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Critical success factors to improve data quality of electronic medical records in public healthcare institutions

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Background: Electronic medical record (EMR) systems have been identified as having the potential to improve healthcare and allow the healthcare sector to reap a number of benefits when implemented successfully. However, problems with the data quality of EMRs are often reported as barriers to successful implementation of these systems.

Objectives: The purpose of this study was to investigate the critical success factors that can improve the data quality of EMRs in public healthcare institutions in the North West province of South Africa.

Method: This study utilised data quality framework (DQF) as a lens to collect qualitative data through interviews with seven nurses and one information technology specialist chosen through purposive sampling. The interview guide was developed using the DQF.

Results: The data quality of EMRs is influenced by the six data quality dimensions of the DQF, namely, completeness, consistency, conformity, accuracy, integrity and timeliness. Therefore, it is important that healthcare workers understand the five factors identified in this study in order to ensure good-quality data in EMRs.

Conclusion: This study recommends that public healthcare institutions should consider using the DQF to improve the quality of patient data, which is documented in EMRs. Implementing the DQF may ensure that the healthcare workers follow the correct standards of documenting patient data, which are accurate, complete, consistent and timely, conforming to the appropriate standards and with integrity.

Keywords: electronic health records; electronic medical records; public healthcare; health information systems; South African healthcare.

Introduction

Healthcare institutions are moving away from paper-based record systems to electronic medical records (EMRs) to capture patient data. According to Adane, Muluye and Abebe (2013), the biggest problem with paper-based systems is related to the quality and completeness of medical entries. If a medical record is not complete or does not reflect accurate information, it becomes difficult for the doctor to make an accurate diagnosis or prescribe the right treatment. However, EMRs have the potential to reduce these errors by providing improved access to and accuracy of the medical information (Yanamadala et al. 2016).

Electronic medical records were the first electronic sources used to digitise patient information (McMullen et al. 2014). They are a collection of individual health information that is captured and stored in a digital format by a clinician during the visitation by a patient (Ohuabunwa et al. 2015). Healthcare institutions that are able to successfully implement EMR systems are likely to reap a number of benefits, including easy access to information, improved decision support and patient monitoring, efficiency and financial improvements (Katsande 2014).

In South Africa, there are legislative and regulatory gaps in how EMRs are implemented in the country. Issues such as record retention are not addressed in the legislation, which could lead to privacy issues. There is also a lack of infrastructure and coherence amongst the different levels of care in the public health sector. This meant that there was no interoperability between the few systems that are in use, mainly in the Western Cape (Katuu & Ngoepe 2015).

An example of the current use of an EMR system is the Clinicom, which is implemented at the Khayelitsha Hospital in the Western Cape, South Africa. When the records kept in this system were evaluated, 15% of the records for trauma cases was found to be missing or incomplete, some had missing vital signs and 73% of the records did not record the patients' time of arrival (Ohuabunwa et al. 2015). The quality of the EMRs is critical as they determine the final outcome of the healthcare patients receive (Katurura & Cilliers 2018).

According to Bowman (2013:1), the 'quality of health care across the continuum depends on the integrity, reliability, and accuracy of health information'. The EMRs provide a number of benefits to the organisations that successfully implement and utilise the systems. However, technology may also introduce its own errors, which may have negative effects. According to Jawhari et al. (2016), many researchers have stated that the effectiveness and efficiency of healthcare cannot be solely improved by EMR implementation. Instead, digital systems tend to introduce complexities that put the personnel under immense pressure because they do not understand the systems, thus causing bad workflow. Thus, it is of importance that every organisation that implements an EMR system invests in providing training to the staff that will be using the system. Additionally, if the medical record is retrieved and charted, the patient's information will present an incorrect surgical history that may impact his or her future procedures requiring anaesthesia (Rebello et al. 2016). It is, therefore, evident that minor mistakes like opening a wrong record could result in another patient's record being incorrect, leaving him or her suffering or even leading to death, and in some cases resulting in litigations (Saba et al. 2019). Another problem identified regarding EMRs is that they lack consistency in terms of how the data are documented across different healthcare institutions by healthcare workers. The inconsistency is caused by the different understandings that the healthcare professionals have regarding the importance of capturing the necessary information that are collected at various points in healthcare institutions, thus affecting data quality (Anthony 2014). The main purpose of this research study is to investigate the critical success factors (CSFs) that may improve the data quality of EMRs in public healthcare institutions in North West province, South Africa.

Literature review

The EMRs are used in healthcare institutions to record patient health information. However, these electronic records are susceptible to poor quality because of the mistakes committed by healthcare workers when capturing the data. Therefore, it is necessary to investigate the effect that poor data quality in EMRs can have (Ohuabunwa et al. 2015). Usually EMRs are created in the healthcare practitioner's office and they remain within the organistaion. Other additional functionalities of

EMRs include decision support, results management and order entry (Ludwick & Doucette 2009).

Katuu (2016) reports that 40 individual health information systems in the public healthcare sector are scattered across provinces in South Africa. More than half of these systems do not adhere to any national or international standards and more than a quarter is stand-alone applications that cannot share with other systems.

The EMRs enable organisations to effectively manage records. The EMRs also have the ability to highlight issues that might have been missed when using a paper record system that is only available to the healthcare workers at a particular hospital. Thus, adverse events can be prevented as a result of the records that contain the patient's history and medication history. The EMRs have several other benefits, not only for the organisation that uses them but also for the community. Although EMRs reduce costs incurred by the healthcare organisations by preventing mistakes that can be avoided, the records also improve the communities' health. Such EMRs provide clinical, organisational and societal benefits. Firstly, EMRs affect clinical outcomes by improving the quality of care of patients and enable the reduction in medical errors by increasing safety, efficiency and effectiveness (Bain 2015; Menachemi & Collum 2011).

Data quality can have different meanings to different individuals, based on their perspectives or what they consider important. Data quality refers to data that are accurate, relevant, valid, reliable, legible, complete and available when it is needed by decision-makers for healthcare delivery and planning purposes (Dragan 2018; Health Information and Quality Authority 2011). The quality of the data can be influenced by how data areanalysed, interpreted and organised. Good-quality information depends on good-quality data. In other words, information can only be of good quality if the collected data are appropriately analysed and organised.

The concept of data quality refers to the ability of the data to fulfil the purpose for which they were collected or fit for use. The concept of 'fitness for use' emphasises the importance of taking the end user's perspective of quality into consideration because it is the end users who will decide whether a product is fit for use or is conforming to specific requirements (Fields et al. 2014).

Data are susceptible to quality issues and these have an impact on the functioning of information systems. According to Sidi et al. (2013), data quality problems are generally divided into two classes: single-source and multi-source problems. Some research has identified four categories of data quality, which are shown in Table 1. The goal of classifying the data quality problems is to illustrate non-standard data and to identify the exact application of data for corresponding requirements (Man et al. 2010).

TABLE 1: Data quality problem classification.

Data quality problem	Category	Definition
Single-source problems	Schema level	Lack of integrity constraints and poor schema designer
		Uniqueness constraints
		Referential integrity
	Instance level	**Data entry errors** – for example, recording incorrect information or leaving out some crucial patient information.
		Misspelling – for example, spelling a patient's name or the patient's address incorrectly.
		Redundancy duplicates – for example, having the same patient recorded in two different medical files.
		Contradictory values – for example, in an EMR, patient A was registered as a pulmonary case, whereas on follow-up visits, it was recorded as an extra-pulmonary case. These contradictory values can lead to poor decision-making.
Multi-source problems	Schema level	Heterogeneous data models and schema design
		Naming conflicts – for example, healthcare practitioners using different languages or medical terms to record patient information.
	Instance level	Overlapping, contradicting and inconsistence data
		Inconsistent aggregating – for example, healthcare data can be different across different departments (pharmacy or radiology), that is, having the same information in different formats which makes the data aggregation inconsistent.
		Inconsistent timing – for example, some healthcare practitioners may record a patient's information later, rather than immediately during the consultation.

Source: Sidi, F., Panahy, P.H.S., Affendey, L.S., Jabar, M.A., Ibrahim, H. & Mustapha, A., 2013, 'Data quality: A *survey of data quality dimensions', 2012 International Conference on Information Retrieval & Knowledge Management,* IEEE, Kuala Lumpur, Malaysia, March 13–15. https://doi.org/10.1109/InfRKM.2012.6204995

EMR, electronic medical record.

Data quality of electronic medical records

The data quality of a medical record is very important; thus, it is essential that the practitioners consider capturing and storing complete, accurate and reliable patient information in order to make more accurate, informed decisions. Miller and Sim (2004) found that quality improvements are determined by the physician's use of the EMR. In other words, the quality of the EMRs is determined by what the physicians put into the record. If the physicians omit certain details, the quality of the entire medical record will be affected as it will be incomplete. The application of quality improvement strategies can guide the physicians on the standards that should be followed when making use of an EMR. For instance, the design of the electronic health information system (EHIS) should not allow the omission of all the important information regarding a patient. The cause of poor data quality in EMRs often includes factors such as high workload, the lack of software features and the shortage of hardware.

Theoretical framework

In order to gain an in-depth understanding of the CSFs to improve data quality in EMRs, the data quality framework (DQF) was adopted. Data quality consists of six primary dimensions, which includes completeness, consistency, conformity, accuracy, integrity and timeliness (Thatipamula 2013). Each of the dimensions is defined below.

Completeness

Data are complete when all the necessary data are present. Askham et al. (2013:8) describe completeness as the 'proportion of stored data against the potential of 100% complete'.

To clarify the mandatory fields, an asterisk can be used to ensure that practitioners or nurses enter all the required data regarding a patient to eliminate issues such as incorrect diagnoses, incorrect medication and incorrect information regarding previous hospital visitations. For example, according to Pinto-Valverde et al. (2013), after a data quality assessment of EMRs at hospitals in Mexico, completeness was identified as a problem arising from the findings of issues such as incomplete addresses, incomplete email addresses and incomplete dates of birth. Therefore, the incompletness of data will decidedly result in poor data quality.

Consistency

Consistency refers to the absence of difference in data captured in one system, when it is compared against data captured in another system by a different individual (Askham et al. 2013). Data should be the same across all systems used in the hospital or clinic. The health information systems should contain integrated information in order for the results to be accurate. According to Chen et al. (2014), the attributes of data quality are grouped into two categories: good-quality and poor-quality attributes. Inconsistencies in the definitions of the attributes were identified as a factor that can affect the quality of data. Inconsistencies in the definitions could result in one healthcare institution capturing, for example, patients' blood type, whilst another institution finds it irrelevant, which could result in adverse effects on the patients' health outcome. Thus, data should be consistent to produce good-quality data. The focus of this study is on the consistency of data as identified in the problem statement section.

Conformity

Conformity refers to the degree to which data conform to the same set of standard data definitions like data size, format and type (Thatipamula 2013). A health information system in a hospital or clinic should follow the same set of standards and regulations to ensure that conformance is maintained as it is important. For example, Price, Singer and Kim (2013) stated that although EMR products may conform to national data standards such as those developed by the Canadian Institute for Health Information, users of the systems are likely not conforming. Users of the EMRs, including the practitioners and nurses, should thus conform to data standards to maintain data quality.

Accuracy

According to Askham et al. (2013), accuracy is defined as the degree to which data reveal the truth about the event being described. Data should be complete to ensure it is accurate. Accuracy can be achieved by correctly capturing and representing data. Data need to be validated to ensure that it is accurate. For example, according to Chen et al. (2014), coding errors were reported by Australian researchers, which were caused by the poor-quality documentations in the clinical informaion systems. 'These errors had led to inaccurate hospital perfomance measurement and inappropriate allocation of health funding' (Chen et al. 2014:5172). Thus, it is evident that poor documentation of medical or health data can lead to inaccuracy of data, which can result in poor health outcomes.

Integrity

Integrity entails that data stored in a database or data warehouse should be accurate and consistent (Teeling 2012). Improper use of EMR systems can jeopardise the integrity of a patient's information, leading to errors that may harmfully affect the patient's health (Bowman 2013). Thus, when documenting patient records, health professionals should ensure that all the required information regarding the patient is recorded to maintain data integrity. The health professionals should verify that the patient information is free of errors. For example, in a study of the records in the Veterans Health Administration's electronic health system, it was found that the notes contained at least one documentation error including inconsistent text, outdated information and copied text, which all jeopardised the data integrity (Bowman 2013).

Timeliness

Timeliness refers to the degree to which data represent reality from the required point in time (Askham et al. 2013). The next section will discuss the empirical evidence that was found in the literature with regard to the quality of EMRs. Data should be up to date from the time they are collected until they are used. For example, a study by Ahn, Choi and Kim (2016) was conducted to investigate the factors associated with the timeliness of electronic nursing documentation using entry times in the EMR system. The study defined timeliness according to the time when a nurse is on duty and enters electronic patients' documents. The study divided the hospital departments into the internal medicine and the surgery department; the study showed that more time was taken to capture patients of the surgery department with 80% as compared to the internal medicine department with 78%. Thus, timeliness is important as it is a characteristic of maintaining appropriate health records (American Nursing Association 2010).

Research methodology

This study conducted interviews to collect data regarding the CSFs to improve data quality in the EMRs in the public healthcare institutions in the North West province of South Africa. The interview guide was based on six dimensions of the DQF. A pilot study was conducted with five nursing students prior to the interviews to test the interview questions for user-friendliness and ambiguity, and it was found that the questions were clear and not ambiguous. The results from the pilot study were not included in the main study.

The targeted population of this study worked in public healthcare institutions in Klerksdorp. A purposive sampling technique was used to identify eight healthcare professionals who were chosen because of their expertise and experience with EMRs. The information technology (IT) specialist was responsible for the maintenance of the EMRs, whilst the healthcare professionals all worked with the EMRs during patient care. Eight participants from the IT Department and the Nursing Department were interviewed as they might have had different insights regarding the quality of EMRs, based on their different work experience. Content analysis was used to analyse the interviews in order to develop themes based on the DQF.

Ethical consideration

Ethical approval to conduct the study was obtained from the University of Fort Hare's research ethics committee (certificate reference number: CIL051SMAK01).

Results

A total of eight participants between the age of 32 and 55 years were interviewed. Participant 1 refers to the IT specialist, whilst participants 2–8 refer to the healthcare professionals. Three quarter (75%) of the participants were older than 40 years of age, and all the participants were women.

The rank of the nurses was as follows: 50% of the participants were professional nurses and 25% were registered nurses. Table 2 provides an oversight of the demographic information of the participants.

Discussion of the dimensions of data quality

Data quality does not have a single standardised definition. However, when defined in a broader context, data quality identifies more attributes of data quality besides accuracy and completeness that were highlighted as the main attributes of data quality in healthcare research (Sebastian-Coleman 2012). The response received from one of the participants regarding her understanding of data quality in EMRs was as follows:

> 'It is the electronic health record system used by many institutions these days to keep data or information that is complete and accurate in an electronic server to ensure quality patient care.' (Participant 8, professional nurse, 33 years' experience)

From the narrative above, it is thus evident that completeness and accuracy are the main dimensions that are considered to define data quality. However, this does not entail that other dimensions of data quality are less important. The data quality challenges in EMRs are influenced by the users of the

TABLE 2: Demographic information of the participants.

Interviewee	Workplace geographical area	Professional title	Length of time in the healthcare field (years)	Health information systems participants have access to
1	Urban	Information systems	10	Administrative systems
2	Rural	Not applicable	> 15	Other – (Nil at the moment. The only way we communicate is via group WhatsApp methods)
3	Urban	Professional nurse	5	Electronic health records and electronic medical records
4	Rural	(Operating)-registered nurse	13	Handled by clerks only. We do not have anything
5	Urban	Professional nurse	14	Electronic health records and electronic medical records
6	Peri-urban	Registered nurse	15	Other – Manual data recording
7	Rural	Professional nurse	16	Electronic medical records
8	Rural	Professional nurse	33	Radiology systems, pathology systems and administrative systems

system and to some degree by the standards of the healthcare institutions:

'Poor electronic health record system design and improper use can cause errors that can destroy the integrity of data.' (Participant 7, professional nurse, 16 years' experience)

User involvement and user satisfaction are important factors that can affect the quality of data in a system. Therefore, organisations should not overlook the users as they make use of the systems in the course of their work duties. Thus, their opinions and involvement should be prioritised. A participant delineated that nurses or users of an EMR system:

'Demand a substantial amount of time for electrical type data entry. Contribute to lower job satisfaction, increased stress and decreased quality of patient care. Reduced patient safety.' (Participant 5, professional nurse, 14 years' experience)

Poor data quality in EMRs can occur as a result of errors created by the healthcare workers or a system that does not function appropriately. It could lead to a number of consequences that may affect the overall healthcare delivery and patient safety. Alotaibi and Federico (2017:5) defined patient safety as the 'avoidance, prevention, and enhancement of adverse outcomes or injuries stemming from the health care'. During the data collection interview process, the following statement was made regarding the consequences of poor data quality:

'(1) Wrong diagnosis, (2) an increased number of litigations, (3) broken trust between patients and healthcare workers.' (Participant 2, retired nurse, > 15 years' experience)

Quality of electronic medical records

Understanding the data quality-related problems and the causes of the data quality problems is crucial. When the cause of a problem is known and understood, measures can be taken to avoid the issues that lead to poor data quality. The quality of data in a database is likely to be with problems caused by human error or by the machines used to capture and store the data. Before taking measures to solve the data quality problems in any organisation, it is important to understand the problems that exist:

'So that we can rectify our mistakes, by filling in the information needed, in order to render quality care to our patient.' (Participant 2, retired nurse, > 15 years' experience)

Completeness of data

The majority of the participants revealed just how important the completeness of data is in the case of a medical record. The participants were asked how they think completeness leads to poor data quality in EMRs and how it is appropriate. One of the participants stated that:

'Data that is not entered immediately – if you enter it later, it will be incomplete; might miss important information and data will be meaningless.' (Participant 4, registered nurse, 13 years' experience)

Entering patient information immediately is crucial as the missing information could lead to an incomplete record. An incomplete record could result in improper decision-making regarding the patient's health.

Another participant stated that:

'When there is a gap or incomplete data from what is expected can lead to poor or delayed patient care that can lead to death, e.g., wrong results to wrong patient.' (Participant 6, registered nurse, 15 years' experience)

Improving medical records' completeness is vital as this affects the overall quality of healthcare.

Consistency of data

Consistent data are represented by the absence of differences between data items representing the same objects based on specific information requirements (Raza 2018). Consistent data contain the same data values when compared between different databases. One participant expressed that:

'Different institutions have different systems especially with referral of patients. Collection of information is not always the same.' (Participant 7, professional nurse, 16 years' experience)

Consistency is defined as having the same patient data across all healthcare institutions, whilst inconsistency refers to having different data, for example, having blank spaces where there is supposed to be information. Another participant also stated that:

'Cannot be easily followed-up; must be able to link information of the last time with the present one; nursing is in continuity.' (Participant 4, registered nurse, 13 years' experience)

In other words, with each consultation, physicians should make notes containing the patient's health and progress in

order to achieve consistent information across all the systems used to store the patient's medical records. Omitting some information or having inconsistent data could lead to poor data quality of the medical records, such as having an incomplete record because of recording information differently.

Data conforming to the same standards

Most organisations stipulate policies and standards which they use as guidelines to operate daily. These standards ensure that tasks are performed appropriately and provide order within the organisation. Participant 6 expressed that:

'For the data to be accurate and valid, certain guidelines need to be followed by all electronic health system users for quality data interpretation; if those guidelines are not followed, that data won't be accurate and standardised.' (Participant 6, registered nurse, 15 years' experience)

This is supported by Participant 3 (Professional nurse, 5 years' experience) who stated that to achieve data conformity, '[there] should be having guidelines or policies so that it can be captured in the same standard way.'

Accuracy of data

To maintain accuracy, data should be recorded as close to its original form as possible. In this theme, the participants were asked how they think accuracy, or the lack thereof, leads to poor data quality in EMRs. Participant 1 (Information Systems specialist, 10 years' experience) responded with the following statement: 'it refers to whether the data values stored for an object are the correct values'. Participant 2 (Retired nurse, > 15 years' experience) also expressed a similar perspective by saying that, 'every time when a person provides his or her identity number, the same information should appear exactly as it was captured last time'. For example, when a patient provides his or her information, the person responsible for capturing the data should record the data as it is stated and should not alter the data. The data should be captured as provided and should reveal its truest value.

Integrity of data

Data should reveal a pattern of consistency; for example, when comparing the data in one database with that of another database, there should be some level of similarity in the data to prove the integrity of data. The participants were asked as to how integrity affects data quality. From the interviews conducted, Participant 5 expressed that:

'Poor EMR's system design and improper use can cause EMR-related errors that jeopardise the integrity of information in the EMRs, leading to errors that endanger patient safety or decrease the quality of care.' (Participant 5, professional nurse, 14 years' experience)

Timeliness of data

Data timeliness refers to data that are up to date and easily accessible and available on time (Measure Evaluation 2008). Healthcare providers and patients should be able to access health information whenever they require it. Data that are not timely could affect the healthcare outcomes by delaying

decision-making by healthcare providers, which could further affect treatment time for the patient. One participant expressed that:

'Data is subject to be delivered in time as expected and delays make data to be ineffective and delays decision-making for commencement of treatment and surgical procedures.' (Participant 6, registered nurse, 15 years' experience)

The majority of the participants agreed that the timeliness of data is important. In EMRs, data should be available at the click of a button and the point of care. A healthcare provider should be able to acquire an up-to-date patient medical record when entering the patient's details on the health information system.

Discussion

This study adopted the DQF to highlight the importance of data quality as data are used for decision-making in organisations. In the section above, the various challenges that were identified during the interviews were presented in the context of DQF. From these challenges, seven CSFs were developed to improve the data quality of EMRs in public healthcare in South Africa. A discussion of the CSFs that can help ensure good-quality data is provided next.

Critical success factor 1: Assign data focal personnel to demonstrate to staff members how to fill in data in specific fields

A case revealed that in the address field, a name of a town was recorded instead of the patient's complete residential address, which includes the street name, house number and postal code (Ali et al. 2018). Incorrect or missing information may make it difficult for healthcare professionals to follow up on patients or to get into contact with them.

Critical success factor 2: Train staff members on how to use data capturing tools and on how to identify and rectify missing information

For example, a contact number was recorded as 10 digits, yet a complete number was considered to be 11 digits. Training staff members will ensure that the rules of capturing complete and accurate data are applied; then staff members will be able to instantly realise when there is missing information and correct the issues before saving and closing the patient's medical file. With reference to Barrier 2, it was identified that substantial evidence has shown that the nurses' attitude towards the EMR system is linked to the success of EMR implemention (Chow et al. 2012; Huryk 2010). Therefore, training of the staff members is crucial to prevent them from making avoidable mistakes, such as typing errors and leaving a record incomplete.

Critical success factor 3: Install a system that identifies and eliminates duplications

One case revealed a consistency issue in a hospital's records and it was shown that 40% of the records registered

Patient ABC as a pulmonary case, whereas on follow-up visits, it was recorded as an extra-pulmonary case (Ali et al. 2018). A system that reveals duplicated data can assist with ensuring that different information is not recorded under the same patient's name.

Critical success factor 4: Set mandatory policies and standards which will be applied to electronic medical record

In line with the recommendation of Katuu and Ngoepe (2015), this CSF speaks about the lack of legislation and regulation in the field of EMRs in South Africa. Conforming to the same standards will result in the avoidance of many errors, such as duplication of data, capturing incorrect spellings and using inaccurate formats. Setting and complying with policies, such as the data quality policy, for instance, will help ensure that EMRs are of good quality and that they are consistent across healthcare departments or institutions.

Critical success factor 5: Data cleansing

According to the data quality assessment, data should be cleansed through both manual and automated processes to ensure completeness, accuracy, consistency, integrity and controlled accessibility of data (Ali et al. 2018). Data cleansing will ensure that errors are rectified before resulting in adverse effects. Data cleansing will also ensure that data integrity is maintained by assuring the accuracy, consistency and reliability of data over its life cycle. Copy and paste features found in EMR systems enable physicians to copy notes from a patient's previous visitations, but at times they may mistakenly not adjust all variations between the copied and the current visit (Kessler 2018). This error jeopardises the integrity of patient data which puts patients' healthcare at high risk. This can lead to inaccuracies by introducing contradictory or incorrect information; one study showed that 23 630 provider notes found that 46% of the text was copied from elsewhere (Kessler 2018). Another issue that was identified is that drop-down menus may limit the physician's ability to truthfully document the patient's condition because of no option of writing notes but selecting from the closely related provided option (Vimalachandran et al. 2018).

Critical success factor 6: Audit the electronic medical record on a regular basis

In a study by Ali et al. (2018), the coding scheme did not match the national coding system and the results presented were not accurate. Auditing the EMR on a regular basis will reveal any errors that exist in the medical records and rectifications can be performed before presenting the final outcome.

Critical success factor 7: Constantly assess and reassess the timeliness of data

The relevant data focal personnel should constantly assess the timeliness or currency of data. Out-of-date data may lead to inappropriate decisions. In a study by Ahn et al. (2016), the timeliness was investigated through electronic nursing documentation using entry times in the EMR system. The hospital departments were divided into two, namely, the surgery and the internal medicine departments. In the study, it was shown that more time was taken to capture patients of the surgery department compared to the internal medicine department. Thus, the EMR data timeliness should be constantly assessed to avoid delays in the decision-making process.

Limitations and future research

This was exclusively a qualitative study involving a small sample size. Therefore, the findings of the study cannot be generalised to other settings. Although the study covered a small population, some understanding was acquired by the researcher regarding the CSFs that influence data quality in EMRs. For more generalisable findings, future studies should consider covering a larger sample size. The study was limited to evaluate data quality in EMRs in Klerksdorp, South Africa. Therefore, the researcher suggests that future studies should consider looking at other factors that could impact the quality of data in the overall healthcare. Furthermore, future studies should look into other factors that influence data quality, such as user's satisfaction or user's acceptance towards using EHIS from having used manual paper systems before.

Conclusion

This study investigated which CSFs may improve data quality in EMRs in South Africa's public healthcare sector. Data quality issues, such as incompleteness, duplications, inconsistencies and typographical errors, were identified as the factors that impact the data quality of EMRs. These are general human errors, and, therefore, the healthcare personnel should receive adequate training on using EHIS such as EMR, electronic health records (EHR) and other related technologies.

This study used the DQF as a theoretical basis. The six dimensions include completeness, consistency, conformity, integrity, accuracy and timeliness. Healthcare organisations need to perform regular data quality assessments and implement improvement strategies to ensure that the quality of data is of a high standard to improve healthcare. Recommendations to improve data quality in EMRs have been provided and the researcher anticipates positive outcomes when the healthcare workers collectively address the data quality problems they encounter in their workplaces. Finally, investments should be made in training, champions, infrastructure and the necessary policies to improve the quality of EMRs in the public healthcare sector of South Africa.

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Competing interests

Authors' contributions

L.C. and N.M. contributed equally to this research article.

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Data availability statement

The authors confirm that the data supporting the findings of this study are available within the article.

Disclaimer

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