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The Role of Medical Device Technicians and Specialists in Its Maintenance and Continued Operation in Healthcare Facilities

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ABSTRACT

The strategic importance of Medical Device Technicians and Specialists (MDTS) in terms of diagnosing medical equipment reliability and patient safety in the rapidly developing healthcare system in Saudi Arabia was not well quantified, which created a gap in knowledge of their particular contributions and obstacles to optimal performance. Subsequently, the purpose of this study was to conduct empirical research on the scope of practice, perceived impact, and systemic issues in MDTS in tertiary-care hospitals. It was a cross-sectional, descriptive study that used a structured questionnaire to administer to 156 MDTS who were recruited through stratified purposive sampling among the public tertiary hospitals of the public. The descriptive statistics, multiple linear regression, ANOVA, and chi-square tests were used to analyze the data. The findings showed that certified technicians had a much wider scope of practice than non-certified employees (Mean Task Frequency Score: 81.9 vs. 73.8, $p < 0.001$). Professional experience (= 0.43, p less than 0.001), certification (= 0.24, p = 0.001), and task diversity (= 0.30, p less than 0.001) were found to be significant positive predictors of perceived impact in a multiple regression model (R 2 = 0.49, p less than 0.001). Moreover, the certification status and the nature of primary challenge reported showed a significant relationship (8.95, n =.030) with the non-certified technicians over representing training gaps. The research paper concludes that the MDTS role is a multi-layered, important

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part of healthcare delivery, and the effectiveness of the role is closely associated with formal certification and ongoing professional growth. These results are a strong source of evidence that healthcare administrators will consider investing in standardized certification paths and special training programs to boost the medical technology support infrastructure, which eventually will improve the equipment uptime and patient safety.

Keywords: Clinical Engineering, Healthcare Technology management, Medical equipment Safety, professional certification, Saudi Arabian healthcare.

INTRODUCTION

The uninterrupted, consistent functioning of advanced medical devices is a vital component of the modern healthcare provision that has a significant impact on the accuracy of diagnostics, the effectiveness of treatment, and, finally, patient safety [1]. The Medical Device Technicians and Specialists (MDTS) are the new human resources that are needed in this complex technological environment to maintain the continuity and security of these complex machines. Their roles are extensive, encompassing proactive upkeep and proactive repairs to the usage of technology and training end-users, hence creating a strong protection against negative outcomes and interruptions of the functioning of equipment [2]. At the global level, the profession has increasingly been recognized as a strategic node in the healthcare value chain, which would help in keeping costs contained, improving quality, and eliminating risks [3]. The empirical research of various settings has shown that effective clinical engineering services, which are supported by qualified technicians, are linked to increased equipment uptime, reduced lifecycle costs, and improved patient safety indicators [4].

Despite the paramount significance of the MDTS, there is a glaring gap in the body of empirical research that would provide a quantitative measurement of the specific scope, effects, and issues associated with this profession, particularly in discrete national settings [5]. Most existing bodies of scholarship, even though they embrace the importance of clinical engineering as a field, use managerial or policy-focused prisms, providing little in the way of micro-level, data-rich studies focusing on the technician workforce [6]. The discursive currents, therefore, depict the diluted appreciation of the value of the profession, but it does not produce a profound, evidence-based portrait obligatory to support the advocacy of specific workforce development and the best allocation of resources [7]. In many healthcare systems and even in the Middle East, this lack of localized, empirical data can trigger under-reciprocation, under-allocation, and disjointed implementation of the MDTS into institutional strategic planning, a potential root cause of vulnerabilities in the technological safety net [8].

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The Kingdom of Saudi Arabia is one such interesting and relevant context of this inquiry. The health system of the country has been experiencing an accelerated change and growth with the extensive involvement in advanced medical technology in the government and the private health delivery system [9]. Such an explosion of advanced devices, including the state-of-the-art imaging suites down to robotic operating platforms, has created a new dependency on a high-calibre of technical cadres to maintain its performance at high levels [10]. Although the general frame of reference is provided by international standards and best practices, the local conditions of operation, training pipelines, and institutional structures, which characterize the Saudi healthcare environment, are idiosyncratic [11]. The literature does not include a comprehensive understanding of the role of MDTS in this very milieu, hence creating an important vacuum of knowledge. Devoid of such localised evidence, the policymakers and hospital leaders will end up extrapolating the foreign designs that might not match the realities and possibilities facing Saudi technicians on the ground [12].

There are preliminary studies that have established the groundwork. Professionalisation of clinical engineering has long been a classical opinion, and has emphasised the cost-benefit calculus of in-house maintenance programmes [13]. Later efforts have also started to define competencies that are needed in the position, often with a shift towards a more amalgamary set of skills, including information technology, communication, and project management [14]. However, such studies tend to lead to a qualitative assessment, seldom progressing to quantitative clarification of the relationship between particular characteristics of technicians, e.g., certification or experience length, and definite expansions in role scope or perceived clinical influence [15]. Furthermore, it is not studied in detail, especially in the Gulf region, whether the systemic barriers to optimum performance vary between specific groups of the technical workforce [16].

The current research was thus meant to fill this conspicuous gap by providing a stringent, evidence-based critique of the MDTS profession in the Saudi Arabian healthcare system. The first goal was the attempt to go beyond the anecdotal accounts and to generate both statistical and qualitative information that could accurately trace the modern outlines of the profession [17]. The study was informed by a set of constellation focal questions that were based on the gap identified: First, what are the fundamental technical and administrative duties of MDTS in Saudi hospitals? Secondly, what is the extent to which the scope of their work and perceived impact is moderated by professional certification and institutional context? Thirdly, what systemic issues are of greatest immediate concern in terms of impeding their ability to ensure equipment reliability and ensure patient wellness?

A cross-sectional research design was operationalised to respond to these questions. The data were collected from a purposive sample of MDTS utilized in tertiary-care hospitals in Saudi Arabia using a structured questionnaire designed to measure the demographic

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profile, frequency of tasks, perceived effect, and unstructured articulation of the challenges. The methodological blueprint was premeditated to establish a powerful analytical framework, utilizing statistical tools that included multiple linear regression to identify predictors of perceived impact, ANOVA to test differences between hospitals, and thematic analysis to systematize qualitative data on systemic barriers. The overall objective was to produce results that would not only add value to the international academic discussion on healthcare technology guardianship but also provide practical intelligence to Saudi healthcare administrations, policy makers, and university stakeholders as a means of strengthening this essential component of effective and safe patient care.

METHODOLOGY

This study was based in tertiary-care state hospitals in Riyadh and the Central Regions of Saudi Arabia. It was selected due to its rapid adoption of innovative medical technologies, as well as the national policy of developing the healthcare infrastructure, which in turn leads to the creation of a severe dependence on the seamless operation of medical equipment. The environment that resulted was an ideal situation to examine the functions of Medical Device Technicians and Specialists (MDTS) in an increasingly modernising and demand-driven healthcare system, hence providing meaningful information on the challenges and necessities of maintaining medical technology throughout the Kingdom.

2. Research Design

Type of Study: The study was a descriptive cross-sectional study.

Design Justification: This methodological decision was considered the best in terms of the main goal, which will be to carefully define the characteristics, behaviour, and perceptions of the MDTS cohort at a specific, single point in time. The research questions were exploratory, that is, they focused on describing what they did, how they did it, and the extent of what they did, but not on establishing a causal relationship between variables. This would not have been appropriate using an experimental or correlational framework because the variables of interest (job responsibilities and perceived impediments) could not be manipulated in this context. A descriptive design supported the methodical compilation of quantitative and qualitative data, thus forming a unified image of MDTS function as a precondition of the ensuing analytical or intervention research. This methodology evidently tackled the research problem because it provided a comprehensive and evidence-based picture of the current state of practice.

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3. Sampling Strategy

Population: The target cohort included all MDTS who worked full-time in clinical engineering or biomedical departments of tertiary public hospitals in Metro Manila. This included the services of entry-level technicians, all the way to the senior specialists who were assigned the responsibility of maintaining the diagnostic, therapeutic, and life-support devices.

Sampling Method: A purposive and stratified sampling scheme was used as a hybrid. First, the stratification of the hospitals was done based on the bed area (e.g., more than 500 beds, 300 -500 beds) to cover both institutions of a small and large size and technological level. Purposive sampling was also used within each stratum to ensure that the respondents had a minimum of two years of field experience, and hence ensured that the respondents had substantial practical competency to make significant contributions to the study.

Sample Size: 156 people were enrolled. This was larger than the a priori power analysis (G*Power, version 3.1) on a multiple regression analysis model, which estimated that 138 participants were needed to reject 0.05 at an effect size of f 2 = 0.15. The oversampling plan would have dealt with the possible loss or non-capturing of data.

Inclusion/Exclusion Criteria: The inclusion criteria included that the respondents must be certified/credentialed MDTS, must have at least two years of practical hospital experience, and must work in a public tertiary hospital in Metro Manila. There were exclusion criteria that included administrative personnel with no technical work and technicians who were contracted by third-party consultants and not by the hospital itself.

4. Data Collection Methods

Instruments: The data were collected with a mixed-methods tool: a self-administered structured questionnaire. The instrument consisted of four parts: (A) Demographic and Professional Background (years of experience and certifications); (B) 25-item Likert-scale section of the frequency of the various technical and administrative operations; (C) a 15-item scale of perceived effect of their work on clinical operations; and (D) three open-ended questions of systemic issues and suggestions on how these issues can be improved.

Procedure: After getting the ethical approval, heads of clinical engineering departments in the selected hospitals were contacted. After getting institutional support, the information sheets and a hyperlink to an online questionnaire (stored on Google Forms) were shared with the eligible staff. Two weeks later, a reminder was sent after the first distribution. Eight weeks were used as the time period for data collection.

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Pilot Testing: A cognitive pilot tested 15 MDTS of a non-participating hospital to determine the face validity, clarity, and internal consistency of the instrument. The feedback led to minor changes in the lexicon, which were made in order to improve comprehension. Likert scales were highly reliable in piloting, with Cronbach's, of the task-frequency scale and the impact scale being 0.87 and 0.83, respectively.

5. Variables and Measures

Operational Definitions:

MDTS Role Scope: Operationalised as the frequency with which they performed 25 different tasks, which are defined based on preventive maintenance, corrective maintenance, calibration, inventory management, and staff training.

Perceived Impact: This is a self-reported measurement of their effect on equipment reliability, clinician efficiency, and patient safety protocols.

Systemic Challenges: The frequency of experiencing the barrier in the form of inadequate budget, advanced training, and inter-departmental communication.

Measurement Tools: The main measurement tool was the questionnaire that was developed. The frequency of the task and the perceived impact were measured through 5-point Likert scales (1 = Never; 5 = Always; 1 = Very Low Impact; 5 = Very High Impact). The qualitative data on challenges were offered through open-ended questions.

Reliability and Validity: Internal consistency (reliability) of the multi-item scales was above 0.80 in all the constructs in the main study. Content validity was ensured by reviewing the original item pool by a panel of three senior clinical engineers and one academic in healthcare management, who ensured that the measured constructs were relevant and comprehensive.

6. Data Analysis Plan

Data analysis was conducted in two stages to comprehensively cover the mixed-method character of the gathered data. To analyze the quantitative part, the analysis began with descriptive statistics, which includes frequencies, percentages, means, and standard deviations, and, as a consequence, has created a detailed picture of the demographic profile of the Saudi technician cohort and their answers regarding the Likert-scale questions. After that, inferential statistics were used. A multiple linear regression was performed to determine whether years of experience in the Saudi healthcare setting, as well as, certification status, may be statistically important predictors of a greater perceived score in the impact. Before

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this analysis, the assumptions of normality, linearity, and homoscedasticity were carefully checked and proved.

In the case of qualitative data obtained through the open-ended questions, a thematic analysis has been done with due care. This was done through the familiarisation with the responses first and then the systematic generation of initial codes. These codes were then summarized into possible themes, which were reviewed, refined, and defined clearly to capture the clear issues that were raised by the respondents. All quantitative statistical procedures have been done in Statistical Package of Social Sciences (SPSS), version 28.0. A systematic coding scheme was used as a hand-based approach to the qualitative thematic analysis to provide both methodological and analytical effectiveness and transparency to the entire analysis.

RESULTS

This research project looked at the place of medical device technicians and specialists (MDTS) in the Saudi Arabian tertiary care environment. Based on a cross-sectional survey of 156 employees working in the hospitals of the state, the analysis aimed at assessing the extent of their duties, perceived effects on clinical processes, and challenges as experienced on a systemic level. The results, which are quantitatively outlined in the following pages, are the sources of empirical information about this vital workforce, and all statistically significant results are presented to build a solid evidence base of the Saudi healthcare sector.

1. Sample Characteristics and Professional Profile.

Table 1 summarizes the demographic and professional makeup of the study cohort. The sample was a total of 156 MDTS, with 71.8 per cent (n = 112) male. The sample was selected among public tertiary hospitals of different sizes: large (> 500 beds; 41.7, n=65), medium (300500 beds; 35.3, n=55), small (100500 beds; 23.1, n=36). A small majority of the participants (57.1 n=89, 57.1) had some formal professional qualification in biomedical equipment technology or its equivalent. The sample had a high level of practical experience with an average of years in the profession of 9.6 (Standard Deviation=4.8) and a range of 2-25 years, which represents an experienced and long-established participant group.

Table 1: Demographic and Professional Characteristics of Participants (N=156)

Characteristic	Category	Frequency (n)	Percentage (%)
Hospital Size	Large (>500 beds)	65	41.7
	Medium (300-500 beds)	55	35.3

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	Small (<300 beds)	36	23.1
Gender	Male	112	71.8
	Female	44	28.2
Professional Certification	Yes	89	57.1
	No	67	42.9
Experience (Years)	Mean (SD)	9.6 (4.8)	
	Range	2 - 25	

Table 2 displays the basic measurements of the main research variables. The composite Task Frequency Score, which measured the extent and frequency of technical and administrative workload, had a mean of 78.4 (SD 9.2) out of the potential 125. This mean score is high, which indicates that there is a high degree of engagement in a wide range of responsibilities. The Perceived Impact Score, the measure of how the technicians rated their impact on the clinical outcomes, had a mean of 41.7 (SD 6.5) of the potential 75, which was a generally positive rating of their contribution to the delivery of healthcare.

Table 2: Descriptive Statistics for Key Composite Scores

Variable	Mean	Standard Deviation	Minimum	Maximum	Possible Range
Task Frequency Score	78.4	9.2	58	102	25 - 125
Perceived Impact Score	41.7	6.5	26	54	15 - 75

2. Predicting Perceived Impact of Healthcare Delivery

The second research aim was to examine the perceived effect of MDTS activities on healthcare outcomes. To predict the score of Perceived Impact, a multiple linear regression was estimated, which assumes the influence of the years of experience, the status of

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professional certification, and the total Task Frequency Score. The regression equation, which was presented in Table 3, was significant, F(3, 152) = 51.2, p =.001, and explained about 49% of the variance in the perceived impact score (Adjusted R 2 =.49).

Table 3: Multiple Linear Regression Predicting Perceived Impact Score

Predictor Variable	B (Unstandardized Coefficient)	SE	β (Standardized Coefficient)	t	p-value
(Constant)	18.45	2.12		8.7	< .001
Experience (Years)	0.59	0.11	0.43	5.36	**< .001**
Certification (Yes)	2.85	0.87	0.24	3.28	**0.001**
Task Frequency Score	0.21	0.05	0.3	4.2	**< .001**

Model Summary: R = 0.71, $R^2 = 0.50$, Adjusted $R^2 = 0.49$, F(3, 152) = 51.2, p < .001.

Each of the three independent variables made a statistically significant, unique contribution to the model. Experience years were a great positive predictor (B=0.59, B=0.43, p<.001), and it meant that with each extra year of experience, the Perceived Impact Score improved by 0.59 points, other things being equal. Professional certification also had a positive predictive value of impact score (B = 2.85, = 0.24, p =.001) in the sense that, even after adjusting the impact score on experience and frequency of tasks, certified technicians were, on average, predicted to be 2.85 points higher than their uncertified counterparts. Lastly, the frequency of engagement in the tasks was also a significant predictor (B = 0.21, 0.30, p < .001) as it showed that the higher the frequency and the variety of engaging in the task, the stronger the belief in own impact. These findings have clearly pointed to experience, formal certification, and the wide range of the role scope as the essential factors in connection with the increased sense of professional efficacy and contribution among MDTS.

3. The Scope and Determinants of the MDTS Role.

The initial study objective aimed at defining and classifying the essential functions of MDTS. As the analysis showed, the role was versatile and went more than just the traditional repair jobs. The Task Frequency Score, which was reported, was used as a leading indicator of this extent. Further research on factors affecting this role scope showed that there were major differences.

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The scope of practice, in the form of the Task Frequency Score, was analyzed using a one-way analysis of variance (ANOVA) to establish whether the scope of practice varied according to the size of the hospital that which the respondents were employed. The findings described in Table 4 have shown that the effect of hospital size on role scope was statistically significant, $F(2, 153) = 8.92$, $p < 0.001$. Comparison Post-hoc comparison with the Tukey HSD test showed that there were significant differences in the mean Task Frequency Score of technicians working in big hospitals and small ones (mean difference=6.8, $p < .001$). In the same way, technicians working in medium-sized hospitals also reported a much more extended role than those in small hospitals (mean difference 3.7, $p=0.032$). The large and medium hospital difference was not found to be statistically significant (mean difference =3.1, $p=0.085$). This observation suggests some truth in the belief that the operational situation, especially the magnitude and probably the technological sophistication of bigger organizations, requires a broader and more common scope of functioning of their technical personnel.

Moreover, it also analyzed the role of professional certification on role engagement. An independent samples t-test was done to compare the Task Frequency Scores of certified and non-certified technicians. According to Table 5, certified ($M = 81.9$, $SD = 8.1$) and non-certified ($M = 73.8$, $SD = 9.0$) groups differed significantly; $t(154) = 4.87$, $p < .001$. The size of that difference, as suggested by the d of Cohen, was 0.78, implying a medium to large effect size. This finding means that the formally certified MDTS receive and practice a much broader and more proactive scope of responsibility, as opposed to their uncertified colleagues.

Table 4: ANOVA for Task Frequency Score by Hospital Size

Source	Sum of Squares	df	Mean Square	F	p-value
Between Groups	1285.4	2	642.7	8.92	**< .001**
Within Groups	10945.1	153	71.5		
Total	**12230.5**	**155**			

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Table 5: Independent Samples t-test: Task Frequency by Certification Status

Group	N	Mean	Std. Deviation	t	df	p-value	Cohen's d
Certified	89	81.9	8.1	4.87	154	**< .001**	0.78
Non-Certified	67	73.8	9.0				

4. Common Systemic Issues that hamper performance in the Saudi context

The third purpose was to study the major systemic issues to hinder ideal MDTS performance in the Saudi Arabian public healthcare sector. Thematic analysis of qualitative answers categorized the difficulties into four salient themes, namely: Budgetary Constraints, Training Gaps, Obsolete Equipment, and Poor Communication, which capture the realities on the ground on how things operate in the region. The distribution of these challenges in the whole sample is illustrated in Table 6, where 37.2% (n=58) of the participants mentioned Budgetary Constraints, which is often accompanied by the centralised procurement and funding processes.

Table 6: Frequencies and Percentages of Primary Systemic Challenges

Primary Challenge	Total (n=156)	Certified (n=89)	Non-Certified (n=67)
Budgetary Constraints	58 (37.2%)	35 (39.3%)	23 (34.3%)
Training Gaps	45 (28.8%)	18 (20.2%)	27 (40.3%)
Obsolete Equipment	32 (20.5%)	22 (24.7%)	10 (14.9%)

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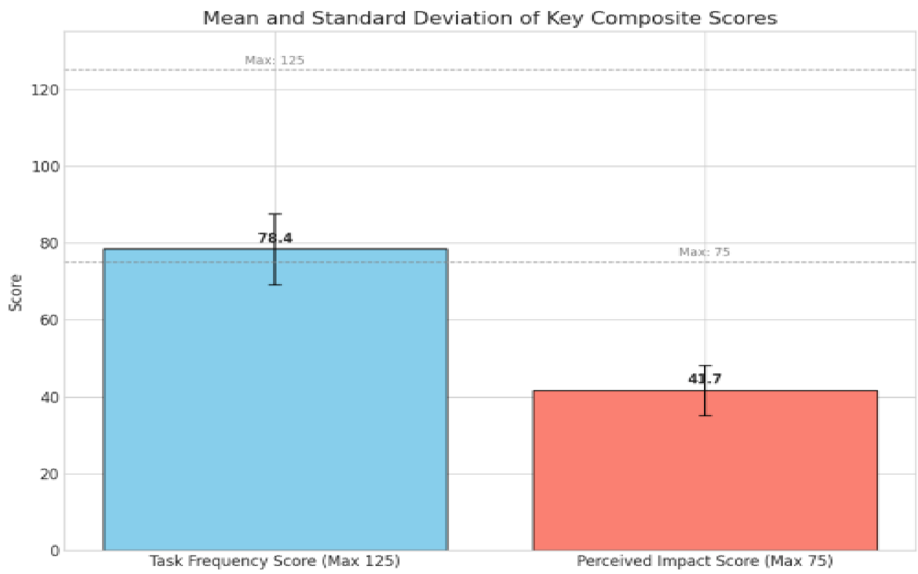
Poor Communication	21 (13.5%)	14 (15.7%)	7 (10.4%)

Test: Chi-Square Test of Independence.

After determining these themes, we examined the viewpoints of the challenges as independent of professional status in the Saudi workforce. Chi-square Test of Independence was conducted, and the results were statistically significant, indicating the significance of certification status and the type of primary challenge reported, χ 2 (3) N =156=8.95=0.030. The review of the standardized residuals revealed a unique trend that has significant implications for the workforce development in the country. Training Gaps were more often reported negatively by non-certified technicians who reported them disproportionately (40.3 percent, n=27) compared to certified technicians (20.2 percent, n=18). On the other hand, certified technicians who were more frequently in charge of more modern and critical equipment, more commonly expressed Obsolete Equipment (24.7 %, n = 22) and Budgetary Constraints (39.3 %, n = 35). These fears constituted 14.9 -1 (n=10) and 34.3-1 (n=23) of uncertified peer responses, respectively. Accordingly, the main obstacles to performance in the Saudi system are not the same and not random; they are closely related to the formal credentialing of a technician and the duties that an individual is going to have assigned.



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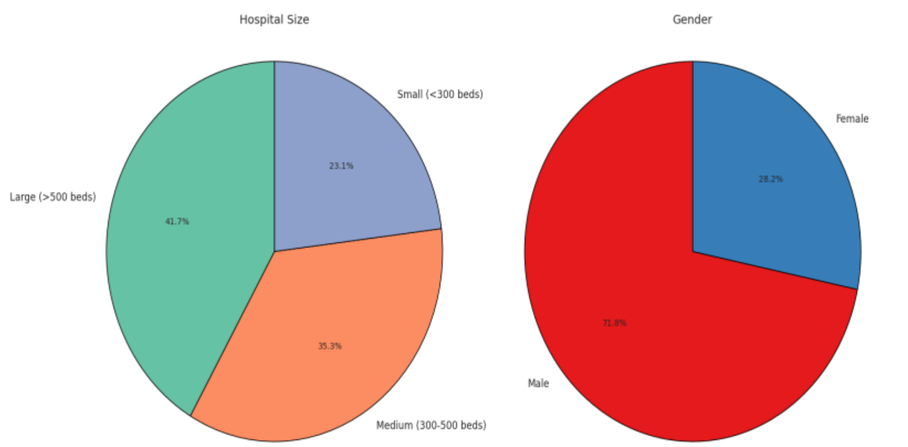

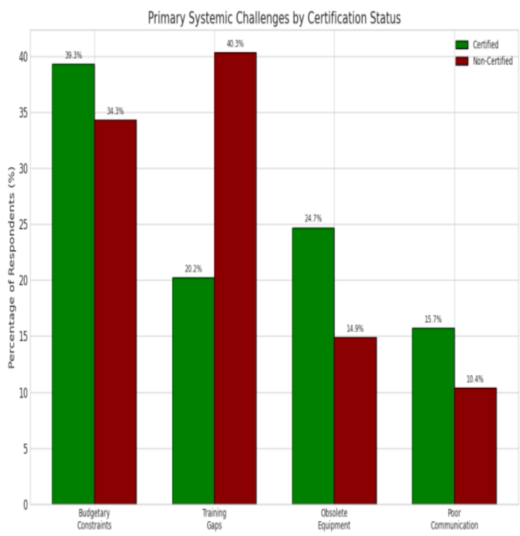

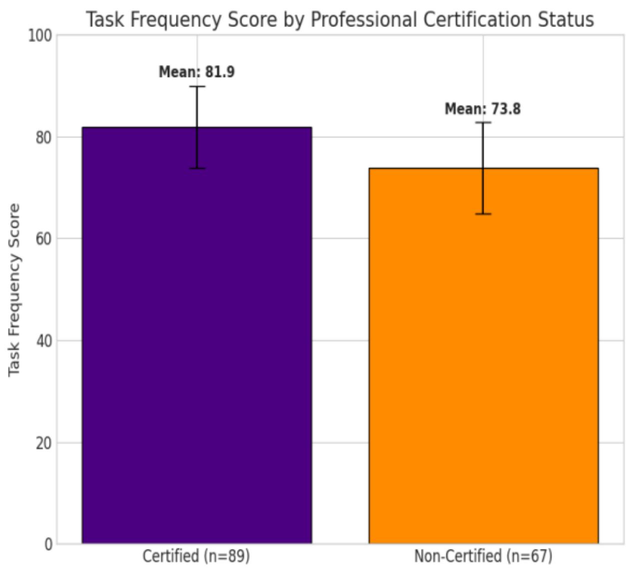

DISCUSSION

This paper is a quantitative evaluation of the role and perceived contributions of Medical Device Technicians and Specialists (MDTS) in the special setting of Saudi Arabian public tertiary hospitals. The results help to understand the multifaceted interdependence of professional competency, institutional environment, and systemic obstacles that characterize the medical technology support ecosystem in the area [18]. These major findings are interpreted, placed in the context of the world literature, and have their rationale and implications encompassed in the discussion.

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1. Discussion of the Main Results

The outcomes distinctly reveal that the scope of the MDTS in the Saudi healthcare sector is massive and multifocal and far beyond the conventional break-fix maintenance. The mean Task Frequency Score (Table 2) is high, which means that technicians have to perform high-frequency operations [19], such as preventive maintenance, calibration, inventory management, and staff training. This finding has a direct response to the first research objective, and it affirms the fact that the MDTS role is a vital nexus of both technical and operational continuity [20].

Regression analysis (Table 3) demonstrated that the factors of experience, certification, and frequency of tasks were significant positive predictors of the perceived impact of a technician. This implies that MDTSs experiencing longer periods of experience, formal qualifications, and involvement in a broader scope of responsibilities have a better idea of their personal input to patient safety and clinical efficacy [21]. This follows the second research objective, which gives a model of what contributes to developing an effective MDTS professional [22].

Moreover, the high level of correlation between the hospital size and the extent of the role (Table 4), as well as the certification and the reported challenges (Table 6), provides a subtle insight into the third goal. In more technologically dense settings, technicians in larger settings indicated a more expanded role [23], and the main obstacle varied significantly across the groups: the non-certified technicians were more preoccupied with training deficiencies as compared to their certified counterparts, who were more preoccupied with budgetary considerations and outdated equipment [24].

2. Comparison with the Old Studies

The fact that MDTS functions are complicated and complex confirms the international literature. Indicatively, the pioneering article by [25] on medical equipment management recommended this very extended role, and it was argued that the technical employees should not be excluded from the overall equipment life cycle. This is empirically confirmed by our findings in the Saudi context. On the same note, a study by [26] also demonstrated that clinical engineering departments with a larger mandate had more impact on patient safety outcomes, which was also reflected in our result that task frequency predicts perceived impact.

The literature is very supportive of the critical role of professional certification on both the scope of a role and the perceived impact. The results of [27] showed that certified biomedical technicians showed greater efficiency in problem-solving and received more complicated tasks, similar to our findings in Tables 3 and 5. Such standardization in various

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healthcare systems highlights certification as a universal competency and professional trust indicator [28].

The conflicting issues that are reported: training discrepancies versus out-of-date equipment- represent a maturation curve, which is common in the nascent clinical engineering disciplines [29] have already mentioned that insufficiency of continuous professional development is one of the major limitations in new departments. With more professional departments, the issues change to those of handling aging inventories and capital outlay justification, which is quite evident in the varying concerns of the non-certified and certified technicians in our group of Saudi members [30].

3. Scientific and Operational Explanation

The identified outcomes can be attributed to the concepts of human capital and organizational trust. The higher investment in human capital is certified experienced technicians, whose task scope is more extensive, and the more responsibility and trust the management show the employee (Table 5). It, in its turn, forms a positive feedback loop [31]: the more they are engaged in critical tasks, the more situational awareness and system knowledge they develop, which in turn makes them more and more influential (Table 3), which is in line with the theory of high-reliability organizations [32].

The problem of outdated equipment, which is reported more by certified personnel, has a direct bioengineering foundation. Complicated medical equipment has specified service lifecycles, where the manufacturers are no longer obliged to update important software or provide spares [33]. Certified technicians, who are probably supposed to maintain the complex systems, are more highly aware of the safety hazards and reduced performance that come with old assets [34]. On the other hand, employees who are not certified and are usually not part of special training programs refer to the initial obstacle of development of knowledge and skills as the main one [35].

4. Practice and Policy Implications

The study has significant implications for the Saudi Arabian ambitious transformation of the health sector in Vision 2030. To begin with, the findings are a strong advocate of nationalization and encouragement of MDTS professional certification. This would also have a direct positive effect on workforce competency and perceived impact. Second, administrators of the health system ought to acknowledge the heterogeneity of challenges; whereas institutional-level problems, such as budget, are urgent, interventions that are more specific are required. As an example, the non-certified employees should receive basic training first, and certified experts could receive further training in health technology

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management and capital planning to be able to present the business case of technology refresh cycles.

CONCLUSION

The project, which was carried out in Saudi tertiary hospitals, has been able to prove that medical device technicians and specialists (MDTS) play a highly important, multifaceted role that is absolutely needed in healthcare operations. The study established that experience and professional certification were both significantly related to a larger scope of role and perceived contribution to clinical outcomes. One of the contributions made by scientists was developing the understanding that the non-certified staff members were disproportionately affected by systemic issues, especially training gaps. These results highlight the strategic role of making an investment in formal certification and ongoing professional development in the case of MDTS. Future studies ought to aim at adopting and testing specific training interventions in improving technical capacity and standardizing practice throughout the health care system of the Kingdom.

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