# Impact of Electronic Medical Records Systems in Reporting HIV Health Data Indicators in Kenya

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**Abstract.** Electronic Medical Records Systems (EMRs) improve the quality of patient care and reduce medical errors. Nevertheless, their role in health data indicator reporting performance is unclear. We assessed reporting completeness and timeliness of HIV indicator data to the national aggregate reporting system, District Health Information Software 2 (DHIS2) in Kenya. We compared the reporting performance of facilities with and without EMRs implementation for the year 2013 as EMRs uptake was in progress. The comparative analysis involved 104 facilities implemented with and 152 without KenyaEMR system on three HIV programmatic areas. There were no statistically significant differences in performance regarding reporting completeness and timeliness by facilities with or without EMRs (p-values > 0.05 on all the three areas). The KenyaEMR system assessed in this study, therefore, cannot be associated with the transformed performance in reporting health indicators. This was probably due to the fact that the EMRs do not report electronically to DHIS2. Additional analysis can be conducted to compare reporting performance once data exchange functionality is fully established between KenyaEMR and DHIS2 systems.

**Keywords.** EMRs, reporting performance, completeness, timeliness

## 1. Introduction

Reporting health care data to support decision making is key to realization of global health goals especially in resource-limited settings towards achieving UNAIDS 95-95-95 global HIV epidemic control goals: 95 percent of people living with HIV know their HIV status, 95 percent of people who know their HIV status are accessing treatment, and 95 percent of people on treatment have suppressed viral loads [1,2]. The capability to efficiently report health indicators requires timely, reliable, high-quality and accessible health service data [3]. Introduction of Electronic Medical records systems (EMRs) in health care delivery has shown improvement in time dependent events such as patient waiting time, time to processing specimen in the laboratory from test request to results reporting among others benefits [4]–[6].

HIV related data reporting to the national reporting system, DHIS2, is a mandatory requirement in Kenya by the Ministry of Health in several programmatic areas. Health

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indicator reporting forms in paper format were introduced in the year 2011 in all healthcare facilities in the 47 counties countrywide while DHIS2 system was rolled out in year 2012. The first Electronic Medical Record systems were introduced to support patient data management in the year 2012 but to a wider scale in 2013. The uptake of varied types of EMRs supported by different partners has been growing rapidly [7]–[9]. The purpose of this study was to assess immediate impact of EMRs in reporting health data indicators with respect to reporting completeness and timeliness by the various facilities across the counties. Completeness and timeliness components are key data quality attributes leading to quality of care.

## 2. Methods

HIV facility reporting data were extracted from the DHIS2 system for HIV Counselling and Testing (HTS), Prevention of Mother to Child Transmission (PMTCT) and Care and Treatment (C&T) programmatic areas. Systematic procedures were used in cleaning the data. The facility reporting data for these programmatic areas was merged using Master Facility List codes (unique identifier for facilities), with an updated list of facilities containing KenyaEMR system implementation dates. Only facilities extracted from DHIS2 that matched with those updated in the KenyaEMR implementation list were retained. The EMRs implementation year for facilities in the resulting database was used to segment facilities based on those with EMRs implementation and those without EMRs implementation in a particular year. For instance, a facility reporting to DHIS2 in the year 2012 may have had EMRs implemented in 2013, hence were categorized as having no EMRs implementation for the year 2012.

KenyaEMR system implementation in facilities commenced in the year 2012. Based on the KenyaEMR system implementation date list, there were only seven implementations in the year 2012, hence, analysis was limited to only year 2013 as there were more implementations. In addition, all facilities in our data set had EMRs implementations by 2014. Performance assessment was based on facility reporting completeness (percentage of expected reports submitted) and timeliness (percentage of expected reports submitted on time).

Prior to data analysis, normality tests we conducted using Shapiro-Wilk tests and test of Homogeneity of Variance. Consequently, we conducted Mann-Whitney U tests to compare the relationship between the facilities implemented with KenyaEMR and those without implementation to performance on HIV indicator reporting, given that the data was not normally distributed. All analysis was conducted using SPSS.

## 3. Results

On average, a total of 256 facilities qualified for the comparative analysis across the three programmatic areas. The comparative analysis resulted in p-values > 0.05 on all the three areas regardless of the state of implementation (Table 1). This reveals no statistically significant differences in performance in reporting completeness and timeliness for facilities with EMRs implementations and those without EMRs implementation in the various programmatic areas.

**Table 1.** Performance for completeness and timeliness in facilities with EMRs implementations and facilities without EMRs implementation for the year 2013

| Quality attribute | Implementation Status | n | P-value | Mean Rank |
|---|---|---|---|---|
| | **HTS** | | | |
| Completeness | Without EMRs | 152 | 0.236 | 124,47 |
| | With EMRs | 104 | | 134,39 |
| Timeliness | Without EMRS | 152 | 0.296 | 132,44 |
| | With EMRs | 104 | | 122,75 |
| | **PMTCT** | | | |
| Completeness | Without EMRs | 153 | 0.097 | 123,91 |
| | With EMRs | 105 | | 137,65 |
| Timeliness | Without EMRS | 152 | 0.546 | 131,80 |
| | With EMRs | 104 | | 126,15 |
| | **C&T** | | | |
| Completeness | Without EMRs | 152 | 0.186 | 123,37 |
| | With EMRs | 103 | | 134,83 |
| Timeliness | Without EMRS | 152 | 0.549 | 130,26 |
| | With EMRs | 103 | | 124,67 |

In Figure 1 and Figure 2, we illustrate the distribution of facilities with and without KenyaEMR implementation in the various counties. The aim was to have a visual representation of the reporting performances by facilities in the various counties. Nonetheless, the number of facilities is varying and limited to enable any analyses between the counties.
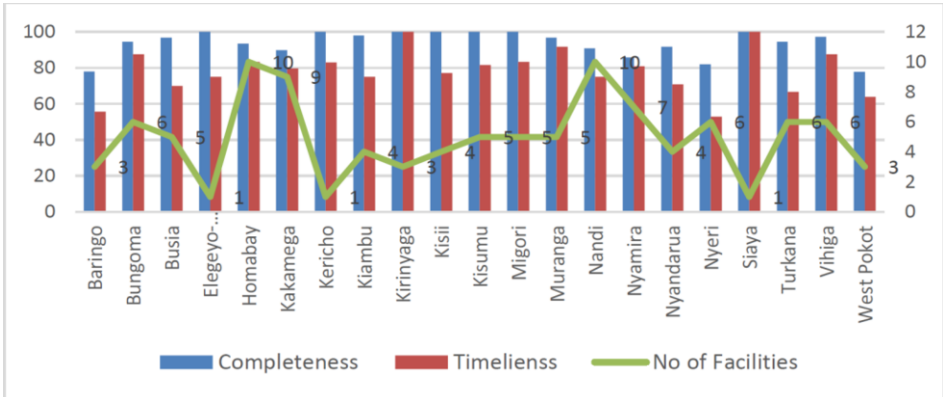


**Figure 1.** Percentage average reporting of HTS for facilities with EMRs implementation and their distribution in the various counties
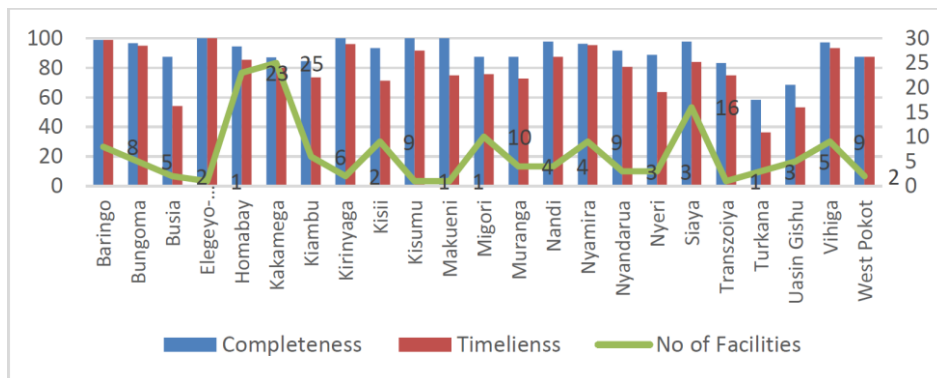
**Figure 2.** Percentage average reporting of HTS for facilities without EMRs and their distribution in the various counties

## 4. Discussion

As seen in Figures 1 and 2, performance on reporting completeness and timeliness varied within the counties and within facilities with and without EMRs implementation in the year under study. Nonetheless, our analysis was based on cumulatively all facilities with and without implementation, and not disaggregated by counties (Table 1). This enabled comparison of performance in facility reporting completeness and timeliness within the initial years of EMRs implementation. Ordinarily, it can be assumed that differences in reporting performance are expected in facilities with EMRs implementations verses those without. However, this study reveals that there were no differences in performance among facilities with EMRs and those without despite their contribution to improved internal health care services as reported by some studies [4]–[6]. This can be explained due to the fact that EMRs were not involved in direct reporting of the indicators to DHIS2 system.

While there are other types of EMRs implementations in Kenyan health facilities [10], the study was limited to only those implemented and projected to implement KenyaEMR system as it was the only one where implementation dates were provided. Additionally, the Kenyan MoH has adopted KenyaEMR as the national EMRs.

This study suggests that there was no direct effect on the reporting performance on introducing the KenyaEMR system which seemed to be contrary to the expectation. That could be attributed to the reporting routines, training and availability of the staff to transform and migrate data between the EMRs and DHIS2 systems. Nevertheless, this study can be used as a baseline for future comparisons in evaluating EMRs implementations in relation to health indicator reporting performance.

## 5. Conclusion

We found that the implementation of KenyaEMR system considered in this study cannot be associated with transformed performance in reporting HIV health data. Our next step is to conduct a follow-up study to investigate reporting performance as implementations have progressed including other types of EMRs as well as. Comparison of performance

after establishment of electronic health data exchange between the national reporting system, DHIS2 and EMRs will also be of interest in our future study.

## Ethical Approval and Acknowledgements

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