

abstract– The purpose of this study was to assess the perceptions of healthcare providers towards health information technology applications in King Abdul–Aziz Medical City in terms of benefits, barriers, and motivations. One–sample t–test was conducted to determine whether the mean score of each item of the three dimensions (benefits, barriers, motives) is significantly higher than a score 3; this being the mid–point on the Likert scale for "Neither agree nor disagree" response to the item. Two–sample t–test was used to test whether there are differences in respondents' perceptions towards IT benefits, barriers to using IT, and motives to using IT variables with respect to gender. One–way analysis of variance (ANOVA) was used to test whether there are difference in respondents' perceptions towards IT benefits, barriers to using IT, and motives to using IT variables with respect to education and occupation

**RESULTS:** a. Respondents' Characteristics: Table I shows the profile of respondents by age, gender, education, work experience, and occupation. The average respondent's age was 36.2 years associated with a relatively high standard deviation of 9.6 years. This shows the medical workforce at KAMC is young. With respect to gender, the vast majority of the respondents were female, 86.2 percent, while the remaining 13.8 percent were males. The sex disproportion is due to the fact that most of the sample were nurses, 55.2 percent; as nurses are usually females. In terms of educational background, most of the respondents, 79.3 percent, hold bachelor's degree, followed by 17.2 percent who had postgraduate degree and 3.4 percent had high school education or less. The work experience of the respondents ranged from one year to twenty–six years. About 43 percent of the respondents had less than five years of work experience; followed by 27.3 percent who had between five to nine years, 20.2 percent between ten to fourteen years, 5.6 percent between fifteen to nineteen years, and lastly 4.2 per cent had work experience of more than twenty years. The average working experience was 7.1 years with a relatively high standard deviation of 5.5 years. As for occupation, the table shows that about two thirds of the sample were nurses, followed by 17.2 percent were physicians and the same percentage were other medical staff. The results show that the nurse–physician ratio is relatively high; 3.8 nurses per physicians in the sample compared to 2.5 for the Ministry of Health

b. Literacy and Use of Information Technology Table II presents the levels of IT applications' knowledge and training and frequency of IT use. The results show that about two–thirds of the respondents attended training courses in information applications, while the remaining respondents, 34.5 percent, stated that they didn't attend any training course in this field. With regards to information technology literacy, 82.8 percent of the respondents stated that they had good knowledge and skills in the use of information applications, whereas 17.2 percent had poor skills in the use of information applications. However, the results show that most respondents who had training in IT had also good IT applications skills. The Chi–squared test confirmed there were significant relationship between training and IT knowledge at 0.01 level of significance. As can be seen from the table, 62.1 percent had training in IT field had also good IT skills compared to 20.7 percent of the respondents who had no training and had good IT knowledge. These results indicated that training has positive effect on health providers' IT knowledge and skills. Table II shows also that, the vast majority of the respondents, 86.2 percent, reported that they always use systems' applications, while 10.3 percent stated that they sometimes systems' applications. The remaining 3.4 percent of the respondents expressed that they rarely use systems' applications in KAMC. However, the results show

there was significant relationship between frequency of systems' application use and IT knowledge at 0.01 level of significance. The results show that most respondents with good IT applications skills use always KAMC computerized system c. Perceptions of healthcare providers towards the benefits, barriers, and motives to use information technology applications in KAMC Table III presents the perceptions of healthcare providers towards benefits, barriers, and motives to use IT applications. The high mean scores of the respondents' responses on benefits of IT applications, ranged between 3.6 to 4.4, reveal that all the respondents perceive that the information technology applications in KAMC are valuable. Therefore, healthcare providers believe that all information technology applications are important and beneficial to both patients and KAMC With regard to barriers to IT use, the mean scores of the respondents' responses ranged between 2.6 to 3.4. This explains that the respondents were split over the barriers to IT use in KAMC. The results of the t-test show that the following represent barriers to IT use in KAMC (items with p-values less than or equal 0.05) o Insufficient number of computers o Time consuming o Low system performance o System being down frequently The results of the t-test show that the following do not represent barriers to IT use in KAMC (items with p-values greater than 0.05): o Lack of training for the hospital staff o Lack of technical support o Incapability of the system o Lack of management support As for drivers to IT use, the respondents' mean score on items measuring the motives of IT use ranged from 3.58 to 3.89, implying the respondents agree with four motives shown in the table. Therefore, it can concluded that healthcare providers generally would be motivated to use IT applications in KAMC by provision of new applications and training, contribution in change hospital's work procedures, and provision of technical support. d. The effect of gender, occupation, and training on respondents' perceptions towards IT benefits, barriers to using IT, and motives to using IT variables: 1) Gender: Two-sample t-test was used to test whether there are differences in respondents' perceptions towards IT benefits, barriers to using IT, and motives to using IT variables with respect to gender. As for benefits of IT, Table IV shows that there were significant differences in respondents' perceptions on items 2, 4, 6, 7, 8, 9, and 13 with respect to gender at 0.05 significance level. The mean score of these items by gender show that the female respondents rated items "provides speed to accomplish work", "easier to find investigation results", "facilitates coordination among departments", and "improves quality of patients' care" significantly higher than did male respondents. As for IT benefits, the results show that there were significant differences (p-value 0.05) in perceptions of respondents who had training in IT and those who had no training on all items except items "Ensures patients' privacy" and "Improves quality of patients' care". It is worth noting that the mean scores of the respondents who had training on these items were higher than the mean scores of the respondents who did not attend training in IT field. This shows that the staff who attended training courses in IT perceive the benefits of IT more than those who did not attend training courses in this field. As shown in the table, the two-sample test's results show that there were no significant differences in the perceptions of staff who had training and those did not attend training on items: "Ensures patients' privacy" and "Improves quality of patients' care" As for barriers, the results show there were significant differences between respondents who attended training in IT and those who did not attend training in their perceptions towards barriers to using health information applications in KAMC in the following items: o Time consuming o Low system performance o

Lack of training for the hospital staff o Lack of technical support The mean scores of the respondents who did not attend training on IT on these items were higher than the mean scores of the respondents who had training except for the item "low system performance".Whereas, male respondents were more likely to agree on items "prevent loss of patients` data", "helps in preparing hospital reports ", and "improves decisions making process" compared to female respondents The two-sample test's results show there were no significant differences between male and female respondents in their perceptions towards items 1, 3, 5, 10, 11, and 12 at 0.05 level of significance. With respect to barriers to IT use, the results of two-sample t-test show that there were significant differences in perceptions of respondents on all items except for items 5, and 6 by gender. Male respondents indicated a higher agreement with the first two barriers (insufficient number of computers and time consuming) than did female respondents. While, females were likely to agree on four barriers, low system performance, system being down frequently, incapability of the system, and lack of management support, than male respondents. Furthermore, the results show there were no significant differences in the perceptions of male and female respondents towards "lack of training for the hospital staff" and "lack of technical support" at 0.05 level of significance. This indicates that the staff who attended training courses in IT perceive less obstacles to IT use in KAMC compared to staff who had no training in IT. Conversely, the respondents who had training in IT perceive that the system performance was low more than those who had no training in IT. Moreover, the results show there were no significant differences between respondents who had training in IT and those who had no training in their perceptions towards barriers to using health information applications in KAMC in the following items: o Insufficient number of computers o System being down frequently o Incapability of the system o Lack of management support With regards to drivers of IT use, the results show there were significant differences between respondents who attended training in IT and those who did not attend training in their perceptions towards two items; "IT provides new/durable applications" and "IT provides technical support at 0.05 level of significance. The mean scores of the respondents who did not attend training on IT on these items were higher than the mean scores of the respondents who had training except for the item "Provide new / durable applications".Physicians indicated higher agreement with the following seven statements: o Insufficient number of computers o Time consuming o Low system performance o System being down frequently o Lack of training for the hospital staff o Lack of technical support o Incapability of the system o Lack of management support Whereas, the results show that the higher mean score of respondents responses to item "System being down frequently" was for other staff, followed by nurses and physicians. It is also noted that nurse respondents were less likely to agree with these stated barriers. Table V presents the results of ANOVA test of motives IT applications use with occupation as the factor. Regarding motives, the ANOVA results showed that there were significant differences between physicians, nurses and other staff in their perceptions of all items measuring motives to IT use at 0.01 significance level. Other staff respondents indicated higher agreement with the statements "Provide new/durable applications ", "Provide training to staff", and "Provide technical support?As for motives, the results show there were significant differences between male and female respondents in their attitudes towards the item which states "IT provides motives new / durable applications" at 0.05 level of significance. Female respondents

indicated a higher agreement with the statement compared with male respondents. Whereas, the results

show no other significant perceptions differences between male and female respondents on the remaining items, "provide training to staff", "change hospital's work procedures" and "provide technical support", at 0.05 level of significance. This means all health providers, regardless their gender, agreed that these three items represent motives to IT applications in KAMC

2) Occupation: One-way Analysis of Variance (ANOVA) was used to determine whether there was a significant mean difference in the respondent's perceptions on benefits of IT applications, barriers to using IT applications, and motives to use IT applications with respect to occupation. This research is an attempt to understand the perceptions of healthcare providers towards health information technology applications in King Abdul-Aziz Medical City in terms of benefits, barriers, and motivation toward the use of health information applications. As for barriers, the results of the ANOVA tests showed that there were significant differences between physicians, nurses and other staff in their perceptions of all items measuring barriers to use IT applications at 0.05 significance level; all p-values were strictly less than 0.02. As for benefits, the results of the ANOVA tests showed that there were significant differences between physicians, nurses and other

staff in their perceptions of all items measuring the benefits of IT applications at 0.05 significance level. Thus, health information systems are capable of having a significant, positive impact on patient care within healthcare settings. Health information technology is in general increasingly viewed as the most promising tool for improving the overall quality, safety and efficiency of the health delivery system. The Institute of Medicine (IOM) identified information technology as one of the critical forces that could significantly improve healthcare quality and safety. One of the most challenging areas of health information technology is integrating it into the workflow of the healthcare providers. As for drivers, healthcare providers generally would be motivated to use the IT applications by provision of new applications and training, contribution in change hospital's work procedures, and provision of technical support. Whereas, other staff indicated higher agreement with the following statements when compared to physicians and nurse:

- o Easier to access patient records
- o Saving paper work
- o Helps in managing patients
- o Facilitates coordination among departments
- o Prevent loss of patients' data
- o Reduces medical errors
- o Ensures patients' privacy
- o Improves quality of patients' care

Interestingly, the physician's respondents indicated the lowest agreement with all statements that measure the benefits of IT applications in KAMC, compared to physicians and nurses

3) Training: A two-sample t-test was performed to test whether there were differences in respondents' perceptions towards IT benefits, barriers and motives to using IT with respect to training (Table VI). In addition, the research will investigate the effect of demographic and organizational variables on the perceptions of the healthcare providers towards the health information technology applications.

c. Analysis: Descriptive statistics were used to analyze the demographic and organization variables and the respondents' perceptions towards benefits, barriers, and motivation to use health information systems. Results indicate that the majority of healthcare providers use KAMC health information applications. Therefore, there is a need for investigating the perceptions of healthcare providers towards the health information technology applications. However, healthcare providers were split over the barriers to HIT use in KAMC. In addition, the questionnaire included a section of general information about the respondents' demographics and

organizational variables which were considered as moderators to the perceptions towards the health information applications. The majority of healthcare providers perceived that the applications are valuable and beneficial. Despite the increasing availability of health information technology applications, anecdotal evidence suggests that its use has not been well accepted by healthcare providers. The second section included 25 statements regarding the benefits, barriers, and motivation of the health information applications using five-point Likert-scale (1=Strongly Disagree, 2=Disagree, 3=Neither agree nor disagree, 4=Agree, 5=Strongly agree).

**b. Population and Sample** The study population consists of all healthcare providers working at KAMC. Also, there were many barriers identified by healthcare providers. The study population consists of all healthcare providers working at KAMC. Finally, there were significant differences in the perceptions with respect to gender, occupation, and training. Despite the importance of HIT in improving healthcare efficiency, there were few studies carried on use, barriers and drivers to HIT in Saudi health organizations. The healthcare providers include physicians, nurses, and clinical/paramedical personnel.

**Keywords**– Healthcare providers; Health Information Technology; Computerized Patient Record; King Abdul-Aziz Medical City. A sample size of 623 was drawn from a population of 7493 healthcare providers using convenience random sampling method.

**I. INTRODUCTION**

**a. Health Information Technology (HIT):** Healthcare information technology (HIT) has become a key preoccupation of healthcare systems worldwide. Cronbach's alpha values for the three dimensions (benefits, barriers, and drivers) were strictly above 0.74; meeting the recommended alpha threshold values of at least 0.7. A review of the literature reveals that there is significant consensus that the implementation of electronic health records (EHRs) and HIT systems is considered among the highest priorities of modern healthcare systems. These include benefits, barriers, and motivation to use health information systems. However, with few significant exceptions, information system research is scarce regarding information technology acceptance in a healthcare environment.

**b. King Abdul-Aziz Medical City (KAMC):** King Abdul-Aziz Medical City commenced its operations in 1983 in Riyadh under National Guard Health Affairs (NGHA). In Saudi Arabia, the government strives to improve quality and safety of healthcare services through adoption health information technology. Nurses had a higher positive perception than physicians and other staff in the following items:

- o Provides speed to accomplish work.

Table V demonstrates the results of ANOVA test of IT benefits with occupation. KAMC is one of the few hospitals that have a basic EHR system which was later replaced by a computerized Patient Record (CPR) system. CPR system provides for an array of technological imperatives, including Computerized Physician Order Entry (CPOE), Clinical Decision Support (CDS), automated nursing documentation, integrated pharmacy and automated medication administration. These results are sensible since all these benefits affect the performance of nurses and other staff more than physicians. Total number of physicians is 1564, total number of nurses is 3921, and the total number of clinical/paramedical staff is 2008.

**METHODS**

**a. Survey Instrument:** In this study, quantitative research method approach was used. CPR is a single integrated system with a comprehensive suite of modules that provides depth and breadth of patient-care support and workflow management. A self-administered questionnaire was developed based on extended literature review and comprised 25 statements on a fivepoint Likert-scale. Clinical practices rely heavily on the collection and analysis of medical data for

decision-making abilities when caring for patients .There have been many studies investigating IT acceptance in different settings at both individual and organizational levels of analysis and different theoretical models have been used .The literature provides evidence of failed clinical system implementations, due to lack of adoption by users .These were insufficient number of computers, frequent system down, and the use of computerized systems is time consuming.Convenience sampling is a non-probability sampling technique where subjects are selected because of their convenient accessibility and accessibility to the researcher .A sample size of 623 was drawn from the population using convenience random sampling method.Therefore, all the three dimensions were internally consistent.According to Dr. David Brailer, cited in Harrison and Daly , CPOE reduces medication errors by 20 percent .For example, from physician's point of view IT does not decrease their workload, which is why it was rated by them as low as 1.6 compared to 4 and 3.8 for nurses and other staff respectively.However, most Saudi health organizations have no electronic health records (HER) systems implemented in their facilities, and they are totally dependent either on manual paper work or on very basic software tools to do their day to day tasks such as patient admissions .Based on extended literature review, appropriate research constructs which had been validated in prior studies were developed.A CPOE system, for example, makes prescription orders legible, identifies the correct medication and dose as well as signals alerts for potential medication interactions or allergic reactions .Thereafter, the questionnaire was validated through evaluation by two faculty members of King Saud University, and a pilot study.CPR system streamlines administrative functions and eliminates paperwork to get caregivers back in the business of quality patient care.Of 623 questionnaires distributed, 377 questionnaires were returned, giving a response rate of 60.5 percent.The population size is 7493.To collect the data, a questionnaire form was designed to achieve the research objectives.o Improves decisions making process.The questionnaires with cover letters that explained the purpose of the study were distributed during April/May 2011.NGHA has passed the requirements for accreditation under the (JCI) Joint Commission International standards with excellent performance in December 2009.Acceptance of information technologies has occupied a central role in information technology research.The average length of stay is 4.6 days, and the average number of outpatient visits per day is 3,145 patients.o Helps in preparing hospital reports.The total bed capacity of the hospital is 847 beds.o Decreases work load.o Easier to find investigation results.377 were returned, giving a response rate of 60.5