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Understanding health worker data use in a South African antiretroviral therapy (ART) register

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Abstract

Objective: To evaluate how electronic data management systems affect data use practices in ART programs within local health districts, and individual health facilities.

Methods: We used a data quality audit to establish a baseline of the quality of data in the electronic register alongside in-depth interviews with health workers and managers, to understand perceptions of data quality, data use by facility staff and challenges affecting data use.

Results: The findings provide a 4-level continuum of data use that can be applied to other settings and recommendations for optimising facility level data use.

Conclusion: By defining four levels of data use our findings suggest the potential to encourage a structured process of moving from passive data use, to more active and engaged data use, where data could be used to anticipate patient behaviour and link that behaviour to differentiated care plans.

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INTRODUCTION

The global growth of antiretroviral therapy (ART) programmes in resource limited countries has precipitated a need for the implementation of electronic medical record systems (EMRS) in order to facilitate national HIV programme monitoring and to improve patient care (Chaplin et al., 2015; Hochgesang et al., 2017). Several studies have examined the implementation of these systems in sub-Saharan Africa (SSA), and have generally focused on assessing the strengths and weaknesses of existing systems (Ledikwe et al., 2014); the implementation process (Chaplin et al., 2015; Hochgesang et al., 2017; Myburgh et al., 2015); and the impacts of these systems on patient care and programme management (Hochgesang et al., 2017; Oluoch et al., 2014, 2015).

While EMR systems have the potential to play an important role in clinical decision-making and health system management, their use remains hampered by a range of factors. Poor data quality is one frequently reported impediment to data use (Kaposhi, Mqoqi, & Schopflocher, 2015; Ledikwe et al., 2014; Mate, Bennett, Mphatswe, Barker, & Rollins, 2009; Wickremasinghe, Hashmi, Schellenberg, & Avan, 2016). Importantly, as Braa et al. (2012) note, high quality data are a key prerequisite for increasing the use of EMRS data, but it is equally important that data are *perceived* to be high quality by health workers and administrators. This inter-relationship between data quality and data use also means that the more frequently data begin to be used, the more likely it is that their quality will improve as health workers realise the value of accurate data for decision making (Braa et al., 2012).

South Africa has the largest ART programme in the world with nearly 3.4 million people estimated to be on ART in 2016 (UNAIDS, 2016). In 2010 the National Department of Health (NDOH) recognised the need for a nationally standardised monitoring system to accompany the change to a decentralised, integrated approach to ART service delivery.

The processes through which health workers begin to engage with EMR systems and make use of electronic data is therefore a key, but understudied, determinant of the impact of these systems. This study therefore examines data use after the implementation of an electronic register in Cape Winelands District, South Africa, in order to understand the ways in which health workers and managers use electronic data to assist in the management of health facilities.

METHODS

Two methods were used to assess the use of the electronic register in the daily running of five health facilities in Cape Winelands District: a series of in-depth interviews focusing on how the electronic register was used; and a data audit to establish a baseline of the quality of data in the electronic register. The protocol and consent procedures were approved by the Health Research Ethics Committee, Faculty of Health Sciences, University of Cape Town and the Western Cape Provincial Research Health Committee. All participants provided signed informed consent to participate in interviews.

In-depth Interviews

In-depth interviews were conducted with 20 key informants involved in the ART programme at the five facilities sampled. Key informants were purposively sampled to represent perspectives from a range of levels in the local health system and participants included data clerks, nurses, facility managers, and ART programme managers. Interviews were conducted in the language of participants' choice by one of three interviewers employed by the implementing organisation, but who were not directly involved in the EMRS implementation programme.

Interviews were audio recorded and transcribed. An initial codebook was developed by four of the researchers after coding and discussion of three representative interview transcripts. Four broad themes were identified during this stage of coding: 1) data quality, 2) data accessibility, 3) data use, and 4) the implementation process. This initial codebook was further refined as data analysis progressed, with a specific focus on understanding data use. Transcribed interviews were coded and reviewed successively by at least two of the authors before they were considered finalised to optimise inter-coder reliability.

Data quality audit

A standardised audit tool (attached in web annex) was used to review 500 randomly selected ART clinical records (100 per facility) (Osler & Boulle, 2010). Facilities were selected purposively, with 1 per sub-district in a district with 5 sub-districts. They were selected to represent the various types of facilities in the area. Myburgh et al. (2015) note, “the selection of facilities considered the following: to compile a diverse sample determined by the number of patients on ART, decentralisation status, and the historic quality of their ART paper-based register”. The data audit provided a basis for examining data use, as high quality data are a necessary prerequisite for evidence based decision making (Kaposhi et al., 2015). Data quality was measured through completeness of the paper based clinical record and percent agreement of the paper based record with electronic data. Data were analysed using MS Excel 2010 and STATA 12 (STATA Corporation, College Station, Texas).

RESULTS

Data audit

Median completeness of demographic and baseline information in the paper based records was 87% and the overall quality (median score) of the demographic information was 80% (Table 1). These figures compare favourably with other assessments of electronic health data systems in South Africa (Auld, Kim, Webb, Podewils, & Uys, 2013; Rose et al., 2013).

Use of electronic data at health care facilities

Our analysis identified four distinct levels of data use among health facility staff. These levels form a continuum from the use of data to meet externally determined reporting requirements to the use of data for longer term planning and management of facilities.

Level 1: Reporting

Participants whose engagement with data was limited to drawing or receiving the standardised reports required for routine reporting purposes were classified as level one data users. These participants tended to see the electronic ART register primarily as a means of enabling them to meet the reporting requirements of their jobs. This very limited engagement with data was reported by data clerks at two facilities, who noted that their role was primarily to compile the monthly reports and pass them on, either to their facility manager or the district programme co-ordinator.

"… I give her the monthly report and she is happy with it. There is stuff from the quarterly [report] I can give her, but she does not request it" (Data clerk, Facility C).

"I give the stats to the programme coordinator every month. I give it to the sister first and to the programme coordinator. Other than that I don't know, when I attend meetings they have much better stats than I have" (Data clerk, Facility E).

A programme co-ordinator similarly noted their perception that data were not actively being used at health facilities due to health workers' failure to understand the value of the electronic register:

"…at the facility level, they are not looking at the data… we showed that at one facility there were many patients that were supposed to start ART who have not started yet. So the people are not really looking [at the data]" (Programme co-ordinator supporting Facility A).

Level 2: Observing

A second level of data use was identified where participants reported a greater degree of interest in using data from the electronic register, but did not actively use the electronic register on a daily basis. These individuals tended to use routine reports to gain a perspective on their patient population.

"…you now know the community better because you know how many are on ARV, how many are on pre-ART, and how many children are on treatment" (Facility Manager, Facility B).

"What is important to me is to see how many patients we started that month. And then we look at the defaulter rate for that month, with the visits. That gives me a vague idea of how things looked" (Nurse, Facility B).

In addition to improving their understanding of their broad patient population, participants noted that they valued the ability to identify areas of work needing attention.

"We have monthly meetings… the data we mostly use patients currently on ARVs, how many patients started for the month, how many children, how many transfer-ins and outs, and how many patients was referred for home-based care...we discuss problem cases, if there are children that's adherence is bad" (Nurse, Facility C).

Level 3: Managing

Several participants reported using data for daily and weekly facility management and planning and were classified as level three data users. The primary uses of the electronic register discussed by these participants included the ability to track patients who had defaulted their treatment, to plan patient appointments, and to easily access patient information.

The ability to easily track patients who had defaulted on their ART was discussed by participants as an important benefit of the electronic register which facilitated more efficient processes of returning patients to care.

"… [the data clerk] gets from the system who is defaulting for how long and stuff like that. Also the poor adherence of the children, because she works it out on the system, so we can see the adherence from there" (Nurse, Facility C).

This also allowed participants to anticipate when defaulting patients were going to return to the facility after being traced and to plan their appointment schedules accordingly:

"The data clerk draws the early loss to follow up [report] weekly, then she knows the patients will come the following week, so she plans her week with those patients in mind" (Facility Manager, Facility D).

A second facility manager noted that the electronic register allowed health workers to plan their work days around the number of appointments on the system.

"You know when the patients are coming so you can just look at the computer rather than having to pull their files. You can plan your day...you can see, today there are so many patients coming" (Facility Manager, Facility B).

While participants reported using the electronic register to track defaulter rates and to plan their workloads, there was relatively little discussion about the use of other data available on the system such as CD4 counts, viral loads, and ART regimen. This data was primarily noted as being used to provide other health facilities with information when patients were transferred.

"Outside clinics call to ask about follow-up appointments…They can just go in [and check] when was the last CD4 count done…[or if] the doctor from Emergency calls and asks what is the regimen of the patient" (Data Clerk, Facility B).

Level 4: Planning

Finally, level four data users were those participants who used data for longer term planning and management. One facility manager, for example, noted the usefulness of data from the electronic register as a guide to decisions on hiring extra staff, as it made it easy to assess individual staff members' workloads:

"Especially when it comes to employing personnel, it will give us an indication…the workload of the ARV sister is currently too much, so she won't be able to handle that load. So that can give us a direct indication - we need an extra hand" (Facility Manager, Facility B).

A sub-district programme co-ordinator also noted the value of the electronic register as an aid to planning in that it offered a more in-depth understanding of what was happening at facility level in terms of patient care.

"I did a HAST (HIV/AIDS, STIs, and TB) mapping, for the entire district, I went to look at patient numbers, how many were primary care), how many were ARV patients, how many go through the clinic daily, clerk workloads ... how many professional nurses do we have... and I could say, we need a clerk in [place name], I need to put another nurse in [place name]... it is a tool to make quality decisions... or decisions that I can support with evidence." (Programme co-ordinator supporting Facility A).

DISCUSSION

Our analysis of the data quality of the electronic system shows that it is possible to achieve relatively high quality data across a range of facilities with varying patient population sizes and staff complements (table 1). Similarly to other research conducted on electronic register systems in South Africa (Auld et al., 2013; Rose et al., 2013) demographic information was most complete and accurate as compared to laboratory results and visit history. Importantly, the audit results establish the necessary basis for examining data use, as health workers are unlikely to make use of electronic registers if they cannot trust that data are accurate (Braa et al., 2012; Kaposhi et al., 2015).

We identified four broad levels of data use within the facilities studied: level one, where data were used solely for reporting purposes; level two, where data were used to observe facilities' patient populations; level three, where data were used for day to day facility management; and level four, where data were used to inform longer term planning and management processes (Table 2). Although research has been conducted on the impact of implementing electronic data management systems in low and middle income countries (LMICs) (Hochgesang et al., 2017; Oluoch et al., 2014, 2015), the potential impact of these systems may be enhanced or hampered by the ways in which local staff adapt to, and interact with, novel electronic systems.

The four levels of data use identified in this study suggest a potential means of rapidly implementing EMRS systems as follows. The initial stages of implementation should focus on rapidly increasing the number of facilities with at least one staff member trained to generate and submit routine reports (data use level 1). This initial stage of implementation thus focuses on establishing the capacity to monitor ART roll-out at a systems level.

Once facilities are using data at level one, ongoing support can be provided to enhance staff members' ability to use data for management and planning. Initially this support could focus on assisting health workers to interpret the standard reports generated as part of routine monitoring processes (level 2). This increasing familiarity with data use concepts and practices would then form the basis for further support and mentoring to enable health workers and managers to engage more actively with the electronic register in their daily work lives. This would include using the register to improve retention in care by generating defaulter lists, plan weekly schedules, and manage daily patient numbers (level 3). Finally, specific support would be provided to staff and managers who showed a particular interest, aptitude, or job requirement for data use, to enable them to use the electronic register as a tool to inform decision making processes around staff deployment and resource allocation (level 4).

The progressive provision of support for data use can therefore facilitate the creation positive feedback loops reinforcing and developing a culture of data use across health systems (Figure 1). These processes may lead staff and programme managers to begin to identify novel ways in which to use data from the electronic register including: differentiation of care (identifying patients at higher risk of defaulting, and linking patients to more tailored care plans) and automation of care (flagging when patients need blood tests, repeat scripts or follow up appointments). By making data more timeously available an electronic register creates a range of important opportunities for data use.

The main limitation of this study is potential researcher bias. Three of the researchers were involved in the implementation of the electronic register which may have affected their objectivity. However, this potential bias is balanced against the advantage of familiarity with the local area and culture as well as the trust from interview participants that accompanies that understanding.

CONCLUSION

The implementation of an electronic ART register has the potential to improve the accessibility and use of data for patient management, monitoring and evaluation, and decision-making. By defining four levels of data use our findings suggest the potential to encourage a structured process of moving from passive data use, focused on reporting and observation, to more active and engaged data use, where data could be used to anticipate patient behaviour and link that behaviour to differentiated care plans. In doing so, it may be possible to significantly enhance the capacity of local health systems to monitor and respond to the changing contexts of growing ART programmes.

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Table 1 Data audit results: agreement and completeness

Data Element	Measure
Composite Scores	*Median % (IQR)*
Completeness: Clinical records items 1-15	87 (87;93)
Overall Agreement between electronic register and clinical records 1-15	80 (73;87)
Overall Demographic agreement	*Proportion Agreement % (CI)*
1. Clinical Record Number	94 (92-96)
2. Name	100 (99-100)
3. Date of Birth	93 (91-95)
4. Gender	95 (92-96)
5. ART start date	88 (86-92)
6. Method into ART (new, experienced or transfer)	76 (72-80)
7. ART prior to above start date	64 (60-68)
8. WHO stage at baseline	76 (72-80)
9. Baseline CD4	65 (60-69)
10. Outcome	92 (90-95)
Overall visit summary agreement	
11. Visit dates recorded	75 (71-79)
12. TB screening at most recent visit	67 (63-71)
13. Regimen recorded at most recent visit	75 (72-79)
14. Number of months prescribed entered correctly at most recent visit	68 (64-72)
15. Next clinic visit date at most recent visit	67 (63-72)

Table 2 Data use levels

Data use level	Primary form of data use	Skills required
Level 1 **Reporting**	- Generating and submitting routine reports.	- Data entry - Data cleaning - Generation of reports
Level 2 **Observing**	- Using routine reports to improve understanding of patient population.	- Interpretation of aggregated data
Level 3 **Managing**	- Using routine reports and specific database queries to improve patient and facility management processes.	- Use of data for weekly planning - Use of data for individual patient management
Level 4 **Planning**	- Actively using data to plan services and allocate resources.	- Use of data for long term planning and resource allocation

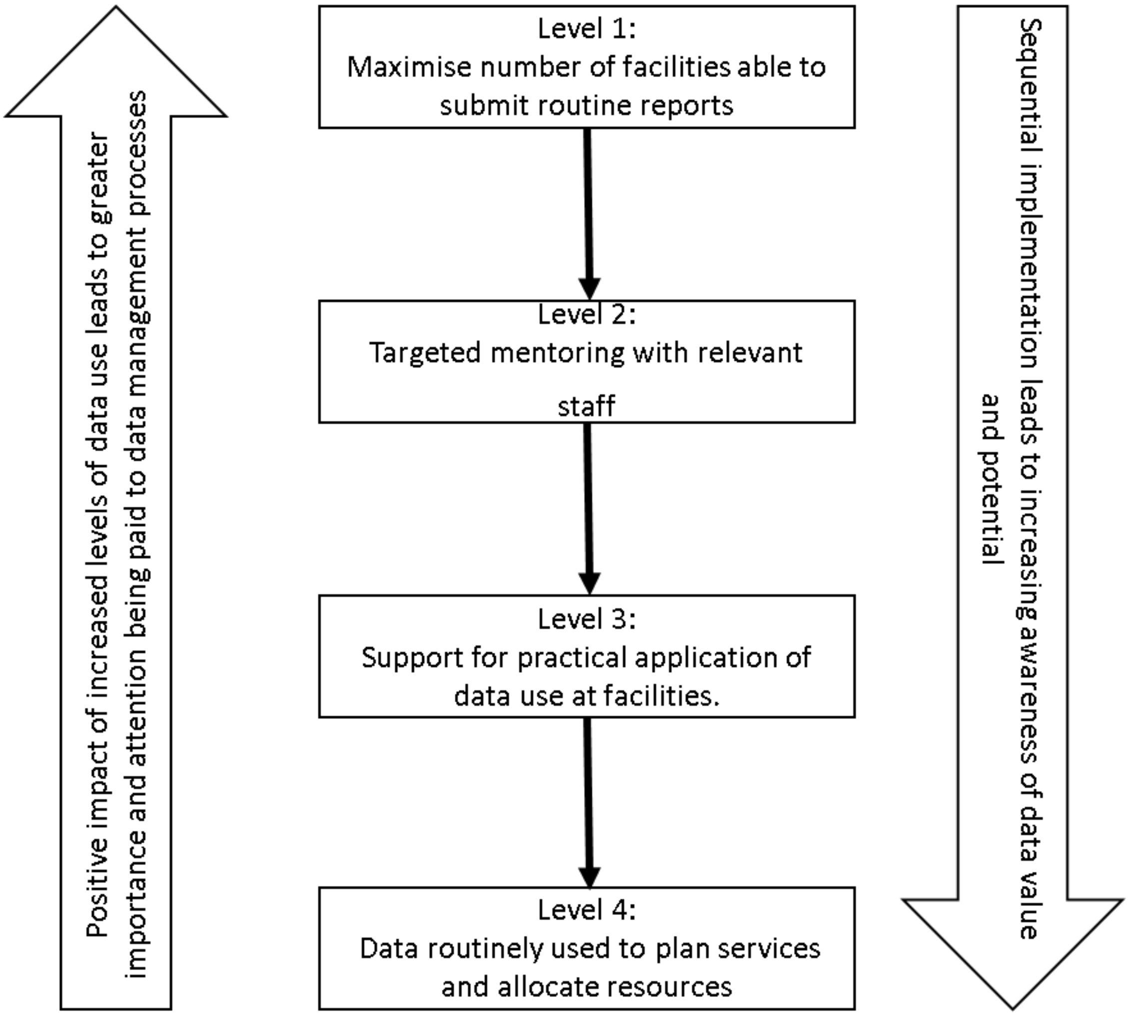

Figure 1 Potential positive feedback loop established through sequential implementation from level 1 - 4