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ASSESSING THE ADVANTAGES OF IMPLEMENTING VOICE RECOGNITION TECHNOLOGY (VRT) IN SAUDI ARABIA'S HEALTH SECTOR

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ABSTRACT

Voice recognition technology (VRT) is a form of artificial intelligence that can convert spoken words into written text in real time. The study design was a descriptive cross-sectional survey conducted in different hospital settings throughout the Kingdom of Saudi Arabia (KSA) among 100 healthcare professionals using self-administered questionnaire. The purpose was to evaluate the effectiveness and usefulness of implementing voice recognition technology among healthcare professionals. A pre-structured questionnaire created using Microsoft Team forms, and after validation, it will be distributed via social media to respondents. After receiving responses from the respondents, data gathered, verified for completeness, and then further analyzed using SPSS software. 91.95% of respondents were aware, 50% of respondents found voice recognition technology extremely easy to use of voice recognition technology in their professional practice. The time saved by using voice recognition technology could be utilized for clinical consultations, work and life balance, or for doing more research. As a result of saving time voice recognition technology also contributes to significant increase in the number of reports completed per day compared to those without using voice recognition technology ($p < 0.001$). Overall, voice recognition technology improves efficiency and productivity in healthcare setting

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1. INTRODUCTION

Voice recognition technology (VRT) is a form of artificial intelligence that can convert spoken words into written text in real time. In the healthcare industry, VRT has the potential to revolutionize the way patient records are collected and managed. Traditionally, healthcare practitioners would manually write down patient information on physical charts, which would later be transcribed and entered into a database. VRT software offers a more efficient and accurate alternative. When the software is activated, it immediately converts spoken words into text, which can be viewed on a screen. Another unique feature that can be found in some advanced software is that it can filter out background noise and enable to identify different accents with ease. The transcribed text can then be easily integrated into the patient's electronic health record (EHR)

system, saving time and effort compared to manual data entry. Doctors and medical professionals can use VRT software to dictate reports instead of typing, eliminating the need for handwritten notes and streamlining the data collection process. Voice recognition technology (VRT) software has brought attention to be implemented in hospitals, and many countries including India, The UK, the Middle East, USA, Canada, and Australia have already started to apply this technology.

Voice recognition technology (VRT) was introduced back in the early 1950s and has been applied to different sectors over the years (Schulte et al.,2020). Indeed, in early 1990s, has reached magnificent popularity in the healthcare sector, especially in the United States (Poder et al.,2018). Moreover, VRT has reached Africa, Europe, and East Asia. Recently investigators have examined the effects of VRT in different aspects regarding the improvement of health care. Evaluating the usage of voice recognition technology for clinical documentation in the electronic health record formed the central focus of a study in which the author found that including VRT in the system, resulted in a beneficial impact in enhancing the workflow and efficiency. Participants were recruited from two large medical centers in Boston, Massachusetts, and Aurora, Colorado, and given a survey to rate VRT. The overall response to the survey was positive with 77.2% of participants agreeing that VRT improved the efficiency (Goss et al.,2019). Another study that set out to determine how the incorporation of a voice recognition system could potentially affect medication errors, which was conducted in Kenya, has reported also positive effects of applying the system. Data for this study were retrospectively collected from charts review and examined before-after intervention showed that before VRS 74.3% of prescriptions had noticeable errors contrast with 65.7% after incorporating VRS. Hence, the finding confirms the association between VRS and reducing medication errors (Migowa et al.,2018). However, most of what is known about VRT is largely based on descriptive studies that investigate the benefits and barriers of this technology in general rather than its effects on a single country. A considerable amount of literature has been published on VRT. These studies showed that applying VRT in the health care system has numerous benefits regarding increasing overall patient care as mentioned earlier (Johnson et al.,2014). Even though this technology also has been seen in hospitals in the Middle East such as Qatar and the United Arab Emirates, it did not get much attention in Saudi Arabia's hospitals. As far as it is known, the only hospital that applied VRT in Saudi Arabia is King Fahad Hospital. Thus, little is known about VRT and its effects, but based on previous studies it can be concluded the benefit that this technology might bring to Saudi Arabia's hospitals.

With Saudi Arabia's Vision 2030 regarding improving the quality and efficiency of health services objective include augmenting technological solutions and investing heavily in healthcare. Voice recognition technology maintained creating a state-of-the-art infrastructure for clinical documentation via electronic medical records (EMRs) and electronic health systems (EHRs) will form the backbone for any holistic centralized healthcare network. There are still limited studies of VRT and its effects in KSA. Information gathered from this study can be used for promoting the adaptation of voice recognition technology in the health sector in Saudi Arabia can lead to improved efficiency, accuracy, patient experience, and accessibility, ultimately contributing to better healthcare outcomes for the population.

1.2. AIM AND OBJECTIVES OF RESEARCH:

1. To encourage the implementation of speech-recognition technology within the healthcare sectors of KSA
2. To assess the advantages and influence of voice recognition technology in the healthcare industry.
3. To evaluate the impact of implementation of speech-recognition technology on various aspects of the health sector.

2. METHODOLOGY

2.1. STUDY DESIGN:

The study design was a descriptive cross-sectional survey conducted in different hospital settings throughout the Kingdom of Saudi Arabia (KSA). Its purpose was to evaluate the effectiveness and usefulness of implementing voice recognition technology among healthcare professionals.

2.2. STUDY SETTING:

The research was carried out among health care professionals in various chosen hospitals with a capacity of 1000 beds each in Saudi Arabia, encompassing both government and private healthcare facilities.

2.3. STUDY PARTICIPANTS:

The participants in the study were adult healthcare professionals between the ages of 25 and 54, who were working in various healthcare fields in Saudi Arabia.

2.4. Inclusion Criteria:

1. Health care professionals between the ages of 25 and 54 who are familiar with the applications of voice recognition technology and had access to the internet
2. Adult health care professionals of both genders and all nationalities are included.

2.5. Exclusion Criteria:

1. Adult health care professionals who have not previously been exposed to or utilized voice recognition technology in their professional practice.
2. Adults below 25 years and above 54 years and those who are not willing to participate

2.6. Sampling Technique:

To reduce sampling error and assure representativeness, a sample size of 100 health care professionals from KSA between the ages of 25 and 54 who are familiar with the applications of voice recognition technology included in the study using a purposive sampling technique based on inclusion and exclusion criteria. A pre-structured questionnaire created using Microsoft Team forms, and after validation, it will be distributed via social media to respondents (Email, WhatsApp). After receiving responses from the respondents, data gathered, verified for completeness, and then further analyzed using SPSS software.

2.7. Data Collection:

Data collection was conducted using a pre-structured, online self-administered questionnaire distributed to participants through online social media platforms. Structured questionnaire having information on demographic variables such as age, gender, education level, work experience and different sets of multiple-choice questions that will help measure the usage frequency, ease of use, time saved, effort reduction, data integrity and user satisfaction. 100 health care professionals aware of voice recognition technology responded to the survey. The questionnaire was validated by expert review and pilot testing on 10% of the sample before full administration. Reliability was assessed using Cronbach's alpha. Any issues identified during piloting were addressed before the full deployment of the survey. Confidentiality will be maintained by protecting the privacy of the adult health care respondents. Descriptive statistical analysis such as frequencies, percentages, frequency distribution tables were calculated based on the type and distribution of variables. Inferential statistical analysis for testing variables with two different categories independent t-tests used. It is used to determine whether there is a statistically significant difference among the respondents' means between various measures. The data will be displayed as the mean ± 2 SD and calculated with the appropriate 95% Confidence Interval. A p-value of less than 0.05 ($p < 0.05$) is considered as significant.

3. RESULTS AND DISCUSSION

After data were extracted from the online survey, it was revised, coded, and fed to statistical software IBM SPSS version 22 (SPSS, Inc. Chicago, IL). Based on inclusion and exclusion criteria, the study data of 100 respondents was included for statistical analysis. The majority of respondents were in the age group of 35-54 years (53%). The frequency of men was higher than women (57%). A higher number of respondents had working experience of 5-15 years (47%) and 41% with greater than 15 years of experience. Most of them had a bachelor's degree (38%) Table 1.

Table 1: Demographic profile of study participants

Demographic characters	N (%)	
Age	25-34	38 (38%)
	35-44	26 (26%)
	45-54	27 (27%)
	55-64	9 (9%)
Gender	Female	43 (43%)
	Male	57 (57%)
Education level	Associate	15 (15%)
	Bachelor	38 (38%)

	Master and Doctoral	37 (37%)
Work experience	< 5 years	12 (12%)
	5-15 years	47 (47%)
	> 15 years	41 (41%)

Usage frequency, ease and learning curve

The survey revealed that 91.95% of respondents were aware about the speech recognition system in their professional practice. Over 55% of responders find speech recognition technology extremely easy to use with a short learning curve of 1-3 days (89.66%) **Figure 1, Figure 2.**

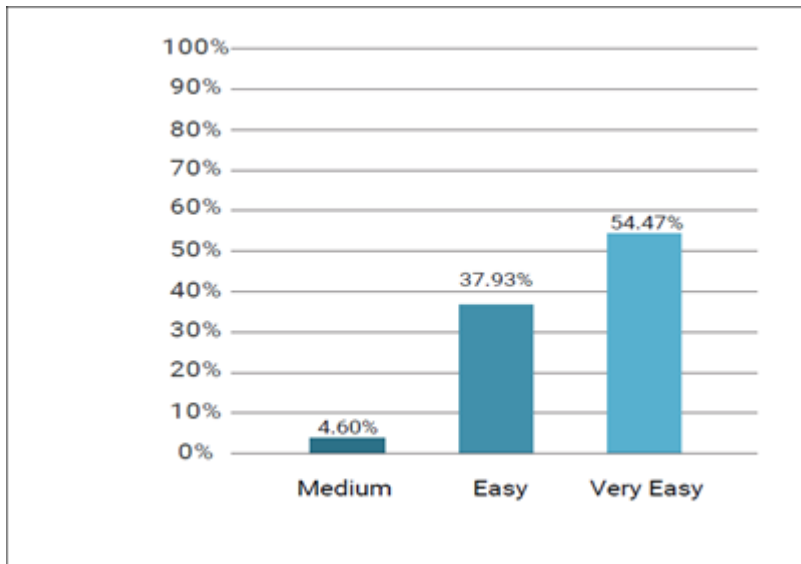


Figure 1: Bar diagram represents the study participant's opinion on the ease of use of voice recognition technology in health sector

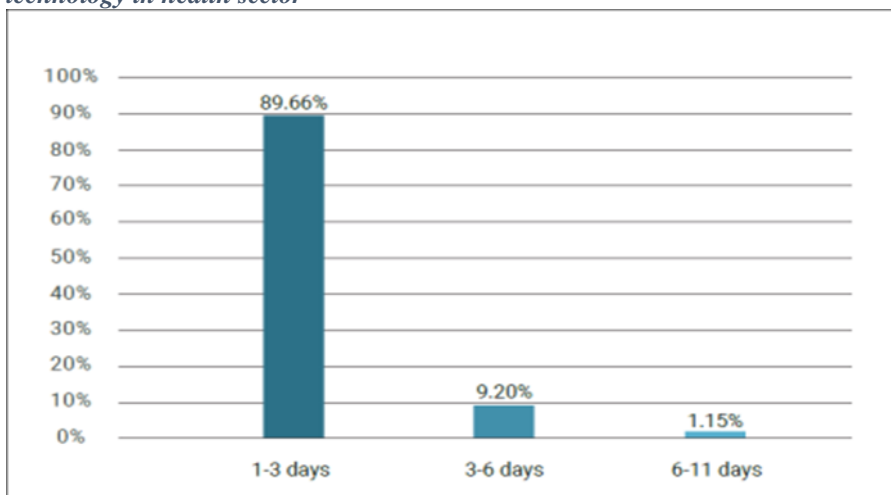


Figure 2: Bar graph represents the responses of study participants on time needs to learn this technique for practicing in professional life

Speed and Time

Respondents familiar with voice recognition technology feel that the speed of drafting clinical reports increases by 3-5 times, on average this speed increases by $3.977 \approx 4$ times **Figure 3.** Voice recognition technology with typing speed is four times faster than without it. This means that with speech recognition technology, only 25% is spent on documentation. Thus, speech recognition technology saves 75% of documentation time, which could be more significantly shared. Health care professionals responded that using voice recognition technology saves more than two hours a day (41.38%), but for some people (28.74%), it

only saves more than an hour **Figure 4**. Considering this, a hospital with 1000 beds can save 18 hours of documentation.

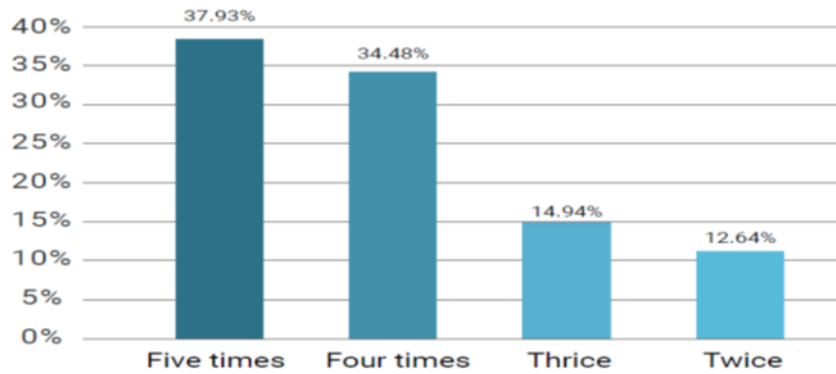


Figure 3: Shows the use of voice recognition technology speed of drafting clinical reports

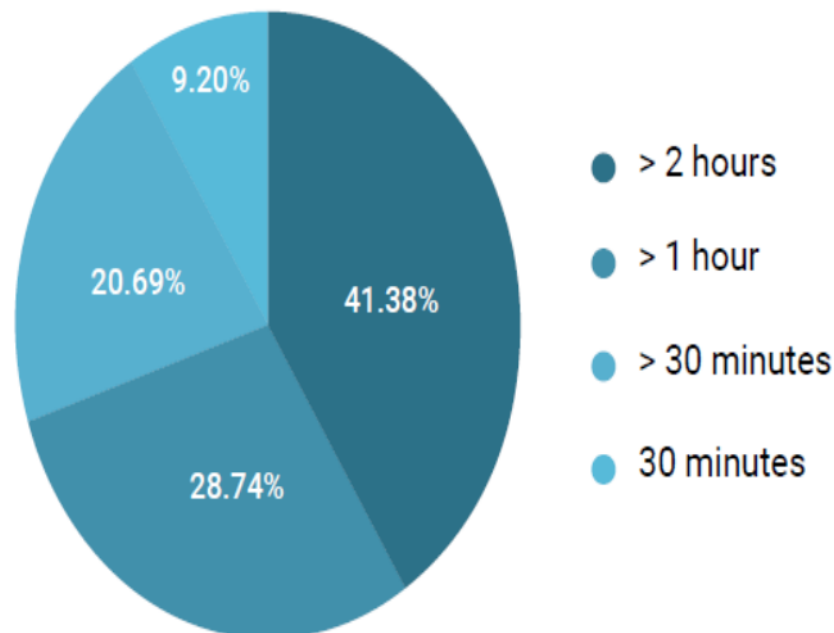


Figure 4: Pie chart represents time saved with the adoption of voice recognition technology

Work efficiency

As a result of saving time voice recognition technology also contributes to a significant increase in the number of reports completed per day compared to those without using voice recognition technology ($p < 0.001$ by Welch's t-test) **Figure 5**, As per the reaction of medical services experts 77.01% responded completing up to 25 more reports daily with help of voice recognition technology than without it, and some even up to 75-100 more reports within the same time (2.3%), significantly enhancing work efficiency.

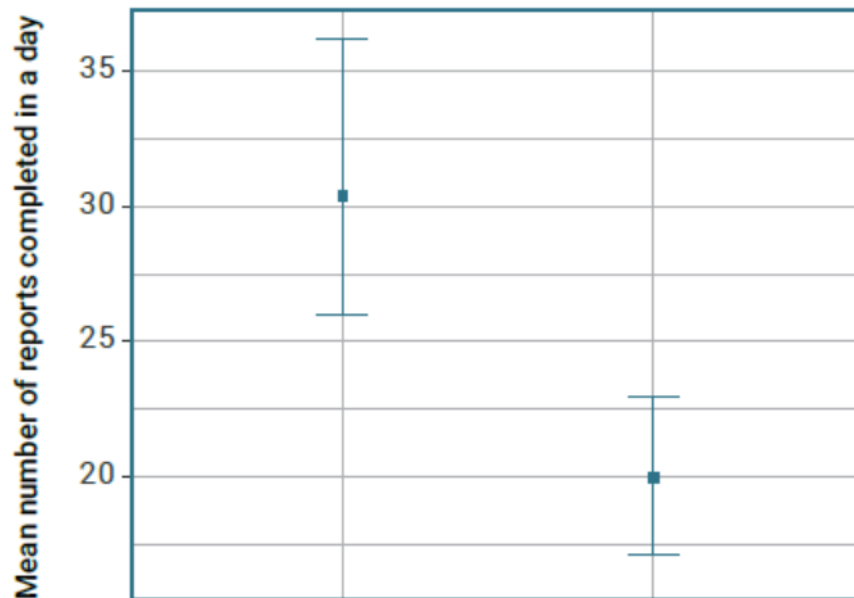


Figure 5: Mean plot of number of reports completed in a day with and without voice recognition technology

According to the response of medical services experts the time saved by adopting with voice recognition technology in health sector 35.1% respond that can be utilized on clinical consultation, spend more time with their families, work on medical papers & journals, and engage in clinical About 24.6% experts opinioned that it can utilized for spending more time with patients **Figure 6**.

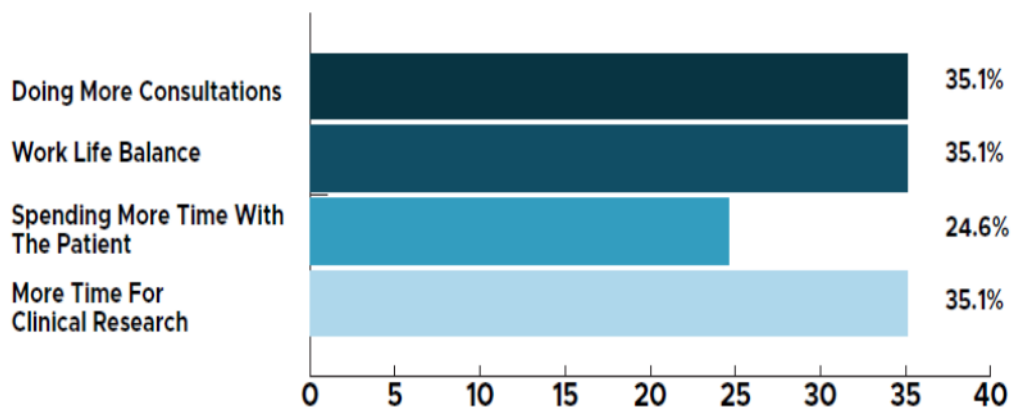


Figure 6: Bar graph represents the time saved by adopting with voice recognition technology utilized

3.1. DISCUSSION:

Prior studies that have noted the effects of applying voice recognition technology (VRT) in healthcare system have established a starting point to evaluate the effects that this technology might bring to Saudi Arabia healthcare sector. Therefore, this study set out with the aim of assessing the advantages and effects of voice recognition technology in the healthcare industry and evaluating its impact on various aspects of the health sector. To begin with, the study found that participants reported VRT to be easy to use even with limited training. This suggests that VRT can provide promising outcomes to healthcare systems with minimal training. However, it is recommended to undergo a prior-training period or prolonged exposure to VRT to minimize errors and optimize its benefits.

The findings also indicate a relationship between VRT, physician satisfaction, and patient care. One possible explanation is the time saved with the help of VRT. Medical professionals reported saving over two hours a day using VRT. Moreover, the study found that the number of reports completed significantly increased with VRT compared to manual typing, with participants completing up to 25 more reports daily. This increased efficiency allows for more time to be allocated to clinical consultations and achieving work-life balance, ultimately improving physician satisfaction and enabling them to provide better care for patients.

These findings align with previous research, such as Vogel's et al (2015) study, which demonstrated that VRT in the medical field enhances documentation speed and user mood compared to manual typing. Therefore, integrating VRT in Saudi Arabia has the potential to improve patient care. However, further research is needed to better understand the association between VRT and patient care in the Saudi Arabian context.

4. CONCLUSION:

In conclusion, the implementation of voice recognition technology has the potential to greatly transform the healthcare industry in Saudi Arabia. By utilizing this innovative technology, healthcare providers can simplify documentation processes, improve workflow efficiency, and enhance the overall patient experience. The ability to dictate clinical notes, prescriptions, and other important documents in real-time directly into electronic health records not only saves time but also reduces the likelihood of errors, resulting in improved patient care. Additionally, voice recognition technology promotes inclusivity by offering accessible input methods for healthcare professionals with disabilities and addressing language barriers through multilingual support. As Saudi Arabia continues to prioritize advancements in healthcare technology, the integration of voice recognition technology becomes a crucial step towards achieving digital transformation and providing high-quality, accessible healthcare services to all residents.

4.1. RECOMMENDATION:

1. Collaborative efforts among individual health professionals, government officials, and policymakers are essential for implementing and integrating VRT technology in health sectors of Saudi Arabia.
2. Implementing voice recognition technology in health system can lead to increased productivity, complete tasks more quickly and efficiently, spend less time entering data by hand, improve safety and security and save money

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