

## Utilization Levels of Computerized Physician Order Entry (CPOE) By Health Care Workers in Mbagathi District Hospital Nairobi, Kenya

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**Abstract:** Computerized physician order entry (CPOE) is the process of entering medication orders or other physician instructions electronically instead of on paper charts. It was also defined as the electronic prescribing systems that intercept errors at the time they occur, typically when a medication is ordered. CPOE has the potential to decrease medical errors and improve quality. Our health system plans to implement CPOE in response to the ARRA HITECH Act. Despite the well-documented ability of information technology to reduce medical errors and pinpoint where potential safety problems are likely to occur, hospitals and physicians remain reluctant to adopt CPOE systems. However, continuing barriers to implementation of information technology that most providers and payers recognize as important, organizations have made very big changes in how they look at patient safety. Failure to use of the CPOE system has caused increased errors related to poor handwriting or transcription of medication orders. The objective of this study was to assess Utilization levels of CPOE by health care workers in Mbagathi District Hospital. In specific, to identify barriers to Utilization of CPOE by health care workers, to determine factors affecting the utilization of CPOE by clinicians and to determine the solutions to overcome the barriers in utilization of CPOE. After data was collected cleaning was done then entered in a database using SPSS and Excel software. Test for normality was done to identify outliers. Frequency tables were running and cross tabulations to identify relationships. Regression analysis was important too as this helped the researcher get the correlations and relationships of data collected. Despite the apparent efficacy of CPOE systems, only 10–15 percent of hospitals use them. There are 98,000 reported deaths per year and many more injuries resulting from medical errors, which made patient safety a top priority in USA health care. Many medication errors are the most common causes of preventable injuries in hospitals and could have been prevented by computerized physician order entry (CPOE) systems. The majority of physicians believed CPOE would lead to a reduction of medical errors and more efficient patient care. However, physicians were highly concerned with how CPOE would affect their own work efficiency as most of them still use manual system due to lack of knowledge of computer use as 75% of physicians were not trained to use CPOE while 81% were using paper prescription.

**Key Words:** Utilization levels of CPOE, barriers to Utilization of CPOE and solutions to overcome the barriers in utilization of CPOE

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Date of Submission: 01-03-2020

Date of Acceptance: 16-03-2020

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### I. Introduction

The Use of a CPOE system can help reduce errors related to poor handwriting or transcription of medication orders. Although CPOE systems are designed to mimic the workflow of the paper chart, their adoption has been slow, largely because of the disruption to existing care settings and the cost of implementation. Few United States of America (USA) hospitals have implemented computerized physician order entry (CPOE) in spite of its effectiveness at preventing serious medication errors (Osheroff *et al.*, 2005). Hospitals that placed a high priority on patient safety could more easily justify the cost of CPOE. Outside the hospital, financial incentives and public pressures encouraged CPOE adoption. Dissemination of data standards would accelerate the maturation of vendors and lower CPOE costs. Despite the apparent efficacy of CPOE systems, only 10–15 percent of hospitals use them. They have reported 98,000 deaths per year and many more injuries resulting from medical errors, which made patient safety a top priority in USA health care. Many medication errors—the most common cause of preventable injuries in hospitals—could have been prevented by computerized physician order entry (CPOE) systems. These systems reduce the incidence of serious medication errors by 55 percent. This collective evidence has prompted the LeapFrog Group, a national consortium of

Fortune 500 companies, to designate CPOE deployment by hospitals as one of three patient-safety goals (Rudolph,2011).

According to the provisions of the Healthcare Information Technology for Economic and Clinical Health (HITECH) Act, healthcare organizations that have achieved meaningful use by 2011 will be eligible for incentive payments; those who have failed to achieve that standard by 2015 may be penalized. A study done in the year 2009 by the Massachusetts Technology Collaborative and the New England Healthcare Institute concluded that CPOE systems could save hospitals up to \$2.7 million a year, compared to a cost of \$2.1 million for implementation and \$435,000 for annual maintenance. Even the private sector, which focused more heavily on electronic systems to boost reimbursement, has begun to develop "decision support" tools for clinicians. Mbagathi District Hospital is the second largest public hospital in Nairobi after Kenyatta National Hospital. It serves a catchment population of 290,399 and has a workforce of 358 Clinicians. Clinicians at the hospital face barriers in utilization of CPOE.

The locality of the Mbagathi District Hospital is Golf Course division of Dagoretti District in Nairobi City County next to Kibera, which is the largest slum in Africa. Mbagathi District Hospital is the second largest public hospital in Nairobi after Kenyatta National Hospital. It serves a catchment population of 290,399 and has a workforce of 358 Health Care workers. Semi-structured in-depth interview instrument to delineate the barriers to and facilitators of CPOE implementation. Descriptive study was used in the study. This helped in answering the research question in a "what is" approach which was compared to "what would be like". It also helped the researcher to see the area which needed to be addressed. Both quantitative and qualitative methods were used. Likert's rating scale was used for analysis of qualitative information that was collected; both open and close-ended questions were used. Open-ended questionnaire helped the researcher in getting the respondents view while closed questions gave a general view of the study. Data was collected from health care professionals involved in use of CPOE. The researcher stratified health care workers into profession (eg. Nurses, doctors) then did a simple random sampling within each stratum. Questionnaires with both open ended and closed questions were administered to those who were selected and protected the privacy of the subjects. They also ensured that information was collected in a standardized way. After data was been collected it was stored to maintain quality. Data cleaning was done then entered in a database using SPSS and Excel software. Test for normality was done to identify outliers. For analysis, frequency tables were ran and cross tabulations to identify utilization levels.

## **II. Methodology**

The locality of the Mbagathi District Hospital is Golf Course division of Dagoretti District in Nairobi City County next to Kibera, which is the largest slum in Africa. Mbagathi District Hospital is the second largest public hospital in Nairobi after Kenyatta National Hospital. It serves a catchment population of 290,399 and has a workforce of 358 Health Care workers. Semi-structured in-depth interview instrument to delineate the barriers to and facilitators of CPOE implementation. Descriptive study was used in the study. This helped in answering the research question in a "what is" approach which was compared to "what would be like". It also helped the researcher to see the area which needed to be addressed. Both quantitative and qualitative methods were used. Likert's rating scale was used for analysis of qualitative information that was collected; both open and close-ended questions were used. Open-ended questionnaire helped the researcher in getting the respondents view while closed questions gave a general view of the study. Data was collected from health care professionals involved in use of CPOE. The researcher stratified health care workers into profession (eg. Nurses, doctors) then did a simple random sampling within each stratum. Questionnaires with both open ended and closed questions were administered to those who were selected and protected the privacy of the subjects. They also ensured that information was collected in a standardized way. After data was been collected it was stored to maintain quality. Data cleaning was done then entered in a database using SPSS and Excel software. Test for normality was done to identify outliers. For analysis, frequency tables were ran and cross tabulations to identify utilization levels.

### III. Results

#### Factors affecting the utilization of CPOE by clinicians

Figure 1: HCW using computerized and manual

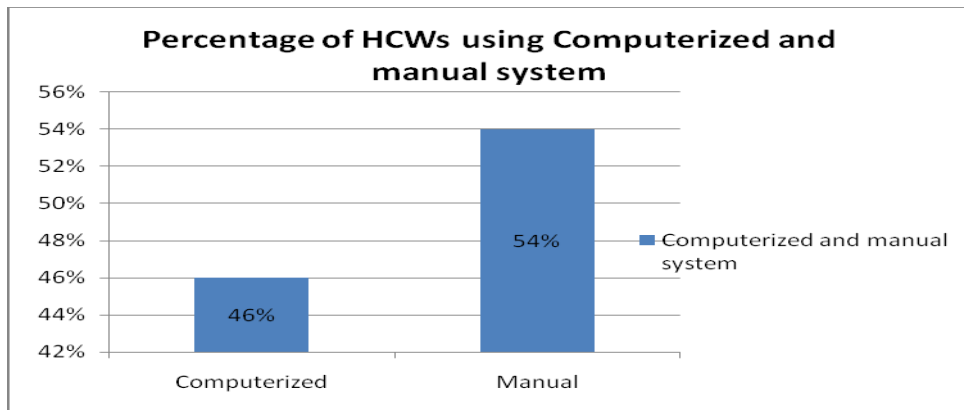
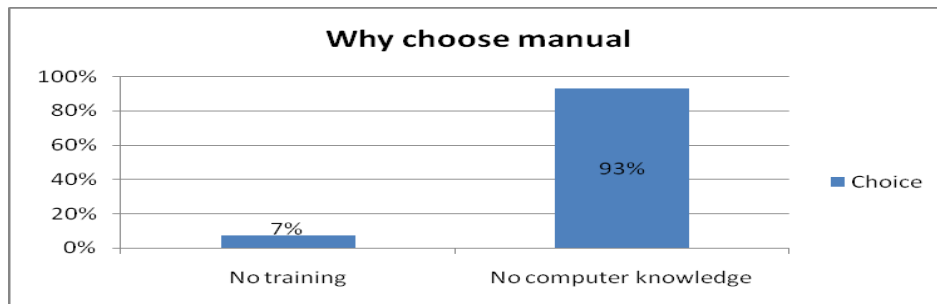


Figure 1 illustrated that more HCW are using manual system with 54% as compared to computerized system, which had 46%.

Figure 2: Choosing the manual system



In figure.2, it was noted that 93% of the HCWs would choose the manual system mainly due to lack of knowledge while only 7% would choose the manual because of lack training.

Table 1: Usage of CPOE and Recording of patients' information

Use of CPOE	Recording of Patient's information		Total
	Computerized	Manual	
Use	80%	20%	100%
No	14%	86%	100%
<b>Total</b>	<b>46%</b>	<b>54%</b>	<b>100%</b>

Of the individual who use CPOE, 80% use it for recording patients' information but unfortunately, 20% still use the manual system to record patient information. It is also interesting to know that 14% of the HCW who do not use CPOE use computerized system to record patients' information.

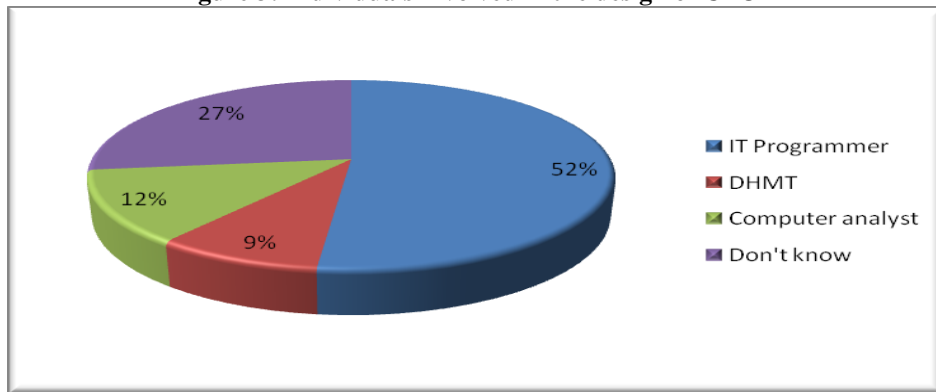
Table 2: CPOE usage and the duration of usage

Use of CPOE	Duration of CPOE usage			Total
	(0 - 1) Years	(1 - 5) Years	(5 - 10) Years	
Yes	49%	51%	0%	100%
No	68%	31%	1%	100%
<b>Total</b>	<b>59%</b>	<b>40%</b>	<b>1%</b>	<b>100%</b>

Table 2, above portrayed that only 1% of the HCWs have been using CPOE for more than 5 years, about 40%

have been using it for between 1 to 5 years and that 59% have been using it for the last 1 year. This shows an increasing demand for CPOE.

**Figure 3: Individuals involved in the design of CPOE**



From the figure 3 above, we note that other than 73% of the individuals who are aware of the personnel involved with the design of CPOE, we still have about 30% who are not aware.

**Figure 4: Use of paper for prescription**

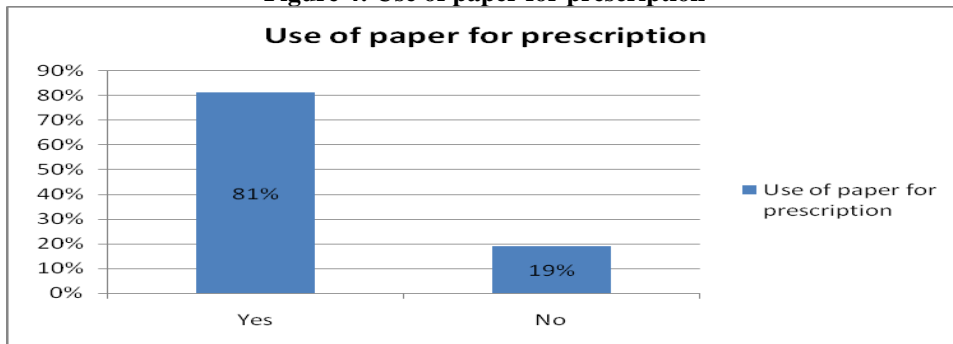


Figure 4 above shows that, 81% of the HCWs are using paper for prescription.

**Figure 5: Issues arising with use of CPOE**

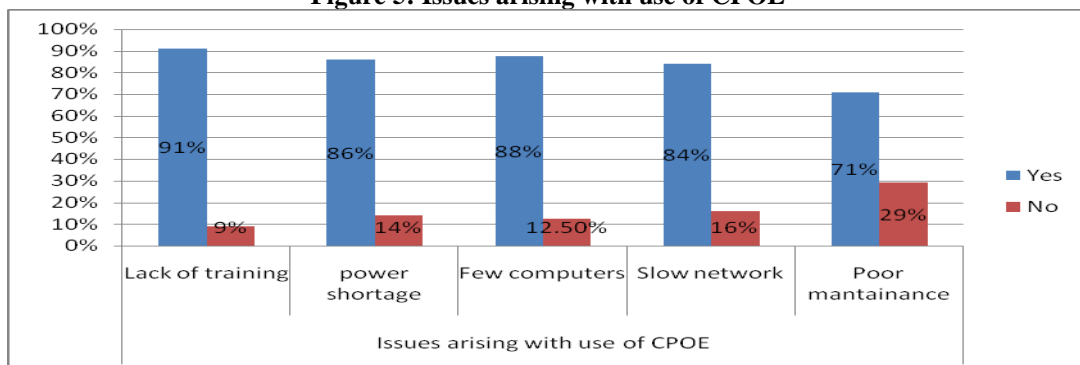
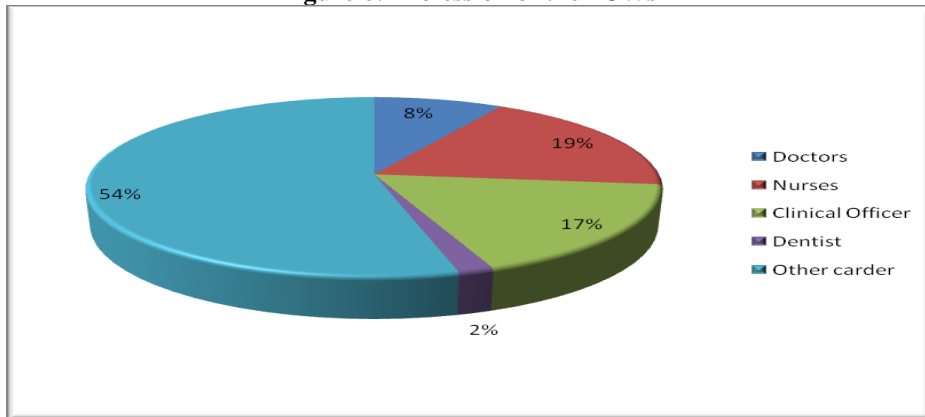


Figure 5 shows that lack of computers, power shortage, few computers, slow network and poor maintenance of computers all are big challenges with utilizing CPOE.

In summary, lack of training with 7% and computer knowledge with 93% was found to be the main factor of underutilization of CPOE by HCWs in Mbagathi District Hospital. This was supported by figure 4.2.2 whereby the HCWs were using manual instead of computerized system, which had 54% and 46% respectively. In addition, Figure 5 showed that lack of computers, power shortage, few computers, slow network and poor maintenance of computers were major challenges to utilization of CPOE.

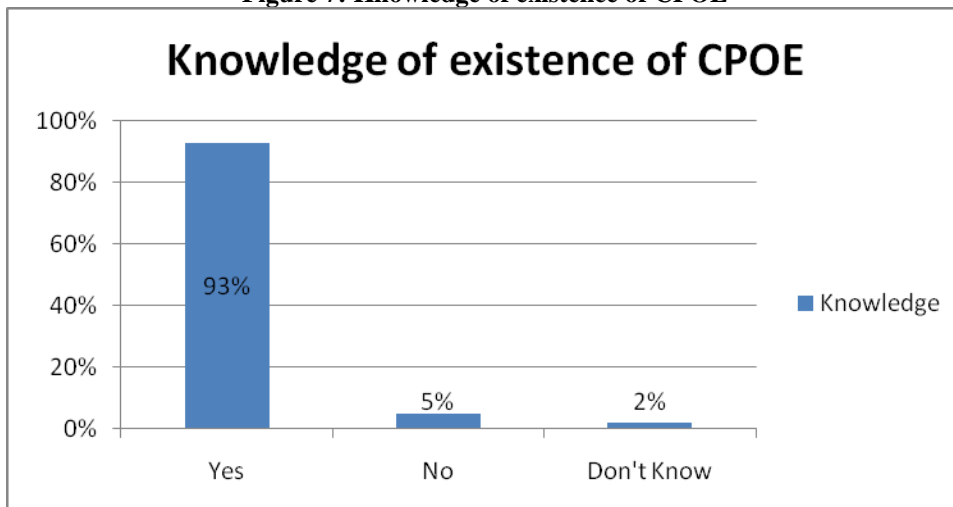
Utilization of CPOE by healthcareworkers

Figure 6: Profession of theHCWs



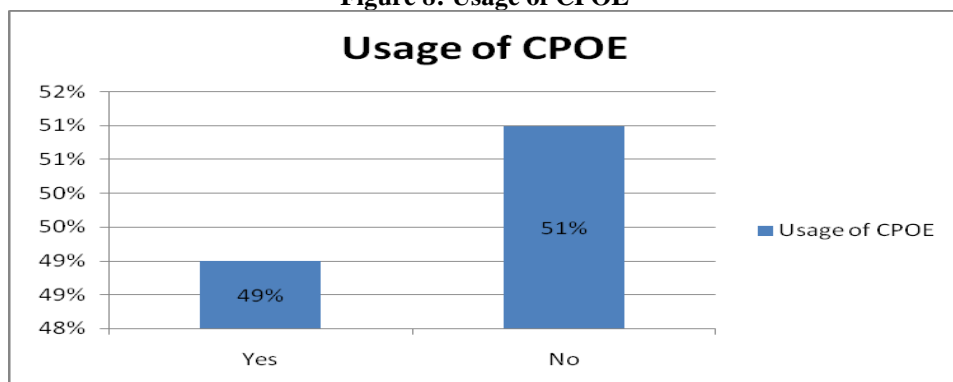
As illustrated in figure 6 above, majority of health care workers utilizing CPOE in Mbagathi District Hospital were “other carder” with 54%, followed by nurses with 19%, clinical officers with 17% , doctors followed with 8% while dentist were last with 2%.

Figure 7: Knowledge of existence of CPOE



From figure 7 above, it was observed that about 93% of the health care workers are knowledgeable on the existence of CPOE with 93% as compared to those who did not have the knowledge of existence and those who did not know with 5% and 2% respectively.

Figure 8: Usage of CPOE



From figure 8, we note that at Mbagathi District hospital, 49% of the HCW are using CPOE.

**Table 3: Knowledge of existence of CPOE and the frequency of usage**

Existence of CPOE	HOW OFTEN DO YOU USE THE SYSTEM			Total
	ALL THE TIME	SOMETIMES	NOT AT ALL	
Yes	25%	29%	47%	100%
No	0%	11%	89%	100%
Total	23%	28%	49%	100%

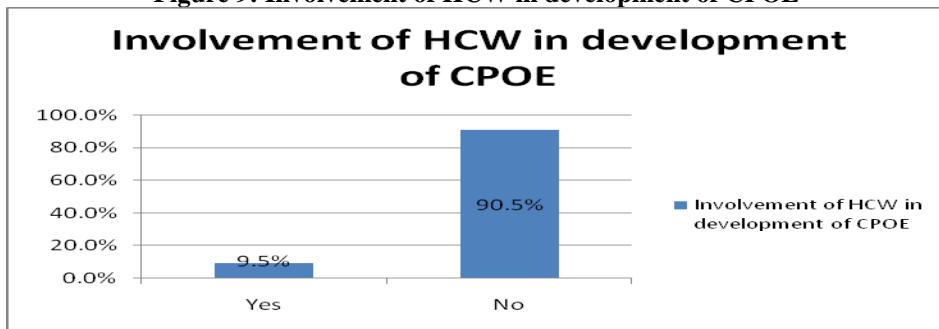
Table 3 demonstrated that HCW knowledgeable of the existence of CPOE only 25% of the HCWs use it all the time, about 30% use it sometimes and close to 50% do not use the system. About 11% of the HCWs who are not aware of its existence but still use it sometimes while 89% are not aware of the system and do not use it at all.

**Table 4 CPOE Usage and Work experience**

Usage of CPOE	WORKING EXPERIENCE			Total
	1 - 5 Years	5 - 10 Years	10 - 20 Years	
Yes	76%	16%	9%	100%
No	69%	18%	12%	100%
Total	72%	17%	10%	100%
%age of usage	54%	45%	41%	

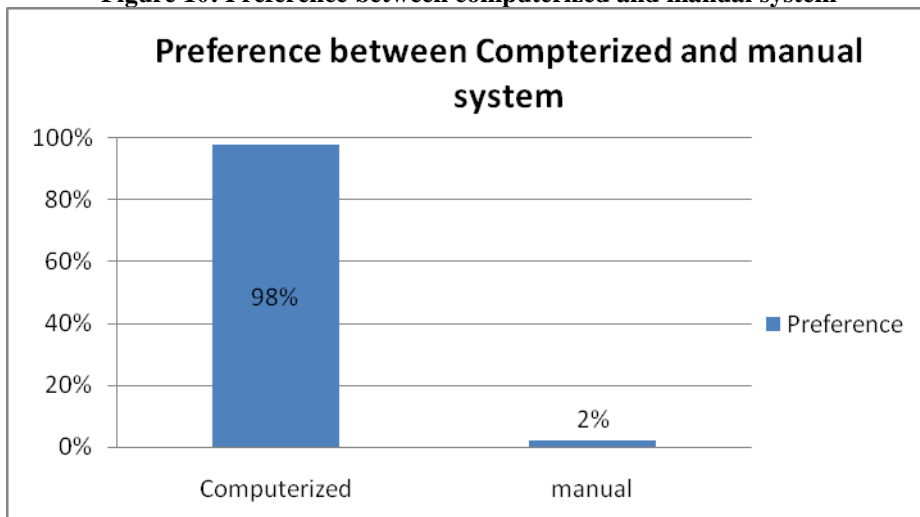
Table 4 above shows that 76% of HCWs who have working experience of 5 years and under use CPOE, while 16% of those who have a working experience of between 5 to 10 years use it and that only 9% of those who have an experience between 10 and 20 years of experience use it. This shows a decreasing usage of CPOE with increasing work experience.

**Figure 9: Involvement of HCW in development of CPOE**



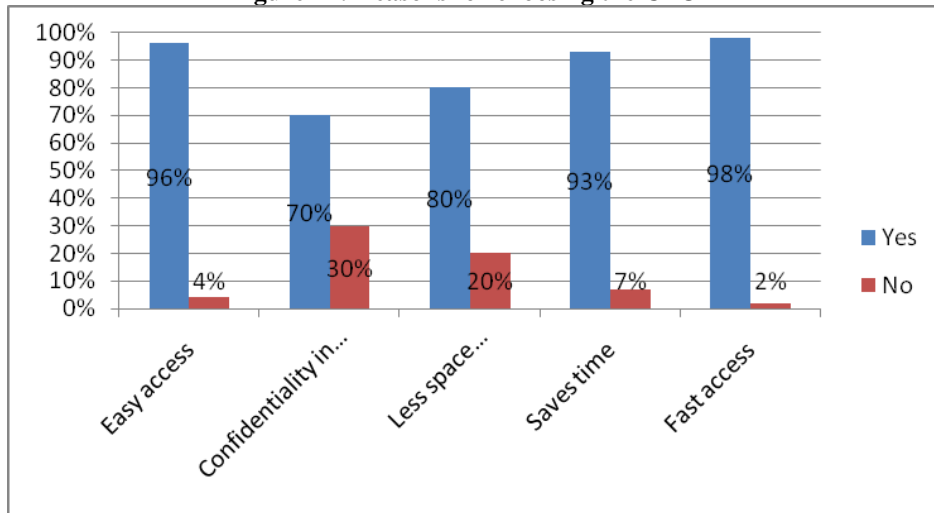
From figure 9, we observe that over 90% of the HCWs were not involved in the development of CPOE.

**Figure 10: Preference between computerized and manual system**



We note that despite low use of CPOE, 98% of the HCWs still prefer computerized system to a manual one.

**Figure 11: Reasons for choosing the CPOE**



Majority of HCW choose CPOE because of ease to accessibility, confidentiality in information storage, less storage space required, saving of time and fast access to information.

**Figure 12: Training of HCWs to use CPOE**

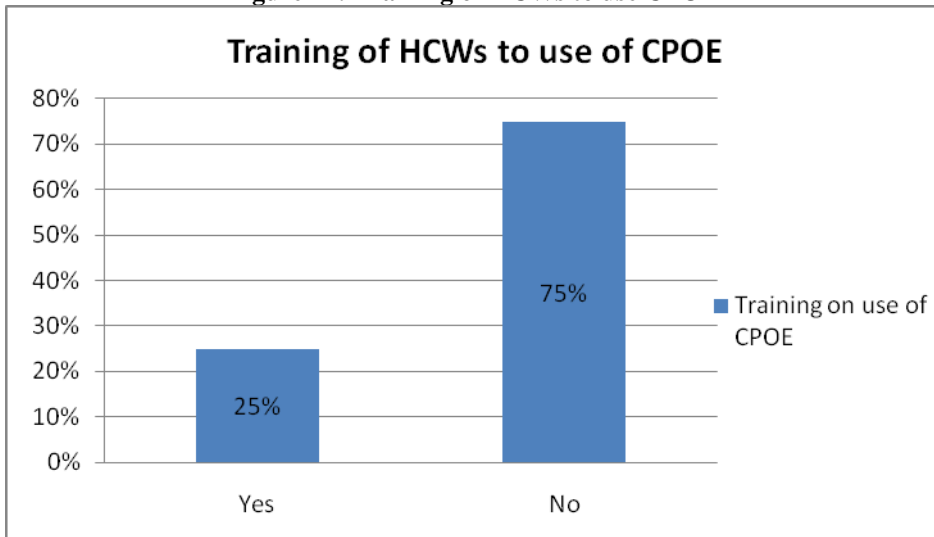


Figure 11 shows that although 93% of the HCWs would choose the manual system with the reason of lack of computer knowledge while only 7% with the reason of lack of training, we can confirm that training is an issue as 75% of the HCWs claim not to be trained on how to use CPOE.

#### IV. DISCUSSIONS

Medication errors in hospitals are significant in volume; contribute to the morbidity and mortality of patients, and increase resource utilization and costs. The CPOE solution, while costly and complex, is one way healthcare organizations can reduce a significant amount of medication errors, however, organizations should be aware that CPOE systems will not solve the entire medication error problem.

From our results, it is evident that Health Care Workers (HCW) from “other cadre” forms the majority. This implies that for utilization of CPOE an individual not need to have a medical background as profession to use the system.

Moreover, it is evident that the HCWs at Mbagathi District Hospital are knowledgeable on the existence of the CPOE. This can be interpreted as that sensitization is well done in the hospital. It is unfortunate from the results that only about 50% of the HCWs are using CPOE and that less than 50% record patients’ information despite knowing that it exists. This is in consistent with a survey of community hospital physicians, which found out that less than half of physicians utilized CPOE yet it had been adopted by the hospital. This indicates that there is some form of reluctance when it comes to its utilization. This has been supported by the

article “*New England Journal of Medicine*” which stated that despite the well-documented ability of information technology to reduce medical errors and pinpoint where potential safety problems are likely to occur, hospitals and physicians remain reluctant to adopt these systems.

The results also indicate that despite the knowledge of existence of CPOE by HCWs, lack of confidence with CPOE was clearly shown and that it is going to be a hard task implementing CPOE alone.

In consideration to the advantages of CPOE, the findings showed that the system was fast, eliminated duplication, easy to access and confidential. (Osheroff et al, 2005) supported this in his findings who stated that most advanced implementations of such systems provide real-time clinical decision support.

It was also found out that working experience had an effect on the utilization of CPOE. Utilization of CPOE decreased with increasing working experience. This could be interpreted as that there was reluctance to adoption of new system by the individuals who had gotten used to using the manual system.

The results also showed that there was still high preference by Health Care Workers on the computerized system compared to the manual one in that it was generally user friendly. Nevertheless, the percentage of HWCs using the manual system was still higher and the main reason attached to it being lack of computer knowledge.

It was evident that there was still majority of HCWs who were still using paper prescription while seeing patients and that most of them had not been trained on how to use CPOE. This implied that training could have been a set back behind computerized prescription. Also, from (Osheroff 2005) stated that, physicians get angry when they are in a hurry and can't order because they can't navigate the system.

In addition, it was realized that there existed barriers to utilization of CPOE. This includes lack of computer knowledge, slow network, power shortage and poor maintenance of CPOE.

The results further suggested that there existed factors that hinder utilization of CPOE; Profession, Age group, Experience, Existence, user friendly, Choice, Involvement, Usage, Trained, Issues, Login, Passwords, Username and Barriers all were found to be factors that hinder utilization of CPOE. With the existence, training and barriers being most significant reason for failure to utilization of CPOE.

## V. Conclusions

From the study, we are able to conclude that utilization of CPOE in Mbagathi district hospital is low and was caused by lack of computer knowledge, slow network, power shortage and poor maintenance of CPOE with much weight on lack of computer knowledge. To overcome the barriers there was need for training of staff, installing standby generators, fast internet and antivirus, which would improve utilization of CPOE. There were some factors that hindered CPOE utilization which were; Profession, Age group, Experience, Existence, user friendly, Choice, Involvement, Usage, Trained, Issues, Login, Passwords, Username and barriers.

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