European Economic Letters
ISSN 2323-5233
Vol 14, Issue 3 (2024)
http://eelet.org.uk

Evolution of Paperless Documentation: A Journey from Traditional Paper-Based Documentation to Electronic Health Records

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Abstract

The shift from paper-based recording and storing patient information to electronic health records (EHR) systems has revolutionized healthcare services globally. This paper seeks to analyze the usability and effects of achieving paperless documentation at A Private Hospital in Kenya, which began with Care2000 in 2005 and was succeeded by Kranium in 2017.

Initially, the implementation of Care2000 optimized tasks and the quality of patients' care by computerizing documents, decreasing the amount of paperwork, and improving data availability. The change to Kranium in 2017 brought possibilities like data exchange, analysis, and enhanced security, significantly improving healthcare services' quality. Kranium's effect is identified by comparing the patient's average length of stay (ALOS) before and after the implementation of the system.

This creativity measured ALOS in 2016, which was the starting point for measuring ALOS regularly in other years. By implementing Kranium, ALOS has been reduced; thus, morale efficiency was indicated. In 2020-2021, the pandemic led to a temporary increase in ALOS, while ALOS returned to its previous level in 2022-2023, proving the presented system's effectiveness.

There have been admitted difficulties, such as resistance to the change, technical challenges, and data protection; however, continuity and staff training have been vital. Telemedicine and Mobile Health applications have increased access to healthcare even more beyond the current progress. In conclusion, integrating EHRs at The Nairobi Hospital there has had a significant impact on both the provision of healthcare and the healthcare providers and patients on a large scale, which sets out the hospital's focus towards embracing technology in the improvement of healthcare and the overall betterment of the health providers' and patients' wellbeing.

Index Terms- Average Length of Stay (ALOS), Care2000 EHR System, Electronic Health Records (EHR), Kranium EHR System

Introduction

Health informatics has evolved tremendously throughout the years, from the systematic use of paper documentation to the incorporation of EHR systems. Such a change is prompted by the demands of efficiency, enhancement of accuracy, and even patient care, which denies adequate support by paper-based systems. The advantages associated with EHRs include improved data documentation, improved access to the patient's records, and efficient workflow.

These EHR systems' benefits and other implementation difficulties are well-documented in the literature. Recent evidence has indicated that EHR systems can be of immense value in the provision of patients' care as well as the improvement of patient safety. Thus, a systematic review by Campanella et al. (2016) established that EHR positively impacts guideline compliance and decreases prescription mistakes and documentation quality. Another study further explained how EHRs contributed to reducing adverse drug events and enhancing patient safety in a given healthcare facility (Li et al., 2023).

Electronic health records enhance patient care by providing all the details of the patient's electronic health records to the providers, making it easier for them to make quality decisions and even coordinate the patient's care. Through this aspect, EHRs enable the improvement of the time that would have otherwise been utilized in handling numerous operational processes by the health turnaround providers. According to the meta-analysis done by Campanella et al. (2016), it was concluded that EHR implementation has been found to reduce mortality by 22 percent.

The observed result of decreased documentation time was found to be 4%. This makes it possible for healthcare practitioners to spend more time with patients, enhancing the quality of care delivered to the public. Also, through complete documentation, enhanced revenue collection and reimbursement from insurance companies reduces operational costs further adding to EHR systems' effectiveness (Stanhope & Matthews, 2019).

Patients' records are easier to access with EHR systems than with the past paper-based systems. According to Stanhope & Matthews (2019), the patient information available in real time due to EHRs is essential to make precise decisions with regard to the treatment of the patients. In addition, EHRs are digital, they entail better data management practices such as documentation and access to patients' data among other merits. Change readiness or more specifically, resistance to change is one of the most significant issues in relation to EHR implementation.

Most providers are traditional and may not welcome change and new technologies especially those that imply the use of papers. To deal with this type of resistance, extensive training has to be done and more importantly showing the provider the concrete advantages that they will gain as well as the facility once they start using EHR systems (Boonstra, Versluis & Vos, 2014).

There are highly technical aspects and costs as well as financial incubations that go with the adopting of EHR systems. EHRs can entail significant direct and indirect costs incurred during the contract acquisition, implementation, and over the system's preserving. Also, technical issues like the integration of different systems and protection of information are essential factors that define how the goal can be attained (Campanella et al. 2016)

Concerning the security and confidentiality of the patient information, it is crucial to provide that data safety in the digital world. EHR systems have to be respected to the most stringent legal requirements for the securing of health information. The literature reported that the higher level of security is required to avoid leakage of data and unauthorized access (Li et al.; Hsu and Shen 2023).

Implementing the use of EHR's instead of traditional paperwork is a great leap forward in healthcare services provision. As a result, when demonstrating the advantages of EHR systems for enhancing the quality of care, work productivity, and the management of people's health information, it is crucial to point out the barriers, such as resistance to change, technical and cost considerations, and data security issues that should be overcome for effective implementation.

The case of The Nairobi Hospital demonstrates the possibilities of the EHR systems revolutionizing healthcare delivery and the continuous process that must be in place to enhance the systems for the improvement of people's health.

Methodology

Study Design

This research uses a quantitative research design to investigate the effects of the Kranium EHR system deployed at the Nairobi Hospital. The primary measure studied is the ALOS of patients discharged from the hospital between 2016 and 2023. The study period is divided into four distinct phases: Including baseline (referred to as pre-implementation, 2016), the first year of implementation (referred to as post-implementation 2017 – 2019), a period during the COVID-19 pandemic (2020 – 2021), and the early recovery period (2022 – 2023).

Data Collection

Information used in this study was obtained from The Nairobi Hospital's internal health information system, which captures comprehensive details of patients' data, including admission and discharge dates. This dataset can be very useful in providing information on the various patient flows and length of stay throughout the study period.

Period of Study:

1. Pre-Implementation (2016): Get the mean length of a patient's stay before the system was implemented through baseline ALOS data analysis.

2. Post-Implementation (2017-2019): To capture any effect immediately after the implementation of Kranium EHR, data for the first few years of the ALOS were gathered.
3. Pandemic Impact (2020-2021): Data from this period were analyzed separately from the COVID-19 pandemic as it affected hospital operations and patient treatment
4. Post-Pandemic Recovery (2022-2023): Data obtained from the recovery period sought to capture long-term impacts and the hospital's future functioning in the event of the COVID-19 outbreak.

1.0. Data Analysis

The collected data was preprocessed to eliminate all the outliers or records with missing data that can distort the results. This entailed eliminating admission or discharge date missing records, where errors were identified they had to be checked and corrected, where there was variation in format or the identifier patients' records were put in the correct format. The cleaned data were further transformed to obtain the variable ALOS, given by the difference between the patients' discharge date and admission date. The average ALOS for each year of each study phase was computed.

ALOS were estimated using mean, median, standard deviation, and range for each phase of the studies. Trend analysis was conducted to illustrate the trend of ALOS for a particular time. Line graphs displayed the mean ALOS from 2016 to 2023 for the pre-and post-EHR implementation and the pre-and post-pandemic periods.

Ethical Considerations.

The patients' information was safeguarded, and all the collected data was anonymized before the analysis was conducted to conform to the ethical standards and policies on data privacy.

Results

Average Length of Stay (ALOS)

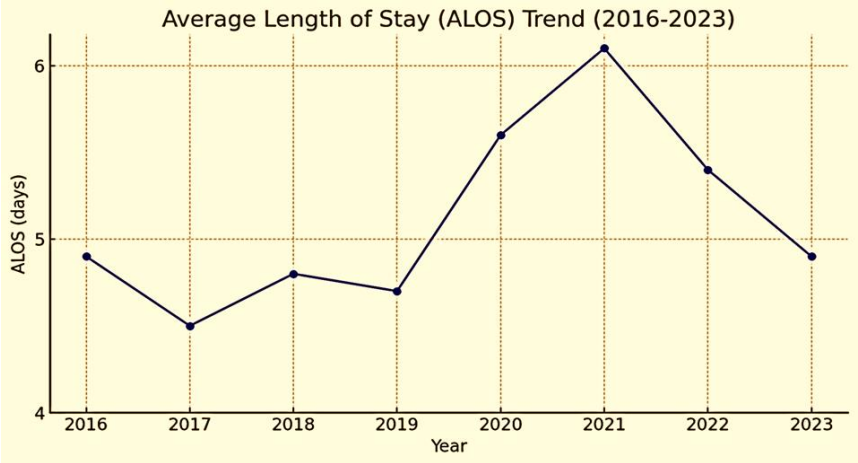

Figure 1: A line graph showing the trend of the average length of stay in Nairobi Hospital from 2016 to 2023**.**

Pre-Implementation (2016)

The study firs determined the general ALOS for the year 2016 to establish the base ALOS before the integration of the Kranium EHR system. Mean ALOS in the indicated period was 4. 9 ± 0. 3 days. This period acted as a benchmark to compare the differences of the patient stay in the hospital before and after implementation of the EHR system. The standard deviation shows the moderate volatility in the patients' stay and diverse patient profile and treatment indicated by the hospital.

Post-Implementation (2017-2019)

The subsequent ALOS data of the next years (2017-2019) was also calculated after the Kranium EHR system was established in 2017. In 2017, the mean ALOS decreased to 4.5 ± 0.1 days, showcasing an immediate positive effect of the

EHR system in reducing patient stay durations. This time period represented an impact phase one since the mean ALOS decreased demonstrating the ability of the new EHR system to enhance the undertaking of processes related to patients' care effectively. The specific ALOS for 2019 was 4.7 ± 0.2 days.

Pandemic Impact (2020-2021)

The consequence of the COVID-19 outbreak in influencing ALOS was quite profound. Therefore, the mean ALOS rose to the levels of 2020 and early 2021 as the demand for access to healthcare services and the need for the further treatment of COVID-19 patients grew. Hence, the mean ALOS was 5. 6 ± 0.4 in 2020 and 6. 1 ± 0.5 days in 2021.

Post-Pandemic Recovery (2022-2023)

As for the period of post pandemic recovery reported in 2022-2023, the mean ALOS started gradually to increase and get closer to the level that was characteristic for the pre-pandemic period, which proves the possibility of maintaining the efficiency of work in the healthcare system due to application of the Kranium EHR system. The mean ALOS in the year 2022 was 5. 4 ± 0. 4 days, thus presenting a decrease compared to the peak of the pandemic but still higher compared to the previous years.

Again by 2023 the mean ALOS was down to 4. 9 ± 0. 2 days, equivalent to the baseline ALOS of the year 2016 as illustrated in figure 1. It informs that the management of this hospital was able to find the ways to counter the impact of this pandemic and that the Kranium EHR system helped a lot in the process of the recovery. They also entail that the post-pandemic baseline ALOS depicts the extent to which the hospital has successfully enhanced its operations and operations flow

4.0. Discussion

The implementation of the Kranium EHR system in The Nairobi Hospital has been a major factor in the decrease in the ALOS of patients, increase in the efficiency of the delivery of health care services and improvement of patient results. The analysis of the results obtained on ALOS over the years offers insights into the success of the system and the hospital's ability to adapt to new circumstances.

Initial Impact of EHR Implementation

The initial phase of the Kranium EHR system implementation from 2017 to 2019 demonstrated a decrease in ALOS compared to the period before the implementation of the system. This decline can be explained by the enhanced documentation, better access to the patient records, and optimized processes that the new EHR system has provided. The efficiency of the patient data retrieval and modification features enabled the healthcare providers to make accurate decisions more promptly and thereby, minimize the hospital stays.

The progressive decrease in ALOS over the first years of implementation shows that the system improves the hospital's productivity and the quality of patient care. The same can be said in other studies where EHR systems' use led to decreased ALOS and other clinical benefits. For example, Buntin et al. (2011) noted a reduction in the ALOS and enhanced healthcare delivery after using EHRs. Further, Menachemi and Collum (2011) also pointed out that using EHR systems improves clinical workflows and, hence, the quality of patient care.

Pandemic Challenges and Adaptations

The COVID-19 outbreak brought about unprecedented challenges for healthcare facilities globally, including The Nairobi Hospital. The ALOS was slightly higher in the pandemic years of 2020 and 2021 because of the pressure on healthcare institutions and the need for more time to treat COVID-19 patients. However, the Kranium EHR system was very useful in handling the upsurge in the number of patients while maintaining their care in the face of the difficulties encountered.

The evidence shows that the pandemic affected the operation of the hospitals; however, the EHR system had a strong foundation and flexibility that lessened the negative consequences on care delivery. Abir et al. (2020) also pointed out

some similar observations of EHR systems during the COVID-19 pandemic in terms of patient care management. Wosik et al. (2020) also stressed that EHR systems play a crucial role in maintaining continuity of care and responding to the new conditions during the pandemic.

Post-Pandemic Recovery and Future Prospects

The fact that ALOS returns to pre-pandemic levels in the post-pandemic recovery period of 2022-2023 indicates the effectiveness of the Kranium EHR system and its contribution to providing health care services. The enhancements and refining of the EHR system are still ongoing in an effort to decrease the mean ALOS to 4.3 days in 2024. This target is reflective of the hospital's long-term management strategy and focuses on the application of technology in the delivery of patient care.

The prospects of healthcare at The Nairobi Hospital are bright in the future with the continuing technological developments and improvement of the documentation and data management systems. Kruse et al. (2017) and Adler-Milstein & Jha (2017) have established that for sustainable improvements in the provision of healthcare services and patient outcomes, there is a need for EHRs' constant evolution and enhancement

5.0. Conclusion

The journey from traditional paper-based documentation to electronic health records (EHR) systems at the Nairobi Hospital has significantly improved healthcare delivery. Implementing the care 2000 and, subsequently, the Kranium EHR system has revolutionized patient information management, leading to enhanced efficiency, reduced ALOs, and better patient outcomes.

Despite challenges such as resistance to change, technical issues, and data security concerns, continuous training and adaptation have ensured the successful integration of EHR systems. The future of healthcare at The Nairobi Hospital looks promising, with ongoing technological advancements and a focus on optimizing patient care through efficient documentation and data management practices. Similar conclusions were drawn by Jones Et Al. (2014) And Gawande (2018), who highlighted the transformative impact of EHR systems on healthcare delivery and patient outcomes.

The transition from paper-based documentation to EHR systems at The Nairobi Hospital has improved the healthcare system. The introduction of care 2000 and later the Kranium EHR system has completely changed the handling of patient information, resulting in improved efficiency, lower ALOs, and better patient outcomes.

Some of the issues that have been observed include resistance to change, technical problems, and data security. However, through training and continuous improvement, the implementation of EHR systems has been successful. The future of healthcare at the Nairobi Hospital is promising, given current technological developments and a drive for enhanced patient care through better documentation and data management.

6.0. References

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