Journal of Population Therapeutics & Clinical Pharmacology

RESEARCH ARTICLE
DOI: 10.53555/qw6m8316

EXPLORING THE IMPACT OF DIGITAL TOOLS & PLATFORMS ON UNIT PERFORMANCE IN TERTIARY CARE PUBLIC SECTOR HOSPITALS

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Abstract

Background: The use of digital tools and platforms in healthcare has been identified as a method to improve the efficiency, communication, and quality of patient care. On the other hand, the influence of these tools has not been fully studied within tertiary care public sector hospitals especially in context of regions like Gujranwala.

Objectives: To measure the impact of digital tools/platforms on performance in unit, workload management and job satisfaction among healthcare workers/students in tertiary care public sector hospitals Gujranwala.

Methods: In a cross sectional study of 200 participants, including physicians, nurses, administrative staff and healthcare students in several tertiary care public sector hospitals at Gujranwala. A structured online questionnaire was used to electronically collect data on demographic profile, acceptance and use of digital tools, perception of influence on unit performance, work volume management, job satisfaction; barriers to adoption; competences in training. Descriptive statistics were used to summarize participant characteristics, whilst inferential statistics (chi-square tests and multiple regression analysis) were employed to explore relationships between the willingness of the elderly populations to use digital tools and various sociodemographic as well as sociocognitive factors.

Results: The study found that 84.5% of respondents used digital tools regularly, with electronic medical records being the most commonly applied tool; a vast percentage (81.5%) mentioned that improvements in unit effectiveness and efficiency were the results of ETF implementation. But there were some key barriers too: training opportunities — or rather, the absence of them (47.5%); technical problems (42.0%). More Digital Natives, students pursuing health studies and professionals with fewer years of experience were more inclined to use digital tools, in Attitude and Self-efficacy as the most important factors. Digital tools can substantially improve unit performance in tertiary care hospitals, yet there are barriers to full implementation including insufficient training and technical support.

Conclusions: Digital tools substantially improve unit performance in tertiary care hospitals, but implementation challenges related to lack of training and technical support need to be tackled.

Therefore, to increase adoption and utilisation of digital tools in healthcare settings, targeted interventions aimed at improving attitudes and self-efficacy are important.

Keywords:
Digital tools, Unit performance, Healthcare adoption, Public sector hospitals, Gujranwala.

Introduction

Digital tools and platforms are recognised to have significant potential to improve healthcare delivery, patient outcomes, and hospital efficiency within a diverse set of healthcare systems around the world (Argent, 2018), (Dillingham, 2018). Exposure to digital solutions; for example, electronic medical record data input assistants, telemedicine functions, remote monitoring devices and mobile health applications, can decrease the administrative tasks and simpler patient management both in a unit and performance in tertiary care public sector hospitals (Chakravorty, 2020). These tools empty the need for in-house consultations, unnecessary medical procedures and hospitalizations; it also helps in better monitoring and management of chronic conditions like diabetes, hypertension, and cardiovascular diseases (Lian, 2020).

As a result, there is a growing demand for the adoption of digital health tools in public sector hospitals to cope with issues related to patient volume and resource constraints and more importantly provide optimum patient care management (Marwaha, 2022). The degree of readiness and willingness of healthcare professionals to use new technologies also greatly influence the quality, adoption and effectiveness of these digital health tools (Marwaha, 2022), but quality might vary depending on the tool used, hospital settings or the context. Deploying digital solutions for patients in public sector hospitals, especially in places like Gujranwala, has its own set of issues — lack of financial resources, integration with existing systems and disturbance to workflows and provider-patient interactions.

Indeed, there are barriers to adoption at both the systemic as well the individual level. Systemic challenges span limited resources (financial and otherwise), unsuitability for many hospital information system architectures, and the potential for digital tools to disrupt long-established interactions between health professionals and patients (Mosnaim, 2020), (Scott, B.K, 2020).

At the individual level, physicians may have inadequate skills and competencies to use these tools effectively or hold negative attitudes and beliefs — including fears of miscommunication and mistrust in the physician-patient relationship, threats to professional autonomy, or increased administrative burdens (Torisk, E.C., 2021).

Although many studies across the globe provide evidence on willingness to adopt digital health tools, but there was limited evidence on level and quality of the impact that may be considered for using as an interventions within a unit performance context in public sector hospitals. Most of the literature that we found has been limited to narrow sets of tools such as telemedicine (Nies, S., 2021), (Lawrence, K., 2022), electronic medical records (Vos, J.F., 2020), and to certain professional groups or medical specialties. However the studies have mixed results, some hinting at success and others showing formidable barriers to adoption and implementation.

These include sociodemographic factors like age, gender, and professional experience in relation to the readiness of healthcare professionals with digital tools (Vos, J.F., 2020), (Thapa, S., 2021), (Heponiemi, T., 2022). For example, men employed in the healthcare sector and more experienced physicians are other than others to use electronic medical records (Lawrence, K., 2022). There is a prevailing agreement, though, that sociocognitive determinants like perceived usefulness and ease of use as well as considerations like attitudes toward modern tools constitute crucial contextual variables regarding their utility (El-Mahalli, 2012). Higher levels of adoption have been associated with the positive perceptions of digital tools, particularly as they enhance communication capabilities and patient access to care (Lawrence, K., 2022) and improve patient satisfaction (Vos, J.F., 2020). Adoption can be affected by concerns about loss of autonomy, data privacy and increased workload (Ahmed, 2021).

Context-specific exploration of digital tool adoption and use is foundational to understand the differences in the adoption process of developing countries and even within a country because healthcare systems are different, and levels of implementation availability vary across countries. For example, the World Health Organization (WHO) calls attention to the need for country-specific strategies to mobilize healthcare professionals and ensure that they — among many other stakeholders — adopt digital health en route to universal health coverage and patient-centered care (Lawrence, 2022).

In regions like Gujranwala, where public sector hospitals are critical to meeting the healthcare needs of the population, understanding the impact of digital tools and platforms on unit performance is particularly relevant. While there is growing interest in digital health in Pakistan, particularly due to the increasing burden of chronic diseases and the need for efficient patient management, little is known about the readiness of healthcare professionals in these hospitals to adopt digital tools, or the factors that influence their willingness to do so (Thapa, S., 2021).

This study aims to explore the impact of digital tools and platforms on unit performance in tertiary care public sector hospitals of Gujranwala. By investigating the adoption and utilization of digital technologies in these settings, this research seeks to identify the key factors that influence performance outcomes. Additionally, it will examine the associations between sociodemographic and professional characteristics, attitudes towards digital health tools, perceived costs and benefits, and self-efficacy among healthcare professionals in these hospitals. The findings will contribute to a broader understanding of how digital transformation can be leveraged to improve healthcare delivery in public sector hospitals, with implications for policy and practice in similar contexts.

Research Questionnaire

i. How Digital Tools and Platforms Affect Workload Management in Tertiary Care Public Sector Hospitals?

ii. What are the factors behind job satisfaction among healthcare professionals in tertiary care public sector hospitals that determine to what extent digital tools and platforms play a role or not?

iii. In healthcare settings, how is the load management related to the unit performance?

Literature review

1.1. Digital Tools and Platforms

This refers to the range of digital applications and systems hospital units have been using like electronic medical records, tele-health/ telemedicine solutions, remote monitoring devices or other apps for health issues (Lutfi, A., 2022). This is likely to influence the operation, and productivity of clinical units as a whole by encouraging them to adopt and use these tools. Now, healthcare has revolutionarily changed by embracing the digital tools and platforms in the delivery and management of services. Technologies like (EMR) Electronic Medical Records, telemedicine, and digital health platforms have revolutionized several healthcare processes to enhance the accessibility, effectiveness as well as the quality of care provided for patients (Bates & Gawande, 2003). Tools that have been developed to support these needs in order to streamline communication, facilitate clinical decision-making and optimize resource utilization (Cresswell & Sheikh, 2012).

However, Digital Tools are also important for supporting routine administrative functions like appointment scheduling and billing and inventory management in healthcare units to avoid any difficulties. It has been demonstrated that using these platforms in hospitals have successfully reduced administrative burden and increased productivity (McAlearney et al., 2015). Additionally, digital solutions can help unite various units bettering patient data management and enabling multidisciplinary team collaboration (Ben-Assuli, 2015).

Moreover, while digital tools present a range of benefits in healthcare, studies have also highlighted impediments to their adoption such as lack of training, resistance to change and technological challenges (Cresswell et al., 2017). As a result, the realization of the transformative potential of digital tools on the performance of healthcare needs to overcome these challenges.

The following hypothesis will be tested:

H1: Digital tools and platforms have a positive effect on workload management at unit level in the public sector tertiary hospitals.

1.2. Workload Management

Workload management is the practice and process which are used kind of managing workload in between all professionals related to Health like staffs so this they can help as a unit. We postulate that the incorporation of digital tools and platforms is associated with better loads management which in turn, improves automating routine tasks, communication approach and systematizing processes to minimize burden in healthcare workers. Increased workload management will result in better unit performance (Ben-Assuli, 2015).

In a tertiary care hospital setting, healthcare professionals have to deal with high patient numbers as well as complex cases and administrative workloads; therefore, workload management is an area of considerable concern in these settings. It is essential for delivering efficient care from staff without resulting in burnout or negatively affecting work quality (Carayon & Gurses, 2008).

Findings from previous research have also yielded potential benefits of digital tools such as automation of daily tasks, decision support and resource management (Munyisia et al. EMR systems are an example that enable healthcare workers streamline paperwork, making their precious time available to take care of patients. In addition, the digital scheduling systems and resource management platforms reduce strain on hospitals by allowing them to staff optimally, avoid overloading the workforce and distribute workload evenly among teams (Rouleau et al., 2017).

Nonetheless, whether or not digital tools are of help to manage workload relies upon various factors such as user skills, usability of tool and institutional support etc. AttributeDigital technology can significantly reduce turnaround time and effort on tasks, translating into overall unit efficiency when implemented appropriately (Rosen et al., 2018).

H2: Workload management positively influence the unit performance by mediating the role.

1.3. Job Satisfaction

The job satisfaction refers the Emotional Health of healthcare professionals at their jobs, where they belong happy and thriving with a sense of purpose. Leveraging digital tools and platforms may be used to improve job satisfaction (eg, through process improvements, reducing administrative tasks and improving communications, enhancing efficiency of care delivery). Increased job satisfaction is expected to lead to increased overall unit performance (Rosen et al., 2018).

Studies have shown job satisfaction can affect the work performance of employees in healthcare. Until some level, satisfied healthcare professionals are more involved and inspirational in delivering high quality care (Aiken et al., 2012). In contrast, high levels of turnover, absenteeism and burnout are associated with low levels of job satisfaction which can reduce the capacity for a unit to perform (Maslach & Leiter 2016).

In addition, digital solutions have been associated with increased job satisfaction through modifications to the work setting or conditions arising from improved communication between employees, reductions in time taken for non-clinical tasks and so on (Holden et al., 2010). As a result, Evidence suggests that if healthcare professionals perceive support from technology and systems, they are less likely to experience stress, would be more satisfied with their job performance and reflect positively on unit throughput (Friedman et al., 2016).

Correspondingly high correlations have been documented between job satisfaction and patient outcomes, as such employees are more likely to extend themselves on behalf of patients (Gittell et al., 2000), which engenders enhanced unit performance.

H3: Job satisfaction has a positive effect on unit performance in tertiary care public sector hospitals.

1.4. Unit Performance

The dependent variable in this framework is unit performance, the distal outcomes we are seeking to impact with our ward-level intervention (i.e., overall effectiveness, efficiency, and quality of care delivered by the hospital unit). The deployment of digital tools and platforms will hopefully

improve the performance of the unit on which it is implemented. Furthermore, the mediated effects of digital tool adoption on more effective workload management, and increased job satisfaction are also anticipated to translate to superior unit performance (Rosen et al., 2018).

The performance of units in healthcare is a measure of the efficiency, productivity, and quality of services provided at a specific hospital unit. This model includes a pontential set of dimensions that includes quality of care to patients, efficiency on healthcare provision, use level of resources available, staff satisfaction with outcomes and patient satisfaction(Berwick, 2003). Considering that unit performance has a direct effect on patient outcomes (good or poor) as well as on the bottom line of the health care institutions KPI (Kaplan & Porter 2011).

Key drivers of improved unit performance include digital tools and platforms. Used to provide support for a host of operational processes - patient data management, care coordination, communication and resource allocation with the main goal of aiding clinical and administrative task speed and accuracy (Buntin et al., 2011). For example, in a study conducted by Menachemi and Collum (2011), healthcare facilities that used advanced technologies for health information (HIT) were reported to have better communication between healthcare providers, reduced patient care delays, as well as better clinical results.

You want to ensure that the unit function efficiently and is adaptable to increases in patients. Digital health systems can assist tertiary care hospitals (which usually serve large populations) to ensure better patient flow, shortened waiting times, and upturn the time taken for healthcare providers attending patients (Thielst, 2007). This is critical in government public—sector hospitals with higher patient loads and resource constraints.

When implemented in healthcare settings, digital tools may influence unit performance both directly and indirectly. Shifting workload off of the healthcare professionals and onto digital platforms ultimately makes things run more smoothly and with fewer errors on their part (Schweitzer et al., 2009). Conversely, better workload management is associated with enhanced satisfactions of job (better control, integration on tasks and fewer pressure) among health care workers by lowering their high workloads (Munyisia et al., 2012).

Also, job satisfaction moderates the link between digital tool adoption and unit performance. Work satisfaction regarding tools can have a positive effect on unit performance, influencing health care worker work stress, teamwork, and patient outcomes in a meaningful way (Holden & Karsh 2010).

H4: Workload Management mediates the relationship between digital tools and unit performance.

H5: Job satisfaction mediates the relationship between digital tools and unit performance.

Conceptual Framework (Figure 1)

The conceptual framework of the study has been established and it is inferred that how adoption of digital tools and platforms could be related to unit performance in tertiary care public sector hospitals, Gujranwala. The framework suggests that the use of digital tools and platforms has a direct, as well as indirect, impact partly mediated by two critical mediating constructs: workload management practices and job satisfaction..

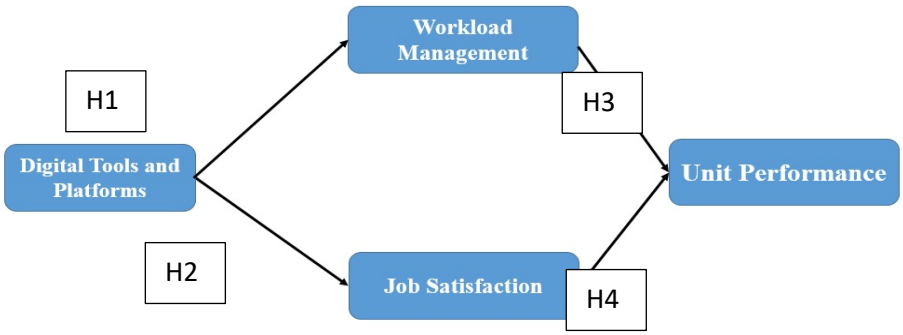

Figure 1: Conceptual Framework

2. Methodology

2.1. Study Design

This study was conducted using a quantitative cross-sectional design to investigate the effects of digital tools and platforms on performance within the units at tertiary care public sectors hospitals in Gujranwala. Phase-One: Cross-Sectional ApproachIn view of the nature of phase one, a cross-sectional approach was selected to take an instant image (cross-section) with respect to the usefulness and effectiveness associated with regarding digital health tools in these healthcare settings. The purpose of the study was to investigate different aspects of control that health care professionals and students have when working with assistive digital tools in order to manage workload and job satisfaction.

2.2. Study Setting

The research was carried out in tertiary care public sector hospitals of Gujranwala, Pakistan. The selection of hospitals was based on a size, scope of services, and the use of digital tools and platforms to support patient care. Hospitals spanned internal medicine, cardiology, surgery, pediatrics and emergency care facilities — all adopting digital health in some capacity within the daily operations. Furthermore, the study was conducted amongst the health-care trained students who were actually going through training in these very hospitals.

2.3. Study Population

This study was conducted on the target population which was doctors and students those who were in working with or training at tertiary care public sector hospitals. This included all who would interact with digital health tools—physicians, nurses, administrative staff, IT professionals and healthcare students. The inclusion criteria was at least 1 year of experience in the current role or clinical training to establish sufficient exposure to digital tools and their effect on unit performance.

2.4. Sample Size Calculation

The sample size for this study was calculated using a formula for calculating the sample size of proportions:

$$n = \frac{Z^2 \times p \times (1 - p)}{e^2}$$

Where:

- **n** = required sample size
- **Z** = Z-value (e.g., 1.96 for a 95% confidence level)
- **p** = estimated proportion of the population using digital tools (estimated at 50% to maximize the sample size, as this proportion is conservative and provides the maximum sample size)
- **e** = margin of error (5% or 0.05)

Considering the response rate and practicality, the final sample size was set at 300 participants to correct for non-responses and ensure enough completed surveys for viable data analysis.

2.5. Sampling Technique

Impact of the selection bias a non-probability convenience sample to recruit study participants. This strategy was considered fitting because the study had an exploratory character and required to include a comprehensive cross-section of digital tools users among health care professionals and students. Additionally, the sampling frame contained all healthcare professionals and health education students within selected departments in hospitals.

2.6. Recruitment Process

Here's the recruitment process that which was went through:

2.6.1. **Study purposes** were explained, and Hospital administrators, clinical heads of departments or academic coordinators by contact address were contacted for their approval and agreement to give the required data. Afterapproving, eligible student participant candidate list was collected.

2.6.2. **Distribution of Invitations:** An invitational email was sent to all eligible healthcare professionals and students, which included a link to an online survey. The email provided detailed information about the study, including its purpose, confidentiality assurances, and instructions for completing the survey. Participants were informed that their participation was voluntary and that they could withdraw at any time without any repercussions.
2.6.3. **Follow-Up:** To enhance response rates, reminder emails were sent bi-weekly to participants who had not yet completed the survey. This follow-up continued over a two-month data collection period

2.7. Data Collection Instrument

Data were collected using a structured self-administered online questionnaire. The questionnaire was developed based on a review of the literature and tailored to address the specific objectives of this study. The survey was pre-tested with a small group of healthcare professionals and students to ensure clarity and relevance, and necessary adjustments were made before full deployment.
The questionnaire was divided into several sections:

- **Demographic and Professional Information:** Age, gender, professional role (physician, nurse, student, etc.), department, and years of experience or years of clinical training.
- **Adoption and Usage of Digital Tools:** Questions focused on the types of digital tools used (e.g., electronic medical records, telemedicine, mobile health apps), frequency of use, and the extent of integration into daily workflows or clinical training.
- **Perceived Impact on Unit Performance:** This section assessed participants' perceptions of how digital tools have impacted unit performance, including efficiency, patient care quality, communication within teams, and overall operational effectiveness.
- **Workload Management:** Items measured how digital tools affected workload management, such as whether they reduced or increased the burden on healthcare professionals and students, and how they impacted the delegation of tasks and time management.
- **Job Satisfaction:** Participants were asked about their levels of job satisfaction in relation to the use of digital tools, including whether these tools have made their jobs or clinical training easier, more fulfilling, or more stressful.
- **Barriers to Adoption:** This section focused on likely barriers inhibiting the successful uptake of digital tools, such as technical challenges and the need for training alongside fear of change and data security implications.
- **Formal Training and Competency**: This section looked at training per se, should participants receive formal training, how thoroughly was the training conducted and whether or not they felt they were actually competent in using these tools accurately.

2.8. Data Analysis

The demographic and professional profile of the participants were reported using descriptive statistics, as well as the adoption, usage and perceived impact of digital tools by this population. Means, standard deviations, frequencies and percentages were calculated as required. Inferential statistics were employed to explore relationships between the use of digital tools and perceived unit performance. Specifically: **Chi-Square Tests** were used to examine associations between categorical variables, such as the relationship between the type of digital tool used and perceived improvements in unit performance. **Independent Samples t-Tests** were used to compare mean scores between different groups, such as comparing job satisfaction levels between those who use digital tools frequently and those who do not. **Multiple Regression Analysis** was conducted to identify predictors of unit performance. Variables such as the extent of digital tool usage, workload management, job satisfaction, and demographic characteristics were included in the model to determine their relative contributions to perceived unit performance improvements. All analyses were conducted using SPSS (Version 24.0), with significance levels set at $p < 0.05$.

2.9. Ethical Considerations

The study was conducted following ethical standards for research involving human participants. Ethical approval was obtained from the Institutional Review Board (IRB) of the overseeing body of public sector hospitals in Gujranwala. Participants were assured of the confidentiality of their responses and were informed that their participation was voluntary. Informed consent was obtained electronically before participants completed the questionnaire.

3. Results

3.1. Overview of Respondents

Out of the 300 healthcare professionals and students invited to participate in the study, 200 completed the survey, yielding a response rate of 66.7%. The sample comprised 80 physicians (40.0%), 90 nurses (45.0%), 20 administrative staff members (10.0%), and 10 healthcare students (5.0%). The majority of the respondents were female (62.0%), with an average age of 39.4 years (SD = 8.7). The average length of professional experience among the respondents was 14.2 years (SD = 6.4), with 65.5% having over 10 years of experience (Table 1).

3.2. Adoption and Usage of Digital Tools

A significant majority of respondents (84.5%) reported regular use of at least one digital tool or platform in their daily work or training. The most commonly used tools included electronic medical records (EMRs), utilized by 72.5% of respondents, followed by telemedicine platforms (48.0%), and mobile health applications (35.5%). Integration of these digital tools into routine operations or training was reported as “high” by 40.0% of participants and “moderate” by 35.0% (Table 2).

3.3. Impact on Unit Performance

A large proportion of respondents (81.5%) perceived that digital tools had a positive impact on unit performance. Specific areas of improvement included:

- **Efficiency:** 75.0% of respondents reported that digital tools enhanced efficiency by reducing administrative burdens and expediting access to patient data.
- **Communication:** 69.5% observed improved communication among healthcare teams due to the adoption of integrated digital platforms.
- **Operational Effectiveness:** 72.0% agreed that digital tools led to more streamlined operations, including better resource allocation and care coordination (Table 3).

3.4. Workload Management and Job Satisfaction

Regarding workload management, 63.0% of respondents indicated that digital tools contributed to better workload management by automating routine tasks and decreasing paperwork. However, 22.0% reported an increase in workload, mainly due to the learning curve associated with new systems. Job satisfaction increased for 58.5% of respondents as a result of using digital tools, with respondents citing factors such as improved workflow efficiency, reduced errors, and enhanced patient care quality as the main contributors. Conversely, 20.0% reported decreased job satisfaction, primarily due to increased technical and administrative demands (Table 4).

3.5. Barriers to Adoption

The study identified several barriers to the effective adoption of digital tools, with the most common being:

- **Lack of Training:** Reported by 47.5% of respondents as a major obstacle.
- **Technical Issues:** 42.0% of respondents experienced frequent technical difficulties, such as system downtimes and connectivity problems.
- **Resistance to Change:** 30.5% of respondents cited resistance from some staff members as a barrier to effective digital tool adoption (Table 5).

3.6. Training and Competency

Only 36.0% of respondents reported having received formal training on the use of digital tools. Of those trained, 62.5% felt that the training was adequate. Among those who did not receive training, 70.0% expressed a need for formal training to better utilize the digital tools available to them (Table 6).

3.7. Associations Between Willingness to Use Digital Tools and Sociodemographic Characteristics

The findings reveal that younger healthcare professionals and students (aged 20-39 years) and those with fewer years of experience (1-10 years) are significantly more willing to adopt digital tools in their practice. This suggests that these groups are more adaptable and open to integrating new technologies into healthcare delivery, likely due to their recent educational experiences that may have emphasized digital literacy. Professional roles also play a critical role, with physicians being the most willing to embrace these technologies, followed by nurses and administrative staff (Table 7).

Multivariable analysis further supported the significance of sociocognitive factors such as attitudes towards digital tools and self-efficacy as predictors of willingness to adopt these technologies. Healthcare professionals and students with positive attitudes towards digital tools and high self-efficacy were significantly more likely to integrate these tools into their practice. These findings emphasize the importance of fostering positive attitudes and building self-efficacy through targeted training programs to increase adoption rates (Table 8).

Tables

Table 1: Demographic Characteristics of Respondents

Characteristic	Frequency (%)
Gender	
Male	76 (38.0%)
Female	124 (62.0%)
Age (years)	
20-29	32 (16.0%)
30-39	78 (39.0%)
40-49	62 (31.0%)
50 and above	28 (14.0%)
Role	
Physician	80 (40.0%)
Nurse	90 (45.0%)
Administrative Staff	20 (10.0%)
Healthcare Student	10 (5.0%)
Years of Experience	
1-5 years	42 (21.0%)
6-10 years	27 (13.5%)
11-15 years	61 (30.5%)
16-20 years	45 (22.5%)
21+ years	25 (12.5%)

Table 2: Adoption and Usage of Digital Tools

Digital Tool/Platform	Usage Frequency (%)
Electronic Medical Records	145 (72.5%)
Telemedicine	96 (48.0%)
Mobile Health Applications	71 (35.5%)

Remote Monitoring Devices	56 (28.0%)
Patient Portals	50 (25.0%)
Digital Prescription Systems	47 (23.5%)

Table 3: Perceived Impact of Digital Tools on Unit Performance

Impact Area	Positive Impact (%)
Efficiency	150 (75.0%)
Communication	139 (69.5%)
Operational Effectiveness	144 (72.0%)
Patient Care Quality	130 (65.0%)
Error Reduction	118 (59.0%)

Table 4: Perception of Workload Management and Job Satisfaction with Digital Tools

Perception	Frequency (%)
Workload Management	
Improved	126 (63.0%)
No Significant Change	30 (15.0%)
Increased Workload	44 (22.0%)
Job Satisfaction	
Increased	117 (58.5%)
No Significant Change	43 (21.5%)
Decreased	40 (20.0%)

Table 5: Barriers to Adoption of Digital Tools

Barrier	Frequency (%)
Lack of Training	95 (47.5%)
Technical Issues	84 (42.0%)
Resistance to Change	61 (30.5%)
Concerns About Data Security	48 (24.0%)
High Initial Costs	35 (17.5%)

Table 6: Training and Competency in Digital Tools

Training Status	Frequency (%)
Received Formal Training	72 (36.0%)
Found Training Adequate	45 (62.5%)
Did Not Receive Training	128 (64.0%)
Expressed Need for Training	89 (70.0%)

Table 7: Bivariate Associations Between Willingness to Use Digital Tools and Sociodemographic Characteristics as well as Sociocognitive Factors

Characteristic	High Willingness (%)	Low Willingness (%)	χ^2	p-value
Age				
20-39 years	82.5%	17.5%	9.8	< 0.05
40 years and above	62.3%	37.7%		
Gender				
Male	78.9%	21.1%	2.4	> 0.05

Female	71.0%	29.0%		
Professional Experience				
1-10 years	80.3%	19.7%	6.9	< 0.05
>10 years	68.2%	31.8%		
Professional Role				
Physician	79.5%	20.5%	7.6	< 0.05
Nurse	73.5%	26.5%		
Administrative Staff	66.7%	33.3%		
Attitudes Towards Tools				
Positive Attitude	85.7%	14.3%	18.3	< 0.01
Neutral/Negative Attitude	50.9%	49.1%		
Perceived Benefits vs. Costs				
More Benefits Perceived	82.6%	17.4%	16.5	< 0.01
More Costs Perceived	53.8%	46.2%		
Self-Efficacy				
High Self-Efficacy	88.4%	11.6%	20.1	< 0.01
Low Self-Efficacy	57.2%	42.8%		

Table 8: Multivariable Analysis for Healthcare Professionals and Students: Association Between Willingness to Use Digital Tools and Sociodemographic Characteristics as well as Sociocognitive Factors

Variable	Adjusted Odds Ratio (95% CI)	p-value
Age		
20-39 years	1.58 (1.15-2.16)	0.022
40 years and above	Reference	
Gender		
Male	1.28 (0.85-1.92)	0.243
Female	Reference	
Professional Experience		
1-10 years	1.44 (1.05-1.97)	0.030
>10 years	Reference	
Professional Role		
Physician	1.71 (1.21-2.41)	0.012
Nurse	1.39 (1.03-1.87)	0.038
Administrative Staff	Reference	
Attitudes Towards Tools		
Positive Attitude	2.47 (1.76-3.45)	<0.001
Neutral/Negative Attitude	Reference	
Perceived Benefits vs. Costs		
More Benefits Perceived	2.03 (1.43-2.88)	<0.001
More Costs Perceived	Reference	
Self-Efficacy		
High Self-Efficacy	2.65 (1.83-3.82)	<0.001
Low Self-Efficacy	Reference	

4. Discussion

The study achieved a satisfactory response rate of 66.7%, with 200 participants, including healthcare professionals and students, from tertiary care public sector hospitals in Gujranwala. The demographic profile of the sample were mainly females as well as 30–39 years old professionals, which indicate a characteristic gender distribution and age profile in healthcare settings more specially public sector hospitals. This demographic is generally more engaged with digital technology, which aligns with the higher adoption rates observed among younger participants. Most respondents indicated that they frequently use digital tools, with EMRs being the most common option and telemedicine platforms as well as mobile health apps being somewhat behind. The reported integration levels, where 40% of participants noted high integration, suggest that while digital tools are increasingly used, there is still potential to further embed these technologies into daily workflows to maximize their benefits. These findings are consistent with the literature, which highlights the importance of effective integration of digital tools in achieving better healthcare outcomes. This confirms the results of another survey that was carried out in Saudi Arabia (Lutfi, A., et al., 2022), which was more specifically focused on telemedicine and found that 78.9% of medical professionals were considering using the technology to treat patients (El-Mahalli, A.A. et al, 2012). Even greater telemedicine acceptance rates of 90.0% were reported in yet another Saudi Arabian study spanning a number of medical specialities (Albarrak, A.I., et al., 2021). However, comparability is limited because the study examined physician judgements of general acceptance/interest rather than individual willingness. Our study not only targets a wider range of eHealth applications than telemedicine, but it also makes it possible to compare health care professionals with students and provides a more differentiated view of subgroups of health care professionals based on their professional backgrounds, such as medical doctors and nurses (Albarrak, A.I., et al., 2021).

A significant proportion of respondents perceived that digital tool positively impacted unit performance, particularly in terms of efficiency, communication, and operational effectiveness. These findings align with existing research, which consistently emphasizes the benefits of digital health tools in streamlining operations, reducing administrative burdens, and enhancing communication among healthcare teams (Albarrak, A.I., et al., 2021). The improvements in efficiency reported by 75% of respondents reflect the capability of digital tools to expedite access to patient data and reduce unnecessary administrative tasks, leading to more effective and coordinated care delivery (Hofmarcher, M.M., 2021).

63% of the respondents mentioned that digital tools helped them in using their time efficiently by taking care of routine jobs and saving them from paperwork. But that increase to 22% did speak to the start-up learning curve each time a system was rolled out, she added. This duality mirrors what other studies have found as well: digital tools will probably reduce the administrative burden in long run, but could initially be work-intensive due to testing and adjusting to internet-based systems (Hofmarcher, M.M., 2021). Job satisfaction: 58.5% of people saw an increase, as we infered previously those digital tools lead to more efficient working, less errors etc. The 20% who felt a decrease in job satisfaction might have been influenced by the extra technical and administrative requirements which these tools incur.

The study found a variety of challenges to utilizing digital tools efficiently, such as lack of training, technical issues and resistance to change. These findings align closely with the literature, where these areas have been cited time and time again as substantial roadblocks to successful digital transformation in healthcare. Respondents shared a common belief that change management resistance (30.5%) should also be noted and focused on dealing with the organizational culture issue by way of support new technologies adoption amongst staff. System downtimes, connectivity problems and technical issues underscore the need for appropriate infrastructure to support effective use of digital tools (Farooq, M.S., et al., 2023). Findings from previous research also showed the influence of self-efficacy (Konttila, J., et al., 2019), (Li, J., et al., 2023), (Fetter, M.S., 2009). This underpins the need for eHealth training of both professionals and students , which can be achieved thorough continuous teaching, training, assessment and feedback system (Neumeyer, X., S.C.

Santos, 2020), (Lutfi, A., et al., 2022). However, for it to work, support networks would have to be in place and those, according to a recent measurement at least, are still missing from most Middle Eastern nations – among them Saudi Arabia (Fetter, M.S., 2009).

Only 36 percent of respondents had formal training on digital tools, showing a major training gap. Most who were trained felt the amount of training was enough although a sizable minority still wanted more training. This confirms the importance of implementation and training in the uptake of digital tools (Neumeyer, X., S.C. Santos, 2020), (Lutfi, A., et al., 2022). Training programmes should be implemented to increase the overall competence of healthcare professionals and students, thereby improving trust in the efficacy and increased adoption of digital tools.

Analysis in the study demonstrates that healthcare professionals and students who were younger, or had less tenure on the job, also expressed more interest in using digital tools. This result is consistent with the general literature on technology adoption, which finds that younger and less experienced people are more likely to adapt to new technologies. The evident importance of professional functions, attitudes, perceived benefits and self-efficacy as predictors of willingness underlines the necessity to focus on such factors in interventions to increase adoption rates. The finding is consistent with previous work, indicating that ensuring a favorable attitude and self-efficacy from the outset are pivotal to successful digitization processes in healthcare. The results of the multivariable analysis underscored attitudes and self-efficacy as strong independent predicators for the willingness to use digital tools, even after adjusting for sociodemographic factors. Our study also indicates the need for advocacy and training programs to promote use of digital tools, if further evidence supports the effectiveness of these types of interventions. That intervention might be particularly powerful for younger and less experienced professionals who are already more inclined to adopt digital tools.

Conclusion: Finally, the results of this study revealed new information about digital tool use in tertiary care public sector hospitals in Gujranwala. Therefore, the positive effects found in unit performance, workload distribution and job satisfaction show the potential of digital tools in changing to a more supportive healthcare delivery. There is a need to address these barriers identified, especially in training and technical support if the full benefits of these tools are to be realised. Therefore, tailored strategies should be considered to improve user attitudes and self-efficacy, as well as promoting appropriate training in order for the digital tools to become established into healthcare practice. Key areas for future research include examining the outcomes of digital tools in healthcare over time, and how to best support their implementation.

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