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Implementation and challenges towards hospital information system deployment for improving the quality of care for women and people with disabilities

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Abstract
This study explored the use of hospital information systems (HIS) to improve care for underprivileged groups, especially women and people with impairments. It thoroughly investigated HIS dynamics and issues in healthcare through focus groups, questionnaires and interviews. The study was carried out at Comprehensive Community Based Rehabilitation in Tanzania (CCBRT), a Tanzanian healthcare institution focused on enhancing the health of mothers and newborns and providing care for those with impairments. The study shows significant advancements in HIS deployment and enhanced data accessibility. Still, it also points out challenges like a lack of ICT skills, excessive reliance on technology, data problems, inadequate connectivity, and financial limitations. Optimizing the use of HIS in healthcare requires addressing these issues.

Keywords: Data accessibility, underserved populations, healthcare technology, healthcare improvement, healthcare quality improvement

Introduction

Improvements to healthcare systems are now widely acknowledged as necessary to meet the unique needs of vulnerable groups, including women and individuals with disabilities (Lwoga, Sangeda, & Mushi, 2021). As healthcare organizations strive to provide equitable and inclusive care, the implementation of Hospital Information Systems (HIS) has emerged as a promising solution to bridge existing gaps and improve the quality of care (Khubone, Tlou, & Mashamba-Thompson, 2020). A Hospital Information System is broadly defined as a system that integrates data collection, processing, reporting, and use of the information necessary for improving health service effectiveness and efficiency through better management at all levels of health services (Torab-Miandoab, Samad-Soltani, Jodati, & Rezaei-Hachesu, 2023). According to Lwoga, Sangeda, and Mushi (2021), HIS helps healthcare organizations collect, process, and disseminate information inside and outside the organization.

Patient information systems, administrative systems, radiology and pharmacy information systems, telemedicine, and hospital information systems, such as computerized physician entry systems, are just a few of the systems incorporated into HIS. By leveraging advanced technologies and digital platforms, HIS implementation aims to improve the efficiency, accuracy, and accessibility of healthcare services while promoting patient-centred care.

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Effective technology can reduce clinical errors, support clinicians, improve information management, and increase patient access to health services, remote care, and the continuity of services. HISs are expected to have social and economic benefits for patients, families, and healthcare providers (Sligo, Gauld, Roberts, & Villa, 2017). Moreover, the HIS can enhance data management throughout the hospital, improve the treatment of patients with disabilities, and help gather crucial maternal and disability health data.(Lwoga *et al*., 2021).

Despite the enormous potential and opportunities of HIS to fundamentally change the healthcare industry, there are several apparent and impending difficulties. The adoption of healthcare IT is slow and lagging. These difficulties include a variety of topics, including those about the technology itself, the healthcare setting, system users, and the regulatory environment (Azevedo, 2017; LeBlanc, 1996). A key challenge in developing countries is the lack of sufficient awareness and use of ICTs and the lack of well-trained ICT professionals (Kimaro, 2006). Studies in Sub-Saharan Africa (SSA) have noted challenges with data quality, such as completeness and timeliness, correctness, consistency, and inadequate use of HIS tools (Teklegiorgis, Tadesse, Mirutse, & Terefe, 2016; Xiao & Watson, 2017).

According to Donald and Lwoga (2022), The benefits of HIS are unclear to most users for several reasons. First, some health facilities did not implement all the HIS modules. The second reason is user demographic components or characteristics, such as age, professional cadre or occupation, sex, and experience. Chang and Hsu (2012) highlighted that the age and gender (specifically male) of a user negatively affect his/her intention to use the system, while years of work experience and professional cadre (specifically a nurse) of a user positively affect his/her intention to use the system.

Increasing the efficiency and quality of care, supporting healthcare delivery, reducing costs, and attaining better health outcomes depend on effective data management through health information systems. Tanzania has made little effort to collect and manage health data on its most vulnerable citizens, such as people with disabilities (PWDs), women who are pregnant at high risk, women who have had obstetric fistulas, young pregnant teenagers, and teenagers who are at risk of teenage pregnancies. Innovative technologies must be adopted to handle these groupings of underprivileged minorities. Electronic hospital management information systems (eHMIS) have recently been embraced by the majority of hospitals as projects to raise the standard of patient care, particularly for vulnerable populations (Lwoga *et al*., 2021).

Comprehensive community-based rehabilitation (CCBRT) is a prominent healthcare organization in Tanzania. Their primary objective is to prevent disabilities and ensure accessible healthcare and rehabilitation services while empowering individuals with disabilities and their families. To achieve early detection and prevention of impairments, CCBRT aims to enhance the maternal and newborn health systems. Although CCBRT maintains a satellite facility in Moshi, its main offices are in Dar es Salaam. In Dar es Salaam, CCBRT offers various healthcare services, including maternity and newborn care, childcare, plastic and reconstructive surgery, orthopedics, and physical rehabilitation. The Moshi CCBRT centre is a crucial provider of essential healthcare and support services for individuals with disabilities who lack other accessible options. In 2015, CCBRT initiated the transition from a paper-based system to an electronic health administration Information System (eHMIS) to enhance overall data management, improve care for vulnerable patients, and facilitate collection of vital disability and maternity health data (Lwoga *et al*., 2021).

This study examines the implementation and challenges of hospital information system deployment to improve care quality for women and people with disabilities. It aims to advance inclusive healthcare systems, ensuring equitable access to high-quality care for all individuals.

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Methods

This study employed a mixed-methods approach, using qualitative and quantitative data collection methods. It was conducted in three phases at the CCBRT headquarters in Dar es Salaam, as outlined below.

a) A Baseline survey aimed to assess the implementation status of HIS and the challenges faced by health workers when using it. Semi-structured interviews were conducted with an ICT technical expert to determine the implementation status. Two separate FGDs were conducted with four clinical and five non-clinical staff members between March and April 2019 to assess the challenges faced by health workers when using HIS.
b) Mid-review aimed to assess the use of HIS among health workers. About 96 employees were approached to respond to the developed questionnaire. An interviewer used a tablet (69) with pre-designed questions, and for another 28 participants, an online survey link was forwarded by email. 69 (71.9%) participants responded to the questionnaire (66 tablets and 3 online surveys).
c) The final evaluation aimed to explore any changes in the implementation and usage of HIS and the challenges health workers face in using HIS. The study was conducted between October and November 2019 using a questionnaire survey of 70 employees who responded to the study out of 96 employees.

In the data analysis, we conducted a descriptive study to explore if there were any changes in the usage of HIS and challenges faced in deploying HIS by using frequencies, percentages and means. Qualitative data from interviews with ICT staff and FGDs with healthcare workers were transcribed verbatim. We used a thematic analysis approach to analyze the findings. The data were analysed through examination and categorization of the respondents' opinions. The analysis was carried out in three stages: first, line-by-line coding of field notes and transcripts (unpacking of text into discrete elements to expose underlying thoughts and meanings); second, in-depth examination and interpretation of the resultant codes into descriptive themes; and third, interpretation of the descriptive themes into more abstract analytical themes.

Results

Profile of the respondents

There was no gender inequality among participants in either survey. The mean age was similar between the two groups. More health workers with bachelor's degrees participated in the mid-survey, whereas most diploma holders agreed to participate in the final evaluation.

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Table 1: demographic characteristics

	Mid-survey	Final survey
The sample size for the evaluation	69	70
Demographic characteristics		
Gender		
• Male	52.2% (n=36)	52.9% (n=37)
• Female	47.8% (n=33)	47.1% (n=33)
Age	Mean = 39.5	Mean = 39.11
Education		
• Certificate	(17.4%, n=12)	(22.9%, n=16)
• Diploma	(27.4%, n=19)	(38.6%, n=27)
• Bachelor	(29%, n=20)	(28.6%, n=20)
• Postgraduate Diploma	(5.8%, n=4)	(7.1%, n=5)
• Masters	(18.8%, n=13)	(2.9%, n=2)
• PhD	(1.4%, n=1)	None
Professional cadre type		
• Clinical	37.7% (n=26)	50% (n=35)
• Non-clinical	62.3% (n=43)	50% (n=35)

Implementation status of HIS

The findings from interviews with ICT staff at the baseline study revealed that the hospital has four clinical services: Orthopedic and physical rehabilitation clinical services; Ophthalmology; Maternal, Newborn, and Child Health; and Plastic and Reconstructive Surgery. In 2015, the hospital partnered with the Vrije Universiteit Brussel (VUB) to adapt OpenClinic, an open-source HIS software, to fit CCBRT's data management needs**.** OpenClinic implementation began in October 2015. By the end of 2018, the HIS was used in Orthopaedic and physical rehabilitation clinical services to register patients and book surgeries, as well as to digitize forms, bill patients, and index medical supplies. Hospitals have information systems for finance and human resources.

The interviews at the baseline and the final study revealed that HIS was covered in two clinical services (Orthopaedic and physical rehabilitation and ophthalmology) by the end of the final survey in 2019 from one clinical service (orthopaedic and physical rehabilitation) during the baseline survey. Hence, the HIS did not cover the following clinical services: Maternal, Newborn and Child Health, and Plastic and Reconstructive Surgery. Furthermore, the number of modules implemented in the HIS by the end of 2019 had increased from 12 to 16 (See Table 2). The hospital had not implemented systems other than the same ones (ie., human resource management and accounting information systems).

The HIS was also integrated with the health insurance claim management system (e.g., the National Health Insurance Fund (NHIF) and SMS reminder system for surgery and club foot patients, appointment booking via phone calls, and mobile payment services). The HIS reports are only submitted monthly via email and paper printouts to higher authorities (e.g., the District Health Information System (DHIS2) at the Ministry of Health).

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Table 2: Implementation status of HIS

	Baseline survey	Final survey
Analysis of the implemented HIS business processes	Implemented 12 out of 26 business processes, which included: outpatient registration, patient billing and payment, diagnostic services (laboratory, radiology, and imaging), store/inventory management, picture archival and communication system (PACS), user management module, and security features	Implemented 16 out of 26 business processes. Additional modules from the baseline study were pharmaceutical management, inpatient, Electronic Medical Records, and surgery.
Clinical services covered by HIS	One clinical service was covered by HIS: orthopaedic and physical rehabilitation clinical services	Two clinical services were covered by HIS: Orthopaedic and physical rehabilitation clinical services and Ophthalmology
Integration with other systems at the National level	The HIS was only integrated with the NHIF	The HIS was only integrated with the NHIF
Other implemented information systems in the hospital	Human Resources Management Information System, SMS reminder system, and Accounting Information system	Human Resources Management Information System, SMS reminder system, and Accounting Information system

Usage of HIS by health workers

The findings from FGDs with clinical and non-clinical staff in the baseline study revealed that they used the HIS daily, especially for entering patient data, medical tests/supplies, and financial data. Generally, clinicians and non-clinicians acknowledge that accessing data from the HMIS is easy. One participant commented,

> *' Before 2018, it was difficult to access data. One needs to access data from a specific link. However, currently, I can easily retrieve data when I log in to the system*" (Participant 1, FGD 2).
>
> Both clinical and non-clinical studies acknowledged that it was straightforward for them to retrieve medical reports from the HIS. A typical comment was that "*it is straightforward to retrieve a report because the template of the report is already set according to what you have requested*' (Participant 2, FGD 1). Another participant added, "*You can produce reports in different formats you want, e.g. power, point, excel, word, etc*".

Both clinical and non-clinical studies have acknowledged that some modules can be Integrated into the HIS. For example, the patient registration, store, and pharmacy modules were all linked to the payment system. Therefore, it is easy for medical staff to prescribe medications to patients.

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Typical responses were that:

> *"When we refer the patient, the prescription is linked to the optics department. The patient can go to the optics department and access the prescription there. The optics department can automatically request the material from the main warehouse to go to the workshop where the spectacles are made. They can go to the delivery desk, which indicates integration in the whole department, I would say. The system is also integrated with the finance… is integrated"* (Participant 2, FGD1).

> *"Clinicians at the departments like orthopaedics, eyes, and gynaecology can prescribe anything from their department. In the laboratory section, I can see the prescription and enter the results so the same doctor can see it. This is how the data is integrated into different departments also to the warehouse where we request materials"* (Participant 2, FGD 1).

> "*A doctor can retrieve patients' data and enter prescription data into patient's history, and thereafter, the patient can go to the finance to receive an invoice for payment*" (Participant 5, FGD 2).

Similar findings were revealed in the mid-survey and final survey, and clinical and non-clinical studies were frequently acknowledged using HIS. The results indicated an increase in the frequency of HIS use among health workers from 81.2% of staff at the baseline to 87.1% at the final evaluation (See Table 3). The results indicate an increase in how health workers spent time on the system, from 58% of the staff during the baseline survey to 77.1% during the final evaluation (See Table 3). The findings showed that all staff members supported the deployment of the HIS at CCBRT during both surveys.

Table 3: Use of HIS among health workers

	Mid-survey	Final survey
1. Analysis of how frequently HIS is used (*Several times a day*)	(81.2%, n=56)	(87.1%, n=61)
2. Analysis of how much time is spent on HIS per day (*four hours or more*)	(58%, n=40)	(77.1%, n=54)
3. Support the deployment and implementation of the HIS	(98.6%, n=68)	(100%, n=70)

Challenges of Using HIS

Data from interviews with ICT teams and FGDs with clinical and non-clinical staff during the baseline study revealed the following challenges regarding the implementation of the HIS: inadequate ICT skills, incomplete data due to errors made during data entry, difficulties in data entry and retrieval, the inefficiency of the HIS because some modules are not integrated or they are missing in the HIS, poor internet connectivity, difficulties in confirming patient histories, and inadequate budget. These challenges are explained in detail below:

Inadequate ICT skills: The findings from FGDs revealed inadequate skills in entering data into the system despite having received training on using the HIS from clinical and non-clinical staff. The typical narratives are as follows:

> *"It is easy to add or customize some of the tests or other information in the system. About half of the staff in my department have been able to add and/or create data and use this system comfortably. However, some are still facing difficulties operating the system or customising data we need to add to the system"* (Participant 1, FGD 1).

> *"I'm not skilled enough because there are still a lot more things I need to know about using the HIS"* (Participant 3, FGD 1).

> *"I'm not skilled; I still need more training and skills to be more competent in using the system, as some fellows say"* (Participant 4, FGD 1).

> *"If you want to add some of the tests that were not there, it is easy to do so, but for some colleagues, it is not quite easy"* (Participant 1, FGD 1).

> *"I need to have more training, especially on how to use HIS"* (Participant 5, FGD 2)

Similarly, the interviews with ICT technical staff revealed that the key challenges that might hinder the implementation of HIS were related to digital illiteracy among staff and a lack of ownership from the clinical team. A typical observation was that "once you put a computer in front of a medical doctor or a clinician, it stops being their job."

Despite this challenge, clinical and non-clinical staff acknowledged that ICT teams were always available to assist when they faced difficulties using the system. They usually reported issues via email or telephone calls.

> *"I can say that as days go by, this system comes so easily because as we get the difficulty, we consult our IT department and make it easy according to our request"* (Participant 3, FGD 1). Another participant added that *"ICT technical staff either come physically or they can instruct you how to solve the problem depending on the nature of the problem. However, they are always there to help us if the reported problem is so complicated. It might take time, but it depends on the nature of the problem. Generally, they help us"* (Participant 3, FGD 2).

> Some non-clinical staff recommended continuous training on HIS use because of the challenges they experienced. One respondent said, ' A fresher course on HIS should be provided during job orientation or at least once in the year' (Participant 1, FGD 2).

Over-dependency on ICT: Another challenge was related to over-dependency on computers, as revealed in both FGDs. One participant said,

> *'When you do automation, you create dependency on your system' (Participant 2, FGD 2). The interviewee with ICT staff revealed that approximately 47% of the staff (i.e., clinical and non-clinical staff) had been trained in using HIS. Thus, there is a need to work on staff capacity building and changing* mindset towards ICT utilization.

Difficulties in data entry and retrieval: Lack of ICT skills led to difficulty accessing some data, as reported in one FGD. Some non-clinical staff members noted that accessing the required data in the ophthalmology department was difficult. One respondent said,

> *"...until you dig deep in the system, that when you able to access some data in HIS. Therefore, the system must be improved"* (Participant 4, FGD 2). The clinical staff also reported that

entering data that was not defined in the system was difficult. One participant observed, *"Although I have received training, it is not easy to trace medicine which was not previously in our HIS"* (Participant 3, FGD 1).

Incomplete data due to errors made during data entry: Some data were incorrectly entered into the HIS, which led to incomplete and incomprehensive data, as reported by clinical staff. A typical comment from the clinical staff was,

"Sometimes if the result is 2.45, you can just find it to 24.5; these errors can be reduced by automatically capturing *data rather than manual data entry"* (Participant 1, FGD 1).

In parallel, the data from the interviews with ICT technical staff revealed that it was challenging to confirm patient histories and patient information, and hospital data were still incomplete. None of the medical records were digitized during the baseline study because Electronic Medical Records were not established.

Some modules are not integrated or missing in HIS: some features were not incorporated into the HIS, as reported by clinical and non-clinical staff. For instance, one respondent commented,

"*There is a need to improve the pharmacy module, such as bill the patient and dispense medicines simultaneously"* (Participant 3, FGD 1). Another participant also echoed this finding. *"We expect the HIMS to link with those machines which we have in my department so that once we are done with the test, they can just pick the results, rather than putting it manually, so these are the improvements we expect particularly this 2019 to 2020 we expect those features to be added. We also expect that some of the tests we are not doing now but expect to be doing may be incorporated into the HIMS … for improvement"* (Participant 1, FGD 1).

Typical observations were:

"The HIS needs to be customized per departments' requirements. Some of the features are not present, so this is the challenge I have been facing" (Participant 1, FGD 1).
"I always contact the ICT team to request them to add some features when I find those items are not integrated into the system" (Participant 4, FGD 1).

"I wish the ICT team to add the feature that I wish to use: … when preparing patient operation procedure, it is difficult to capture a patient who is scheduled to undergo two surgeries at a time. The system allows capturing only one surgery, such that the other must be put in the remark section rather than automatically capturing it because it does not allow that" (Participant 4, FGD1).

"if you have a patient who needs to be transfused and you send blood units to that particular patient, you do not find an appropriate tool to feed the information; for example, you have to identify the client blood group which is there in the systems, again, you want to identify the units that are available, you also want to ascertain if the type of blood group wants to transfuse is available, we wish that this kind of information need to be captured and integrated in the current year 2019 having them in the system, would be very helpful to our department" (Participant 1, FGD1).

"I wish the HIS to have bar codes, having much more control in the system, and I'm looking forward to having a digital signature attached to the invoices to acknowledge the customer" (Participant 2, FGD1).

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"I wish we could improve how we capture and generate reports on clinical data. The system is more focused on generating financial data" (Participant 1, FGD2).

"At the pharmacy module, there are features which we are using to capture those data. However, there is a need for some improvement, such as how to clean up data and put it in a grouped way so that it can be easily interpreted by users" (Participant 3, FGD 2).

"There is a need to improve how we generate reports" (Participant 2, FGD 2).

System workflow: Issues with the system workflow pose a challenge in confirming patient histories, as reported by non-clinical staff. Participants reported that the system allowed the patient to attend one clinical service and complete it before commencing another service. However, they felt that this was a problem for the patients. One participant said,

"Maybe some patients have two problems (i.e. eye and orthopaedic). The system will only allow the patient to complete one clinical service and thereafter go for another service' (Participant 5, FGD2).

Poor Internet connectivity: The clinical staff reported other challenges related to poor Internet connectivity. Participants acknowledged that the Internet was so slow that it inhibited the use of the HIS more effectively.

Inadequate budget: ICT teams reported inadequate budgets as another challenge. Hospitals must improve their networks, hardware, software, and technical ICT staff. On the other hand, the final survey questionnaire revealed that lack of training and skills in using HIS were significant limitations in the effective implementation of HIS among health workers.

Table 4: Challenges of implementing HIS

	N (Percent)
Lack of training	39(58.2%)
Lack of skills on how to access and use HIS	32(47.8%)
Lack of electrical power	17(25.4%)
Workload pressure	16(23.9%)
The process of health data in the current HIS was long and difficult	14(20.9%)
Lack of feedback from a high level to a low level	13(19.4%)
Limited ability to exchange information between systems	12(17.9%)
Poor quality of data	10(14.9%)
Lack of access to a computer in my department	10(14.9%)
Poor managerial skills	9(13.4%)
Lack of skilled ICT experts	9(13.4%)
Limited feedback of data in systems for patient care	8(11.9%)
A negative attitude about HIS	6(9.0%)

Multiple responses were allowed.

Overall, a lack of training and skills in using HIS was a significant limitation in the effective implementation of HIS in both interviews and FGDs during baseline and questionnaire surveys in the final study. Other challenges that emanated in both interviews and questionnaires were related to the process of health data in the current HIS, which was long and arduous; lack of feedback from a high level to a low level; poor quality of data; limited ability to exchange information between systems; lack of access to some data because the system is not integrated; negative attitude about HIS; some modules are not integrated or they are missing in HIS, leading to lack of access to some data; and poor response time on HIS, for example, sometimes the system is slow or hangs.

Discussion

Implementation status of HIS

The HIS was deployed in orthopaedic and physical rehabilitation clinical services during the baseline study at CCBRT. Other nations, such as Kenya, Peru, Haiti, Uganda, Malawi, and Brazil, have demonstrated a consistent tendency to initially deploy HIS in specific departments or services within healthcare institutions (Fraser *et al*., 2005). This approach allows for targeted implementation and gradual expansion of other clinical services.

Orthopaedic physical therapy and ophthalmology were added to the HIS coverage when the final research was completed in 2019. This shows the development of CCBRT's HIS implementation. However, HIS has not yet covered the costs of plastic and reconstructive surgery and maternal, newborn, and child health services. This result is consistent with those of some studies (Alsalman *et al*., 2021; Mekonnen, Chanyalew, & Tilahun, 2022) that showed variances in the degree of HIS deployment across various clinical services within healthcare institutions. It often takes longer to administer all healthcare services because it may be difficult and time-consuming (Mekonnen *et al*., 2022).

By the end of 2019, 16 modules were integrated into the HIS, an increase from the previous 12 modules, indicating that attempts to improve the system's usability are still being made. This finding is in line with those of other studies that have stressed the significance of broadening the scope of HIS modules to support many facets of healthcare delivery, including patient management, billing, and inventory control (Kagiri, Waiganjo, & Ngechu, 2015; Lwoga *et al*., 2021).

The HIS has been integrated into the health insurance claim management system, SMS reminder system, appointment booking, and mobile payment services to improve patient care and administrative procedures. Similar integrations have been observed in other studies, which suggests that there is a growing understanding of the benefits of integrating various systems and services to improve patient experience and streamline healthcare operations (Asangansi *et al*., 2013; Kagiri *et al*., 2015).

The reporting of HIS data is one area where implementation at the CCBRT might be even better. The reliance on higher authorities' monthly emails and paper printouts raises the possibility of a delay in data availability for analysis and decision-making. Other studies (Csonka & Korppi, 2022; Kohane *et al*., 2021) have stressed the significance of real-time or almost real-time reporting using electronic platforms, enabling timely monitoring and reaction to health trends and concerns.

Usage of HIS by health workers

The study found that clinical and non-clinical workers at CCBRT regularly entered patients, medical tests, and financial data into the HIS. Participants indicating that retrieving data from the HIS was more straightforward than in the past noted the simplicity of the process. This optimistic view of data accessibility is consistent with research results from other studies, which have suggested that it may enhance data availability and retrieval for healthcare professionals (Girardi, De Gennaro, Colizzi,

& Converting). The participants at CCBRT acknowledged that it was easy for them to retrieve medical reports from the HIS, as the system had pre-defined report templates that matched their specific needs.

This feature facilitates the generation of reports in different formats, such as PowerPoint, Excel, or Word. Similar results have been observed in other research, showing that having adaptable report templates available can improve the HIS's use and efficiency for health workers (Khalifa & Alswailem, 2015; Lau, Price, & Keshavjee, 2011; Lwoga *et al*., 2021).

The clinical and non-clinical staff at the CCBRT acknowledged the integration of several modules within the HIS. For instance, there was connectivity between the patient registration, retail, pharmacy, and payment system modules. Through this connectivity, procedures might be expedited, including the automatic ordering of supplies from the central warehouse and the direct prescription of medication from the HIS. Such an integration can increase the overall coordination of healthcare services, increase workflow efficiency, and reduce errors. The relevance of integrating various HIS components to improve healthcare delivery has been highlighted by comparable findings of module integration that have been published in related contexts (Aguirre, Suarez, Fuentes, & Sanchez-Gonzalez, 2019; Lwoga *et al*., 2021).

The study also showed that health professionals used HIS more frequently over time. The percentage of workers using the HIS increased from the baseline to the final evaluation, demonstrating a rising acceptance and reliance on the system. The amount of time spent on the system also increased, indicating the increased integration of the HIS into the daily workflow of health workers. These results are consistent with those of other studies (Donald & Lwoga, 2022; Rouibah, Hamdy, & Al-Enezi, 2009). The acceptance and engagement of health workers are critical for successfully adopting and utilising the system.

Challenges of using HIS

Insufficient ICT skills have been a significant problem for health professionals at CCBRT. Some staff members complained of data entry and modification challenges despite HIS training, indicating the need for ongoing training and skill development. Other studies have highlighted the significance of continuing training programs to improve the ability of health workers to use HIS efficiently by reporting similar ICT skills issues (Gesulga, Berjame, Moquiala, & Galido, 2017; Lwoga *et al*., 2021) .

Difficulties in data entry and retrieval were reported in the CCBRT, with some staff members finding it challenging to access the required data or enter data that were not predefined in the system. These challenges can be attributed to a lack of ICT skills, incomplete system integration, or limited customization options. Similar results have been observed in other studies, indicating the necessity for intuitive user interfaces, extensive data entry options, and increased system integration to support effective data management in HIS (Donald & Lwoga, 2022; Jahanbakhsh, Tavakoli, & Mokhtari, 2011).

Another issue with CCBRT is incomplete data owing to errors during data entry. Employees mentioned occasions when mistakes in data entry resulted in erroneous or incomplete data. This study emphasizes the significance of data quality control procedures, such as automated data collection and validation checks, in reducing data entry errors. Similar issues with data correctness and completeness have been noted in other studies, highlighting the necessity of user-friendly interfaces and data validation methods to reduce manual data entry errors (Endriyas *et al*., 2019; Rumisha *et al*., 2020) .

The lack of integration or missing modules within the HIS was also identified as a challenge at CCBRT. Staff members reported needing more features and better integration to improve system performance. The significance of customization options and ongoing system improvements to meet

particular clinical requirements and workflow needs is demonstrated by this finding, which is consistent with studies conducted in related contexts (Aguirre *et al*., 2019; Kawila & W., 2017; Lwoga *et al*., 2021; Mekonnen *et al*., 2022).

For health professionals at CCBRT, poor internet access presented a hurdle that reduced the efficacy and efficiency of using the HIS. This study emphasizes how infrastructure constraints can make it difficult for electronic systems to function correctly when resources are scarce. Other studies have noted similar issues with internet connectivity, highlighting the requirement for robust IT infrastructure and dependable connectivity to guarantee continuous access to the HIS (Gesulga *et al*., 2017; Lwoga & Musheiguza, 2023).

Inadequate budgets have also been identified as a challenge. The development, extension, and maintenance of an HIS can be hampered by a lack of funding, which affects the efficiency and usefulness of the system. Similar financial restrictions have been reported in other studies, highlighting the significance of long-term investment and financial planning to support the effective implementation and ongoing operation of HIS in healthcare facilities (Kruse, Stein, Thomas, & Kaur, 2018; Mekonnen *et al*., 2022; Ngafeeson, 2014).

Implication of study findings

The study's results have important implications for implementing Hospital Information Systems (HIS) to improve the quality of care for women and people with disabilities. Expanding HIS coverage to multiple clinical services has led to progress in implementing the system at CBRT. This result suggests that targeted implementation in specialized departments or services can be an effective strategy for continuously expanding HIS within healthcare facilities.

Integrating various modules within an HIS, such as patient registration, storage, pharmacy, and payment systems, has improved workflow efficiency. This integration allows healthcare providers to perform tasks more effectively, such as prescribing medications directly from the HIS and automatically requesting materials from the central warehouse. The ease of accessing data and retrieving medical reports from HIS has enhanced data availability and retrieval for healthcare providers. Customizable report templates facilitate the generation of reports in different formats, catering to users' specific needs. These findings highlight the importance of user-friendly interfaces and customizable features for enhancing the usability and effectiveness of HIS.

The study also revealed several challenges that need to be addressed to enhance the utilization of HIS. Inadequate ICT skills among healthcare workers pose a common challenge, emphasizing the need for continuous training and skill development programs. Challenges such as difficulty in data entry and retrieval, incomplete data, and lack of integration or missing modules within the HIS hinder efficient data management. To overcome these challenges, user-friendly interfaces, comprehensive data entry options, improved system integration, and data quality control measures such as validation checks and automated data capture are essential. Another significant challenge is poor internet connectivity, mainly in resource-constrained settings. This study highlights the importance of robust IT infrastructure and reliable connectivity to ensure uninterrupted access to HIS.

Conclusions

The use of Hospital Information Systems (HIS) has the potential to significantly raise the standard of care provided to both women and individuals with disabilities. The results of this study include information on the development of the HIS at the Comprehensive Community-Based Rehabilitation in Tanzania (CCBRT) as well as the difficulties health professionals face when using the system.

According to the study, HIS deployment at CCBRT has advanced, with the system initially being put in place in specialized departments before eventually being extended to other clinical

areas. The HIS integration of several modules reduces the number of procedures and increases workflow effectiveness. The results also highlight healthcare professionals' positive comments and rising system usage over time, demonstrating a growing acceptance and reliance on HIS. The system's improved data accessibility and the accessibility of customized report templates have made it simple for healthcare professionals to use.

Several issues need to be resolved to use HIS best. The dilemma faced by health personnel with inadequate ICT skills highlights the need for ongoing training and skill development programs. Effective data management is hampered by challenges such as data entry and retrieval, insufficient data, and lack of integration or missing modules within the HIS. Ineffective budgeting and poor Internet connectivity also challenge using an HIS to its full potential.

Investment in regular training programs to improve the ICT abilities of health personnel is essential to overcome these obstacles. To enable effective data management inside an HIS, user-friendly interfaces, thorough data entry choices, and better system interactions should be prioritized. Implementing automated data collection and validation checks will ensure data quality control. A solid IT foundation and dependable internet connectivity are crucial for continuous access to an HIS. Sustained financial investment and planning are required to enable the successful deployment and operation of the HIS.

Healthcare organizations may have the potential to raise the standards of care for women and persons with disabilities by addressing these issues. The results of this study will contribute to the development of inclusive healthcare systems and ensure that all people, regardless of their vulnerability, have fair access to high-quality care. They also offer important insights and lessons for healthcare facilities in implementing HIS.

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