes remained largely stable, suggesting that hospital management could still make timely decisions. However, occasional mistakes were observed in both manual and electronic systems. The absence of an integrated health information management system (HIMS) across hospitals contributed to repeated entries. All five tertiary hospitals reported duplicated clinical notes, mostly arising from transferring paper-based records into electronic systems. This duplication sometimes led to inflated counts of prostate cancer cases, which could misinform administrative planning. While ongoing efforts focus on cleaning databases, full HIMS integration would require policy changes. An integrated system would allow clinicians to access prior patient records from referring hospitals, avoiding redundant procedures and improving continuity of care.

The coexistence of paper and electronic systems also affected documentation quality. One clinician described the issue, explaining that duplication occurs during data entry and errors in patient details are possible: "When we moved from paper-based records to electronic systems, all the information had to be entered into the computer. This caused some duplication and errors—for example, a patient's sex might be recorded incorrectly in the electronic system while the paper record is correct. We are working to clean the database, but it takes time" (HCP-3–11).

Security information for prostate cancer management

Regarding data security, all hospitals maintained electronic databases in locked rooms. Two hospitals performed monthly backups, while the remaining facilities lacked clear procedures for securing and backing up electronic records, as shown in **Table 4.**

Table 4. Information on data security for prostate cancer at tertiary hospitals in Tanzania.

Facility	Personnel Authorized to Access Data	Individual Responsible for Data Storage	Availability of Database for Electronic Storage	Availability of Data Backups	Backup Frequency	Guidelines for Data Storage and Backups
Hospital 1	Healthcare Providers / Managers	Head of the Unit	Yes	Yes	Unspecified	None available
Hospital 2	Healthcare Providers / Managers	Head of the Unit	Yes	Yes	Unspecified	None available
Hospital 3	Healthcare Providers / Managers	Head of the Unit	Yes	Yes	Monthly	None available
Hospital 4	Healthcare Providers / Managers	Head of the Unit	Yes	Yes	Monthly	None available
Hospital 5	Healthcare Providers / Managers	Head of the Unit	Yes	Yes	Unspecified	None available

Tertiary hospitals employ both paper-based filing cabinets and digital databases to archive patient data derived from clinical notes. Reports indicate that retrieval of data from these clinical notes is restricted to healthcare providers (HCPs) and administrative managers, with access secured through passwords. Hospital

administrators noted that physical data storage areas are secured with keys and locks, and the unit head serves as the designated custodian. Access to patient information from clinical notes is granted only to authorised personnel; this approach fosters patient confidence while fulfilling legal requirements. All electronic databases used for storing clinical note information are housed in rooms protected by key-and-lock systems. Although two hospitals perform monthly backups, the remaining facilities lack explicit protocols for this process.

Secure storage of clinical notes strengthens data protection: "We utilise both paper-based and digital clinical notes; these are archived in medical records departments, and no extraction of information is permitted without prior authorisation from the executive director" (HCP-2–07).

Tertiary hospitals maintain dedicated rooms equipped with locked cabinets for housing paper-based clinical notes. Servers containing electronic clinical note data are rigorously safeguarded with restricted entry. Personnel are required to use robust passwords for safeguarding digital records. None of the surveyed hospitals employed dedicated data protection officers, and respondents were generally unaware that this constitutes a distinct professional role. It was observed that responsibilities for data security occasionally overlap between ICT staff and medical records personnel. Overall control of data security rests with hospital administration. One patient treated for prostate cancer had provided informed consent upon registration, permitting anonymised use of their data for research purposes. Although data security measures appeared robust—incorporating password safeguards and physical locks—several hospitals lacked defined protocols for regular data backups.

Safeguarding patient information within clinical notes is essential for providing high-quality care: "As you are aware, we handle highly sensitive data (relating to individuals' health). We enforce stringent controls on releasing information from clinical notes; as you encountered, approval from hospital administration is required following ethical clearance, and we retain a copy of that approval before disclosing any patient clinical notes" (HCP-1–01).

This investigation into data quality for prostate cancer management in Tanzanian tertiary hospitals uncovered critical insights concerning data completeness and system integration, identifying these as primary barriers to enhancing care quality. Clinical notes for prostate cancer patients were predominantly incomplete across most variables. Documentation of clinical stage was present in only 70% of records, while the Gleason score—an essential indicator of prostate cancer's histological grading—was recorded in just 61.4%. Nevertheless, the precision of recorded information in clinical notes was encouraging, demonstrating considerable uniformity across variables in both digital and paper-based formats. These tertiary facilities exhibited effective storage and security arrangements for clinical note data, supporting adherence to broader data protection standards [25]; however, explicit policies for backup procedures in clinical note storage were often absent. The Health Information Management System (HIMS) and facility-level cancer registries lacked interoperability, disrupting care continuity. Additionally, these systems are not linked between institutions, further compromising seamless care during patient referrals. Healthcare providers attributed suboptimal clinical note quality to factors including insufficient knowledge, inadequate oversight, staffing shortages, parallel use of digital and paper systems, and challenges in data storage and patient record protection. Substandard clinical note quality exerts both immediate and longer-term impacts on the efficiency and efficacy of prostate cancer management within the healthcare system [8, 30].

Inadequate recording of variables such as education level, marital status, clinical stage, and Gleason score was largely due to clinicians' judgement, as these fields were frequently optional on admission forms, compounded by limited awareness among some providers of the value of thorough documentation. Certain staff, particularly medical records officers, occasionally omitted disease-specific details owing to unfamiliarity with their significance. This fell short of recommended benchmarks, which advocate for clinical note completeness exceeding 90% [22, 23]. Moreover, the lack of robust oversight for clinical note quality resulted in minimal feedback on institutional performance, impeding initiatives for service improvement [31–33]. Deficient data quality in prostate cancer care directly and indirectly undermines treatment results and overall service standards [22, 34]. Reliance on incomplete records can compromise clinical decisions by omitting vital diagnostic details needed for optimising supply chains and service delivery. Effective and prompt treatment decisions for prostate cancer depend on reliable data, particularly clinical stage and Gleason score [35].

A prominent structural issue was the absence of linkage between Health Information Management Systems

(HIMS) and institutional cancer registries, both internally and across hospitals. This disconnection markedly hinders care continuity for prostate cancer patients. Without integration, referrals between facilities necessitate repeating patient histories and prior investigations, leading to avoidable delays in care provision. Such delays adversely affect patient outcomes, including access to psychosocial support—a marker of comprehensive service quality. This siloed structure also restricts the availability of reliable data for mapping national prostate cancer incidence and burden, which is vital for strategic planning and resource distribution [6, 36–38]. Additionally, minimal documentation of multidisciplinary tumour board discussions for prostate cancer cases suggests that patients may not fully benefit from collaborative treatment planning, potentially resulting in suboptimal or excessive interventions [39].

The simultaneous operation of digital and paper-based recording systems was shown to degrade data quality, causing duplication of entries in 42.1% of clinical notes across the tertiary hospitals. This redundancy mainly arose during staggered transitions to electronic platforms. Such duplication risks inflating reported prostate cancer prevalence and delivering inaccurate insights to decision-makers [40]. Although ongoing efforts exist to refine institutional databases, the findings underscore the importance of skilled data specialists for systematic cleaning to eliminate redundancies and enhance data reliability for planning purposes. Adoption of standardised data entry tools at the point of care could further elevate institutional performance [31, 41–43]. Incomplete referral documentation—stemming partly from initial recording deficiencies—obliges receiving facilities to redo evaluations, prolonging service delivery and revealing deficiencies in information transfer within the referral pathway.

In terms of data security, the study identified sound practices across tertiary hospitals. All facilities maintained electronic databases and physically secured storage areas, typically locked. Access to patient records was confined to authorised healthcare providers and managers, featuring password controls for digital systems and formal approval processes for data extraction, aligning with general data protection principles [44]. A notable shortfall, however, was the lack of formal backup policies in multiple institutions. Furthermore, no hospital employed specialised data protection officers, with ICT and records staff occasionally sharing these duties. The findings recommend a more systematic data governance framework—including comprehensive backup strategies and appointed protection roles—as facilities shift toward fully electronic records. The study highlights the urgent requirement for integrated electronic cancer registries to drive quality enhancements, since unreliable data perpetuates inadequate information cycles that hinder efficient resource allocation for prostate cancer services [25, 44, 45].

In summary, although documented information demonstrated high accuracy, the limited completeness of key clinical variables—combined with systemic challenges like disjointed HIMS, deficient interoperability, insufficient oversight, and workforce constraints—poses substantial obstacles to advancing healthcare delivery through improved data quality in Tanzania [16]. These results both corroborate and extend prior research on health data quality, especially in cancer care across Sub-Saharan Africa (SSA) [8]. The study confirms earlier reports of fragmented and non-integrated Health Information Management Systems (HIMS) and hospital cancer registries in Tanzania. Factors contributing to suboptimal data quality—such as gaps in data literacy, weak supervision, human resource shortages, and excessive workloads—mirror previously documented human, systemic, and infrastructural barriers in SSA [8]. The work reinforces evidence that poor data quality can distort findings, squander resources, compromise treatment results, and limit data utilisation for informed decision-making. Findings are consistent with broader patterns observed in Tanzanian health facilities and other low- and middle-income countries (LMICs), where data quality often remains questionable, restricting its value for policy and operational purposes [3, 8, 32, 44–46].

Limitations and strength

The strengths of this research stem from its practical mixed-methods design, which combined deductive (positivist) and inductive (constructivist) perspectives in the thematic analysis process. This integration enabled a deeper, more layered insight into issues surrounding data quality by incorporating both objective, measurable elements (such as security and storage practices) and subjective perspectives from healthcare workers (including views on completeness and accuracy). The approach thoroughly examined data quality issues across different levels and processes within the health system, providing a solid foundation for developing targeted

interventions. Data collection involved direct observations at five varied tertiary hospitals, which strengthened the trustworthiness of the findings and improved their applicability to other Tanzanian facilities encountering comparable documentation difficulties. The intentional selection of experienced participants also bolstered the reliability of the results.

Nevertheless, the study faces certain limitations, such as the risk of social desirability bias and recall bias in responses from interviewed healthcare professionals. Its broader applicability may be restricted to tertiary-level institutions and may not fully capture the obstacles encountered in primary or secondary care settings, which often operate with differing resource levels. Moreover, although several core aspects of data quality were evaluated in detail, other elements—like timeliness and relevance—received less comprehensive attention.

Conclusion

The level of completeness in clinical notes for prostate cancer management at tertiary hospitals in Tanzania was suboptimal, whereas the accuracy and security of recorded information showed encouraging results. Emphasizing the completeness of data in clinical notes remains essential. Key contributing factors to inadequate completeness included the absence of standardized forms, insufficient human resources, and disjointed health information management systems (HIMS). Accuracy was primarily compromised by redundant entries in clinical notes, largely arising from the shift between paper-based and digital recording systems. Hospital-specific HIMS and cancer registries lacked interconnection, which threatened seamless continuity of patient care. Implementing an integrated health information system could significantly enhance data quality in clinical notes and support uninterrupted care throughout the cancer referral pathway.

Recommendations

Greater focus should be placed on building capacity via targeted training and ongoing supportive supervision for healthcare staff regarding the value and standards of clinical documentation, coupled with the assignment of skilled data personnel to handle validation and maintain dependable information for planning and resource distribution. In addition, creating robust data governance frameworks—with explicit protocols for storage and backups—and appointing specialized data protection roles would be vital to strengthening security and reliability. These measures would ultimately contribute to better patient outcomes and more effective resource use in prostate cancer care services.

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