Assessment of HIV Data Reporting Performance by Facilities During EMR Systems Implementations in Kenya

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Abstract. There is little evidence that implementations of Electronic Medical Record Systems (EMRs) are associated with better reporting completeness and timeliness of HIV routine data to the national aggregate system. We analyzed the reporting completeness and timeliness of HIV reports to Kenya's national aggregate reporting system from District Health Information Software 2 (DHIS2) for the period 2011 to 2018. On average, reporting completeness improved to 97% whilst timeliness increased to 83% in 2017 with similar performance for the facilities under study that implemented either KenyaEMR or IQCare. However, in 2018, the reporting rates dropped by 13% for completeness and 11% for timeliness most likely due to changed reporting procedures. This suggests that besides EMRs, there are other factors influencing reporting such as reporting routines, which need to be assessed separately. Nonetheless, the EMRs have facilitated the collection of HIV data for submission to the DHIS2, which in turn facilitates the reporting process for the data officers.

Keywords. KenyaEMR, IQCare, HIV data, reporting, timeliness, completeness

1. Introduction

Many healthcare facilities in developing countries are increasingly using Electronic Medical Record Systems (EMRs) during patient care, despite challenges of unstable power supply and human capacity[1]–[3]. Mostly, the EMRs implementations in these settings are as a result of the President's Emergency Plan for AIDS Relief (PEPFAR) initiatives with a view to support HIV patient data management[4]. As such, the EMRs majorly support HIV services encompassing prevention, testing, care and treatment. Due to socio-technical challenges in developing countries, adoptions of the EMRs in the healthcare facilities differ in maturity levels. This has led to varying modes of operation with some settings using paperless, point of care approaches, retrospective data entry, or a hybrid approach[5][6]. These approaches potentially have variable impacts on the intended EMRs benefits.

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KenyaEMR and IQCare are among the major EMRs accredited to support HIV healthcare delivery services within facilities under the Ministry of Health (MoH) in Kenya[7]. On the other hand, the District Health Information Software Version 2 (DHIS2), a web-based open source system, supports collection and analysis of both routine and non-routine aggregate reporting health services data drawn from healthcare facilities countrywide [8].

With the prevalence of EMRs implementations in countries like Kenya, it remains unclear what their contribution is to quality of aggregate data in support of data-driven decision-making. This paper explores the impact of EMRs implementation efforts on quality of reporting of HIV indicators in developing countries with particular focus on completeness and timeliness of reports to DHIS2 maintained by Kenyan MoH.

2. Materials and Methods

Facilities are required by the MoH to submit HIV routine data on six programmatic areas based on a summary reporting tool for HIV referred to as MOH731 by the 15th day of every month. DHIS2 aggregate system was used to obtain HIV routine data reports for the period 2011 to 2018 on HIV counselling and testing (HTS) and care and treatment (C&T) programmatic areas for all healthcare facilities in Kenya. Systematic procedures were used to clean the data. The data sets generated and analyzed in this paper are available in the national DHIS2 online database https://hiskenya.org/dhis-web-commons/security/login.action. The EMRs were implemented in the facilities on varying dates from November 2012 to September 2014 for KenyaEMR and August 2012 to July 2016 for IQCare.

Descriptive analyses were conducted to compare performance in reporting completeness and timeliness by the facilities during the period 2011 to 2018. Timeliness refers to whether reporting facilities submit their reports according to the timeline set by the MoH. Completeness is the extent to which the expected reports are successfully submitted to the national reporting system. The facilities (*n*) included in the study were those which submitted MOH731 reports to DHIS2 and progressively implemented either KenyaEMR or IQCare systems. The variations in *n* was due to the establishment of new facility sites during the years under study. All analyses were conducted using SPSS.

3. Results

Table 1 shows the rates of reporting completeness and timeliness in 2011 (pre-EMRs) and in 2012-2018 when facilities progressively rolled out EMRs. There was a steady improvement of reporting timeliness and completeness across facilities with and without EMRs during the study period. In the year 2012, significant reporting rates are seen when only a few EMRs were introduced averaging around 56% and 40% in reporting completeness and timeliness respectively. On average, reporting completeness improved to 97% whilst timeliness increased to 83% by 2017 with similar performance for the facilities implemented either KenyaEMR or IQCare. However a noticeable drop in performance is seen in 2018 with an average drop of 13% in completeness and 11% in timeliness of reporting. Anecdotal evidence suggests that there was a change in reporting routines, which could have negatively affected reporting on the two programmatic areas.

Table 1. MOH 731 Reporting completeness and timeliness averages in %

Year	HTS				C&T			
	KenyaEMR		IQCare		KenyaEMR		IQCare	
	Pre-EMR Implementation							
	n=74		**n=57**		**n=49**		**n=41**	
2011 Completeness	15.98 ± 8.71		16.95 ±9.19		15.30 ± 7.88		17.08±9.50	
Timeliness	5.96 ± 7.99		5.41 ±6.96		5.78 ± 8.02		4.87± 6.98	
EMR Implementation status	**With EMR**	**Without EMR**	**With EMR**	**Without EMR**	**With EMR**	**Without EMR**	**With EMR**	**Without EMR**
	n=4	**n=226**	**n=3**	**n=223**	**n=4**	**n=219**	**n=2**	**n=214**
2012 Completeness	56.25 ± 27.55	71.17± 25.18	58.33± 44.13	70.00± 25.10	56.18± 25.90	65.76± 25.65	70.85± 29.49	65.01± 26.05
Timeliness	41.68 ± 34.03	58.33± 25.15	38.9± 34.70	51.90± 25.71	33.25± 34.08	52.69± 26.05	45.85± 29.49	45.71± 23.53
	n=104	**n=152**	**n=105**	**n=137**	**n=103**	**n=152**	**n=105**	**n=126**
2013 Completeness	92.80± 12.97	91.41± 14.35	92.31± 12.92	89.91± 16.85	91.20± 14.82	87.23± 21.06	88.74± 15.77	87.72± 19.66
Timeliness	77.65 ± 23.53	81.47± 19.87	76.36 ±22.92	78.54±22.88	73.23± 24.70	73.49± 27.38	64.10± 30.17	69.44± 27.71
	With EMR n=260		**n=227**	**n=15**	**With EMR n=259**		**n=225**	**n=15**
2014 Completeness	97.44 ± 6.97		95.60 ± 8.88	97.79± 3.80	96.53± 8.87		95.45± 10.61	93.34± 17.03
Timeliness	85.90 ± 17.53		83.09 ±19.30	75.03±27.29	80.05 ± 21.30		75.44± 26.75	71.11± 27.93
	n=261		**n=239**	**n=2**	**n=260**		**n=241**	**n=2**
2015 Completeness	99.27 ± 2.86		97.88 ± 7.03	79.15± 29.49	98.95± 3.74		97.10± 7.81	75.00± 35.36
Timeliness	90.05 ±17.57		81.33 ±26.11	62.50± 5.94	84.24 ± 22.36		78.07± 23.79	54.15± 5.87
	With EMR n=260		**With EMR n=241**		**With EMR n=260**		**With EMR n=243**	
2016 Completeness	99.36± 2.43		97.76± 5.83		99.08± 3.00		98.33±4.80	
Timeliness	94.12 ± 9.48		87.52± 14.04		83.73 ± 20.29		75.16± 24.87	
	n=260		**n=243**		**n=259**		**n=244**	
2017 Completeness	98.24 ± 5.22		96.27 ± 8.68		98.75 ± 3.85		96.56± 9.06	
Timeliness	90.91 ± 12.72		83.17 ± 16.26		85.01 ± 19.37		73.67± 24.67	
	n=261		**n=243**		**n=259**		**n=243**	
2018 Completeness	70.10 ± 23.85		66.30± 23.34		69.38 ± 23.96		66.48±23.37	
Timeliness	67.01 ± 24.58		60.48 ±23.99		62.47± 26.55		57.74± 26.50	

4. Discussion

The descriptive statistics concerned the two major EMRs implemented in Kenya, namely KenyaEMR and IQCare. The study looked at the two most common HIV services as required by the MoH, which are HTS and C&T. Since the systems are used at the front end of the data management, it was of interest to understand their contribution to the mandatory national monthly reporting of the HIV indicators to DHIS2 system over time. The data collected within the EMRs is not directly reported into the DHIS2 and therefore the analyzed data can only provide evidence about reporting in general terms. The

increase in reporting performance in 2013 could be attributed probably to the EMRs, but the best evidence for that would be anecdotal. Nevertheless, the inbuilt reports generation functionality in EMRs could have facilitated in the collation of HIV data, which in turn expedites the reporting process for data officers to the DHIS2. Additionally, some benefits could have arisen from the user support and e-learning resources offered by the implementing partners [9]. The method applied in this study can be replicated to data from other disease types.

The study reported here did not investigate aspects such as organizational factors, human resource, patient load factors, and financial resources. It is less clear what reporting routines were established prior to the introduction of the electronic records. However, it seems that the routines and procedures contributed to the improvement in the completeness and timeliness of reporting.

5. Conclusions

The study investigated the performance in HIV indicators reporting using descriptive statistics that included two EMRs namely; IQCare and KenyaEMR. The completeness and timeliness of reporting rate was high. However, it is easier to assume than approve that EMRs solely contribute to the success of reporting since there are other factors to consider such as organizational, human, patient load, and financial resources, which can be explored in future studies.

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References

[1]   Williams F, Boren SA, "The role of electronic medical record in care delivery in developing countries", Int. J. Inf. Manage 28 (2008), 503–507.

[2]   Philomena N, Martin W, Babic Ankica, "Facilitators and Barriers of Electronic Medical Records Systems Implementation in Low Resource Settings: A Holistic View," Stud. Heal. Technol. Informatics IOS Press (2018), 187–190.

[3]   Landis-Lewis Z et al., "Barriers to using eHealth data for clinical performance feedback in Malawi: A case study HHS Public Access," Int J Med Inf 84 (2015), 868–875.

[4]   Akanbi MO et al., "Use of Electronic Health Records in sub-Saharan Africa: Progress and challenges.," J. Med. Trop 14 (2012), 1–6.

[5]   Muinga N et al., Case Study-Implementing an Open Source Electronic Record (EHR) System in Secondary Care in Kenya.(2013).

[6]   Kang'a S et al., "A national standards-based assessment on functionality of electronic medical records systems used in Kenyan public-Sector health facilities", Int. J. Med. Inform 97 (2017), 68–75.

[7]   Muinga N et al., "Implementing an open source electronic health record system in kenyan health care facilities: Case study," J. Med. Internet Res 20 (2018), 1–23.

[8]   Karuri J, Waiganjo P, Orwa D, Manya A, "DHIS2: The Tool to Improve Health Data Demand and Use in Kenya", J. Health Inform. Dev. Ctries 8 (2014), 38–60.

[9]   "Kenya HIS Online Learning,"Available:https://elearning.health.go.ke/?redirect=0.Accessed 2020-03-31.