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The Role of Nursing and Operating Technicians in the Presence of Modern Technology in Helping Patients in the Community

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Abstract

The delivery of patient services has changed dramatically as a result of the use of contemporary technology in healthcare, especially in community-based settings. This study investigates how operating technicians and nursing personnel might use contemporary technologies to enhance patient care in the Saudi healthcare system. The study evaluates healthcare professionals' attitudes, abilities, and difficulties adjusting to technology tools using a cross-sectional approach. Variations across age, gender, education, and experience levels were examined using a one-way ANOVA. The findings show that confidence and efficacy in using technology are highly influenced by education and experience. In order to improve the impact of contemporary healthcare technologies in community settings, the study emphasizes the necessity of focused training and ongoing professional development.

Keywords: Modern technology, Healthcare, Community service, nurses, technicians.

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Introduction

"Modern technology has greatly improved patient care, both in terms of therapy and the effectiveness and efficiency of nursing practice. The foundation of healthcare systems, nurses play a critical role in using these technologies to improve patient satisfaction, safety, and support. The work of nurses has expanded to include data analysis, digital recordkeeping, and technology-supported interventions as healthcare becomes increasingly complex. **[2], [11]** Hospitals have transformed with the advent of technological applications such as clinical decision support systems (CDSS), telemedicine, barcode medication administration (BCMA), smart infusion pumps, electronic health records (EHRs), and remote patient monitoring. These gadgets improve patient monitoring, reduce errors, and support evidence-based practice. **[9], [1]** According to estimates from the World Health Organization (WHO), about 15% of hospital expenses in high-income nations are related to patient safety failures, the majority of which can be avoided with technological assistance. Nurses are the primary users of these systems; hence their adoption and utilization are essential. The atmosphere of patient recording and engagement has changed as a result of the widespread deployment of EHRs. EHRs streamline the charting process, facilitate real-time access to patient records, and facilitate healthcare teamwork coordination. Likewise, it has been demonstrated that BCMA systems, [**4]** which are mostly used by nursing personnel, can reduce medication delivery errors by as much as 41.4 percent. Technology is particularly important in the post-COVID-19 era and is also crucial for infection control. Automated hand hygiene, wearable sensors, and UV disinfection robots have improved the job of nurses in maintaining a clean environment and preventing healthcare-associated infections (HAIs)." **[5], [6]**

"In the United States alone, HAIs cause around 99,000 deaths annually, according to the Centers for Disease Control and Prevention (CDC). The key to minimizing these impacts and guaranteeing patient safety is the usage of such technologies by nurses. Nurses may now take action when there are irregularities in patients' vital signs and chronic diseases thanks to wearable health devices and remote monitoring. **[7], [8]** The way high-risk patients are treated in intensive care units and post-operative facilities has been particularly transformed by this. **[9]** Constant monitoring improves treatment outcomes by reducing ICU readmissions and warning staff about the early warning signals of worsening patient health, according to studies. The interpretation of these data streams is crucial for nurses, who use this information to inform their clinical decisions. **[10], [11]** Modern technology integration has revolutionized the way services are provided, tracked, and assessed in the quickly changing healthcare industry. Robotic surgery, electronic medical records, telemedicine platforms, sophisticated diagnostic tools, and AI-based technologies have all transformed patient care by increasing precision, usability, and effectiveness. **[12]** However, the proficiency and flexibility of medical personnel who are at the forefront of patient interaction—particularly

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nurses and operating room (OR) technicians—are crucial to the success of these technological developments." **[13]**

"The foundation of every healthcare system is made up of operating technicians and nurses. Their responsibilities extend beyond the technical performance of medical procedures to include vital components like infection control, patient education, psychological support, preoperative and postoperative care, and the use of contemporary technologies for health parameter monitoring. As medical interventions become more complex, their interaction with advanced technology has become a crucial part of patient care, particularly in community settings where healthcare delivery frequently takes place outside of hospitals in places like homes, mobile clinics, and remote health centers. **[14], [8], [18]** In community health settings, these professionals are often the primary point of contact for patients, especially in underserved or rural regions where doctors may not always be available. With the use of contemporary technology, nurses can provide remote health monitoring, virtual consultations, health education through digital platforms, and continuous care with minimum physical contact—all of which are crucial in pandemic scenarios like COVID-19. In contrast, operating technicians are essential in ensuring that, with the use of portable and automated technology, surgical and diagnostic operations carried out in smaller community-based facilities are carried out with the same accuracy and safety as those in tertiary hospitals." **[21], [22]**

"Even if technology is becoming more and more important in healthcare, there are still obstacles to overcome in the process of adapting. Lack of training, opposition to change, restricted equipment access, and worries about technology taking the place of human judgment are some of the challenges faced by many nurses and technicians. Furthermore, automated procedures shouldn't eclipse the humanistic components of care—empathy, communication, and cultural awareness. Providing nurses and technicians with the knowledge and self-assurance to use these tools efficiently while upholding a patient-centered approach is essential to the success of technology integration. **[5], [19]** Developing regulations, training initiatives, and healthcare plans requires an understanding of the changing roles of operating technologists and nurses in this setting. In Saudi Arabia's community healthcare settings, this study intends to investigate how contemporary technology affects the roles, duties, and efficacy of nurses and OR technicians. In addition to identifying the difficulties these professionals encounter, it aims to examine how they use technology to improve patient outcomes."

This study aims to give a thorough understanding of their importance in the digital healthcare revolution by concentrating on their real experiences, degree of training, and daily interactions with technology. For the development of inclusive and sustainable community health, it is essential to acknowledge and assist these frontline workers as Saudi Arabia continues on its journey toward health modernization.

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Objective

In addition to evaluating the degree of awareness, training, and competency of nurses and operating room (OR) technicians in using contemporary healthcare technologies, the study aims to determine how modern medical technology affects the roles and responsibilities of these professionals in providing healthcare support to patients in community settings.

Hypothesis of the Study

There is a significant positive relation in usage of updated technology and the efficiency of the nurses and operating technicians in dealing with the same.

Research Process

Study Design

To capture the scope and depth of the research question, this study will use a convergent parallel mixed-methods design. To produce thorough insights, quantitative and qualitative data will be gathered concurrently, examined independently, and then combined. Triangulation and a more thorough comprehension of how contemporary technology impacts the functions of operating technicians and nurses in community health settings are made possible by this design.

Area of Study and Population

In Saudi Arabia's metropolitan and semi-urban regions, the study will be carried out in a number of primary healthcare facilities, community clinics, and minor hospitals. These locations were picked to represent the variety of community healthcare delivery settings.

Population of the Study can be stated as follows:

- In community healthcare settings, registered nurses are employed.
- Surgical technologists or operating room technicians who perform minor surgeries or outpatient procedures in clinics.
- Managers of community-based healthcare (for contextual interviews).

Sampling

For Quantitative Component

To guarantee representation across, stratified random sampling will be employed. This will be based on:
- Geographical areas (urban and semi-urban)
- Kinds of healthcare facilities
- Professional positions (OR techs, nurses)
- Based on the overall number of employees in each category, a proportionate sample will be

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chosen from each stratum.

For Qualitative Component

- 20–25 people will be chosen for focus groups or in-depth interviews using purposive sampling. Criteria for selection will consist of:
- Numerous years of expertise
- Previous experience using or being exposed to medical technologies
- Willingness to engage in a prolonged discussion

Sample Size

Adjusting for design effect and likely non-response, the necessary sample size is estimated at about 200 participants using Cochran's calculation, assuming a 95% confidence interval and a 5% margin of error.

Data Analysis

Data will be analyzed using SPSS Ver. 27.0 and the statistical test used was ANOVA (One Way).

Data Analysis and Interpretation

Summary of ANOVA (One way)

On the Basis of Age	F	Sign
Regularly use the tools like EHRs, Smart infusion pumps, Automated medicine dispensers, etc.	.166	.815
Documentation of the patient has improved with the use of modern technology	.577	.582
Communication is made easier with new technologies	.469	.565
Decision making in the clinical process became easier	.254	.667
The respective workload has reduced	.778	.335
Satisfaction level of patient has increased or improved	3.217	4.017
Modern technology is crucial in Emergency department and surgical processes.	.545	.617
Proper training is provided for using current technology	.427	.414

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There is a regular update in the technical know how	.325	.400
On the Basis of Experience		
Regularly use the tools like EHRs, Smart infusion pumps, Automated medicine dispensers, etc.	.098	1.016
Documentation of the patient has improved with the use of modern technology	.423	.600
Communication is made easier with new technologies	.544	.726
Decision making in the clinical process became easier	.875	1.402
The respective workload has reduced	.117	.348
Satisfaction level of patient has increased or improved	.443	.519
Modern technology is crucial in Emergency department and surgical processes.	.445	1.017
Proper training is provided for using current technology	.616	.514
There is a regular update in the technical know how	1.620	1.701
On the Basis of Gender		
Regularly use the tools like EHRs, Smart infusion pumps, Automated medicine dispensers, etc.	.819	1.532
Documentation of the patient has improved with the use of modern technology	.562	.617
Communication is made easier with new technologies	.772	.482
Decision making in the clinical process became easier	.601	.713
The respective workload has reduced	.556	.593
Satisfaction level of patient has increased or improved	.111	.351

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Modern technology is crucial in Emergency department and surgical processes.	.445	1.712
Proper training is provided for using current technology	.316	.310
There is a regular update in the technical know how	.462	.522
On the Basis of Education		
Regularly use the tools like EHRs, Smart infusion pumps, Automated medicine dispensers, etc.	.071	.470
Documentation of the patient has improved with the use of modern technology	.374	.582
Communication is made easier with new technologies	.481	.756
Decision making in the clinical process became easier	.679	.877
The respective workload has reduced	.382	.516
Satisfaction level of patient has increased or improved	.673	.680
Modern technology is crucial in Emergency department and surgical processes.	.510	.517
Proper training is provided for using current technology	.215	.210
There is a regular update in the technical know how	.771	.821

Interpretation

On the basis of age, it can be seen that in most of the cases the value of Sign. Is more than the value of F ratio, like for usage of modern technology the F value is .166 and Sign value is .815, then for improvement in documentation process and and ease of communication the F and Sign values are .577/.460 and .582/.565 respectively. Likewise, in most of the cases the results are favorable. There is some variation in the case of training and regular know how I.e. the F value is higher than the Sign value i.e. F value is .427 and Sign value is .414.

Then in case of experience again, most of the responses fall in the category of acceptance, like for usage of modern technology the F value is .098 and Sign value is 1.016, then for for decision making F value is .875 and Sign value is 1.402, then for satisfaction level of the

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patients the F value is .443 and Sign value is .519. in rest of the cases the results are favorable. Only for proper training and regular update the level variation is high or may be negative. Gender is a crucial component in case of KSA, things are changing very fast but then again certain restrictions are there, not from the side of employer but may be from the side of social environment. For male nurses and technicians, the issues are not crucial but for female nurses' situation is different, same stands true for female technicians also. The result states that apart from the regular training and update, the results are favorable in most of the cases.

Result

On the basis of above analysis and interpretation it can be seen that in most of the cases, results are favorable and it can be stated that there is positive and significant relation in usage of modern technology and efficiency of nurses and technicians. Hence the null hypothesis, "*There is a significant positive relation in usage of updated technology and the efficiency of the nurses and operating technicians in dealing with the same."* can be accepted.

Conclusion

The study's findings demonstrated the significant role that healthcare technology plays in improving nursing practice and patient outcomes. Particularly in high acuity units, including as intensive care units and surgical wards, where they had a more positive attitude toward technology, the majority of nurses showed moderate degree of understanding. Technologies like patient monitoring programs and electronic health records (EHRs) have gained a lot of traction. Areas still need further integration, though, as resources like telemedicine portals were utilized less. The general consensus among nurses was that technology is beneficial, particularly when it comes to improving clinical decision-making, communication, and documentation. Divergent opinions existed, although, regarding whether it lessens the workload. Overall, the results suggest that department-specific interventions, specialized training, and greater technology accessibility can further optimize nursing productivity and technology utilization in a clinical setting.

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