Telemedicine Outcomes in Riyadh Tertiary Hospitals: A systematic review

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Abstract

Background: Especially during the COVID-19 epidemic, telemedicine has quickly become a major instrument in the healthcare industry. Telemedicine has been more and more incorporated into tertiary hospitals in Riyadh, Saudi Arabia, to raise patient satisfaction, lower costs, and increase access to medical care. But especially in terms of patient and healthcare professional satisfaction, cost-effectiveness, and the barriers and enablers for adoption, the results and efficacy of telehealth services are still under evaluation.

Methodology: A systematic review of the current literature was used in this study to compile the results of telemedicine usage in tertiary hospitals in Riyadh, Saudi Arabia. Published over the last ten years (2013–2023), pertinent studies were chosen according inclusion criteria like focusing on telemedicine outcomes including cost-effectiveness, patient pleasure, and obstacles/facilitators. Assessment of study designs, sample sizes, demographics, and major outcomes was part of the data extraction process. Major databases including PubMed, Scopus, and the Saudi Digital Library were used to find the research.

Results: The review revealed that, with rates varying from 68.1% to 93%, patient satisfaction with telemedicine services in Riyadh's tertiary hospitals was usually high. Among elements affecting satisfaction were access, convenience, and quality of communication. Although tele-psychiatry and tele-rhinology services got good comments, video consultations were linked to marginally reduced satisfaction as a result of technological problems. Concerning secondary outcomes, telemedicine proved to be cost-effective, notably in lowering travel expenses and wait times; nevertheless, technological problems and privacy issues remained major roadblocks.

Conclusion: In Riyadh's tertiary hospitals, telemedicine has shown to be a useful instrument in improving patient satisfaction and healthcare access. The adoption of telemedicine presents many obstacles, especially concerning technological problems and the absence of in-person communication. Telemedicine must overcome these obstacles if it is to realize its whole possibilities. The results indicate that to maximize telemedicine's use, additional technological advancements as well as its incorporation

34 into the more general healthcare system are needed. rewards guarantee both patients
35 and providers a flawless healthcare experience.
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Introduction

Particularly in the context of tertiary hospitals, telemedicine—the practice of providing healthcare remotely using telecommunication technologies—has seen notable expansion recently [1, 2]. Particularly during the COVID-19 epidemic, telemedicine has become a vital tool to improve healthcare delivery in Riyadh, Saudi Arabia, a rapidly growing city [3,4]. Incorporating telemedicine into Riyadh's tertiary hospitals has enabled ongoing patient care, therefore guaranteeing that limitations on in-person visits do not interrupt healthcare services [5]. This change toward online consultations has garnered a lot of interest, therefore fueling a body of research meant to assess its results in both medical and non-clinical contexts.

Among the main criteria used to assess how well telemedicine is working, patient satisfaction emerges as the main result [6]. Prior research have shown that patient satisfaction with telehealth services is mostly determined by a number of variables including access, convenience, communication quality, and the purportedly effective virtual consultations [7–9]. The increasing use of telemedicine in Riyadh's third-level hospitals is thought to have increased patient satisfaction by lowering waiting times and enabling patients to access From the coziness of their homes, healthcare services are available [10]. Still, there is little empirical data available on the satisfaction of patients employing telemedicine in Riyadh's healthcare system; therefore, a systematic review is required to gather current knowledge on this topic.

Cost-effectiveness is still a vital second result demanding more investigation in addition to patient satisfaction [11]. Studies from all over the world showed that telemedicine can greatly lower healthcare expenses by lowering in-person visits, enhancing the efficiency of treatment delivery, and decreasing hospital readmission rates [12]. Regarding Riyadh's tertiary hospitals, one must ascertain whether telemedicine solutions have produced significant financial benefits for patients as well as for medical facilities [10]. Examining cost-effectiveness studies will enable one to assess whether the funds put toward telehealth infrastructure and services yield a fair return on investment.

The obstacles and enablers to the adoption of telemedicine in Riyadh's hospitals should be another crucial factor in assessing its results. Key obstacles to the widespread use of telemedicine include lack of training for healthcare providers, technological limitations, and patients' technological literacy as found in several investigations [13,14]. Facilitators, on the other hand, include policy support from the

government, changes in telecommunication infrastructure, and the increasing acceptance of telemedicine among healthcare professionals and patients [13,14]. Enhancing telehealth services and guaranteeing they are sustainable long-term depends on knowing the obstacles and facilitators unique to Riyadh's tertiary hospitals. Through a systematic review of telemedicine outcomes in Riyadh's tertiary hospitals, this research seeks to fill these gaps in the current knowledge. This study aims to give a thorough grasp by studying patient satisfaction as the main outcome and investigating cost-effectiveness, hurdles, and facilitators as secondary outcomes. For researchers, healthcare professionals, and lawmakers trying to maximize telemedicine services in the area, such a study will be very useful.

Methodology

A systematic review of the current research on telemedicine results in tertiary hospitals in Riyadh, Saudi Arabia, this study was done. To improve healthcare delivery, Riyadh's tertiary hospitals have led the charge using telemedicine technology. These hospitals have added telemedicine into several areas of medicine, including regular consultations, chronic disease management, and specialist referrals. The review emphasized articles and research looking at results of telemedicine, patient satisfaction, cost-effectiveness, and the impediments and enablers in the Riyadh healthcare environment.

Included in the criteria for the research were studies on (1) telemedicine results in tertiary hospitals in Riyadh or more generally in Saudi Arabia; (2) primarily targeting patient satisfaction; (3) studies including cost-effectiveness, obstacles, and enablers for telemedicine deployment as secondary outcomes; (4) studies published in English or Arabic within the last 10 years (2013–2023) to guarantee the relevance of data; and (5) both quantitative and qualitative studies addressing patient satisfaction and related outcomes. The exclusion criteria comprised (1) studies concentrating on telemedicine in rural or non-tertiary healthcare environments; (2) studies devoid of direct results reporting. pertaining to telemedicine adoption in hospitals in Riyadh; and (3) papers that did not emphasize results like patient satisfaction, cost-effectiveness, or obstacles/facilitators.

This study used a systemic review approach, which entailed a methodical, organized search of the literature to combine findings from pertinent research. While also covering secondary outcomes including cost-effectiveness, the review mostly

emphasized research examining patient satisfaction with telemedicine services in tertiary hospitals in Riyadh. Telemedicine implementation obstacles and enablers. Based on the criteria listed below, studies were chosen using a purposive sampling approach: (1) Relevance: Only studies concentrating on telemedicine outcomes in secondary hospitals in Considered were Riyadh or Saudi Arabia; (2) Studies of great methodological quality assessed using established appraisal instruments were given preference; (3) Only publications To make sure the analysis incorporated the most up-to-date information, papers published in the last ten years (2013–2023) were included. Through prominent databases like PubMed, Scopus, Google Scholar, and the Saudi Digital Library, relevant gray literature including government Reports and institutional papers were also taken into account.

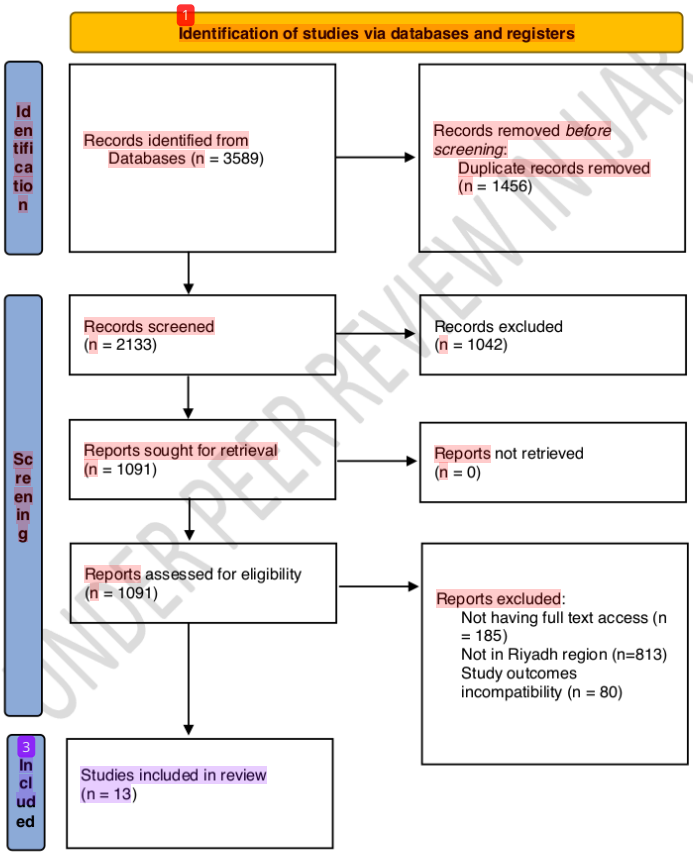
Data gathering depended on a thorough and methodical search plan to extract pertinent studies from several academic and clinical databases. Search terms included "telemedicine," "patient satisfaction," "cost-effectiveness," "barriers," "facilitators," and "tertiary hospitals in Riyadh." Every study highlighted in the review was evaluated for (1) study type—e.g., randomized controlled trials, cohort studies, qualitative research—and (2) primary outcomes: patient satisfaction with telehealth), (3) secondary outcomes (cost-effectiveness, challenges, facilitators), and (4) population traits (patient demographics, healthcare setting). Relevant data from each study—including study design, sample size, outcomes measured, results, and major conclusions—was gathered using a data extraction form.

Throughout the review process, references were organized, screened, and handled using a reference management program Mendeley. Duplicate articles were eliminated and comprehensive full-text screening was performed to guarantee investigations fulfilled the inclusion criteria. Key themes and trends across studies were highlighted narratively by synthesizing the findings of the systematic review. Qualitative data were examined using a thematic synthesis methodology, with attention on obstacles and facilitators to telemedicine use as well as the drivers of patient satisfaction.

Results

With a variety of sample sizes, thirteen studies included in this systematic review (Figure 1, [15–27]) were carried out over several telemedicine services in tertiary hospitals of Riyadh. participant demographics, sizes, and telemedicine service kinds. With most studies concentrating on Saudi subjects (ranging from 54% to 93.59% Saudi), the sample sizes varied from 49 to 607 participants. Participants ranged in age;

many studies such had a median age of almost 40 years. [15, 25]. Though gender distribution varied across studies, several studies as those by Alharbi et al. (2021) and Alomar et al; (2025) reported up to 64.75% were female participants [18,26]. With several studies concentrating on general, the telemedicine service types were varied, including call centers; tele-retinal screening; virtual clinics; tele-emergency services; telepsychiatry; and telemedicine clinics. Specialist referrals, chronic illness



management, and consultations (Table 1).

Figure 1: PRISMA flow for including studies

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Table 1: General Characteristics of the Studies and Included Participants

Study	Study Design	Sample Size	Participants' Demographics	Mean Age	Gender Distribution	Location	Telemedicine Service Type
Alfaleh A et al., 2021 [15]	Cross-sectional	249	93.59% Saudi, 45% from Riyadh	34.9 ± 9.89	50.2% Male	Saudi Arabia (Riyadh)	937 Call Center &Sehha Application
Alhumud A et al., 2020 [16]	Cross-sectional	163	54% Male, 38% employed, 62% unemployed	44.8	54% Male	Saudi Arabia (Riyadh)	Tele-retinal Screening (Endocrinology Clinics)
Alharbi K et al., 2021 [17]	Cross-sectional	439	54% Male, 45.6% aged 18–39	Various (18-60+)	54% Male	Saudi Arabia (Riyadh)	Virtual Clinics (Various Specialties)
Alomar M et al., 2025 [18]	Cross-sectional	383	70.2% aged 16–39, 64.75% Female, 51.4% Bachelor's degree	N/A	64.75% Female	Saudi Arabia (Riyadh)	Tele-emergency Services
Alqahtani S et al., 2022 [19]	Descriptive Survey	151	74.8% Male, 88.1% Saudi, 70.9% with 0–5 years of experience	31.14	74.8% Male	Saudi Arabia (Riyadh..)	Telemedicine Services (Private Healthcare)
AlFawaz I et al., 2023 [20]	Cross-sectional	60	48.3% Male, 30 junior and 30 senior residents	N/A	48.3% Male	Saudi Arabia (Riyadh)	Telemedicine Clinics (Family Medicine Residency)
Alanazi A et al., 2022 [21]	Cross-sectional	49	51% male, 49% female, 46.9% aged 18-50, 55% from Southern region	N/A	51% Male	Saudi Arabia (Various)	Telemedicine Clinics vs. Face-to-Face (FTF) Visits
Abass G et	Cross-	200	70% aged	N/A	70%	Saudi	ED-CAHPS

al., 2021 [22]	sectional		35–64 years, 55% with secondary or higher education		Male	Arabia (ED)	Survey (Telephonic Interviews)
Alshareef M et al., 2021 [23]	Retrospective	339	60.2% Male	41 ± 14.4	60.2% Male	Saudi Arabia (Riyadh)	Telemedicine in Rhinology (Phone Consultations)
Almalky A et al., 2021 [24]	Cross-sectional	141	56% Female, 85.8% residing in Riyadh	39.39 ± N/A	56% Female	Saudi Arabia (Riyadh)	Telepsychiatry (Phone Consultations)
Bin Traiki T et al., 2020 [25]	Retrospective Cross-sectional	331	70% Female, Median age 53	53	70% Female	Saudi Arabia (Riyadh)	Patient Satisfaction & Surgical Outcomes Survey
Alharbi R, 2023 [26]	Cross-sectional	607	86.5% Saudi, 57.33% Male, 41.52% aged 31-40	N/A	57.33% Male	Saudi Arabia	Telehealth Awareness, Practices, Barriers
Habib S et al., 2023 [27]	Cross-sectional	163	N/A	N/A	74.2% Male, 25.8% Female	Saudi Arabia (Riyadh)	Physician Telemedicine Use Survey

Overall patient satisfaction with telemedicine services was high across the studies reviewed. Alfaleh et al. (2021) reported an 83.14% satisfaction rate, with key factors influencing satisfaction being physician recommendations, communication, and waiting times [15]. Similar findings were observed in studies such as Alhumud et al. (2020), which showed 80.4% overall satisfaction, with emphasis on accessibility to healthcare professionals and convenience [16]. Alomar et al. (2025) also reported high satisfaction due to time-saving and convenience, as well as the quality of communication during consultations [18]. However, not all studies showed uniformly high satisfaction. For instance, Alharbi et al. (2021) found that only 68.1% of patients were satisfied, with gender, age, education, and familiarity with telemedicine being significant influencing factors [26].

Physician satisfaction varied as well. Alqahtani et al. (2022) reported a relatively low satisfaction rate of 27.8%, with dissatisfaction stemming from the lack of face-to-face interactions, despite perceived time savings and increased productivity [19]. Studies like AlFawaz et al. (2023) highlighted that residents in family medicine had mixed feelings about telemedicine, with 71.7% preferring in-person visits [20]. Overall, while patient satisfaction tended to be higher, there were concerns about physician satisfaction, mainly due to the limitations of telemedicine in providing comprehensive care and the challenges associated with remote consultations (Table 2).

Table 2: Primary Outcomes (Patient/Physician Satisfaction)

Study	Primary Outcome	Satisfaction Level	Factors Influencing Satisfaction
Alfaleh A et al., 2021 [15]	Patient Satisfaction	83.14% satisfied (general)	Physician recommendations, communication, listening skills, waiting time
Alhumud A et al., 2020 [16]	Patient Satisfaction	80.4% overall satisfaction	Interpersonal manner, accessibility to ophthalmologist, convenience of screening
Alharbi K et al., 2021 [17]	Patient Satisfaction	68.1% overall satisfaction	Gender, age, education, familiarity with telemedicine
Alomar M et al., 2025 [18]	Patient Satisfaction	High satisfaction overall	Time-saving, convenience, quality of audio and communication, registration
Alqahtani S et al., 2022 [19]	Physician Satisfaction	27.8% satisfied, 28.5% dissatisfied	Perceived time savings, improved productivity, comfort in using telemedicine
AlFawaz I et al., 2023 [20]	Resident Satisfaction	71.7% prefer in-person visits	Less clinical experience, supervision, and communication with attending supervisor
Alanazi A et al., 2022 [21]	Patient Satisfaction	Similar satisfaction to FTF visits	Similar satisfaction, cost-effectiveness, less time and travel required
Abass G et al., 2021 [22]	Patient Satisfaction	36% (Doctor care), 43% (Nursing care), 56% (Discharge process)	Waiting time, pain management, quality of doctor/nurse care, follow-up care
Alshareef M et al., 2021 [23]	Patient Satisfaction	83.3% satisfied	Quality of voice call, trust in telemedicine, time and cost savings
Almalky A et al., 2021 [24]	Patient Satisfaction	80.1% (structure), 95.7% (process), 96.5% (outcome)	Comfort, privacy, ease of access, clinicians' skillfulness
Bin Traiki T	Patient	77.6% (Nurses), 93%	Quality of care, respect,

et al., 2020 [25]	Satisfaction	(Doctors)	communication, sanitary measures, discharge instructions
Alharbi R, 2023 [26]	Telehealth Satisfaction	90.44% aware of telehealth	Awareness, validity, reliability, and willingness to adopt telehealth
Habib S et al., 2023 [27]	Physician Satisfaction	59.5% usage during COVID-19	Convenience, ease of use, technology barriers, patient acceptance

The secondary outcomes of the studies primarily focused on cost-effectiveness, accessibility, barriers, and facilitators related to the implementation of telemedicine in Riyadh's tertiary hospitals. Several studies indicated the positive cost-effectiveness of telemedicine services, with savings in travel costs and time being commonly noted. For example, Alomar et al. (2025) highlighted that telemedicine saved patients time and reduced the need for travel, which led to high satisfaction [18]. Similarly, Alanazi et al. (2022) found that telemedicine significantly reduced travel costs and provided better convenience, especially for patients in remote areas [21].

Barriers to telemedicine were consistently identified across studies. Technical difficulties, such as issues with communication and lack of video options, were often mentioned, with studies by Almalky et al. (2021) and Habib et al. (2023) noting that these barriers hindered the effectiveness of telemedicine in some settings [24,27]. Privacy concerns and the lack of face-to-face interactions were also frequently cited as challenges, particularly in specialties requiring physical examination [19,26].

In terms of facilitators, the studies emphasized the convenience and time-saving aspects of telemedicine, which were identified as major drivers of its success. For instance, studies by Alharbi R (2023) and Bin Traiki et al. (2020) showed that telemedicine improved accessibility to healthcare services, particularly in emergency settings, and reduced the need for in-person visits [25,26]. Furthermore, the positive attitudes of healthcare professionals towards telemedicine were noted in studies like Habib et al. (2023), where physicians recognized the benefits of telemedicine in reducing face-to-face consultations, especially during the COVID-19 pandemic [27].

The results also revealed that telemedicine had a positive impact on surgical outcomes, particularly in terms of low ICU admission rates and minimal complications, as shown by Bin Traiki et al. (2020) [25]. The study reported that 93% of patients were satisfied with the doctor's care and 77.6% with nursing care, which highlights the

196 overall positive response from patients to telemedicine consultations, even for
197 surgical cases (Table 3).

Table 3: Secondary Outcomes

Study	Secondary Outcomes	Key Findings	Barriers	Facilitators
Alfaleh A et al., 2021 [15]	Cost-effectiveness	Not explicitly addressed	N/A	High user satisfaction leading to willingness to recommend
Alhumud A et al., 2020 [16]	Accessibility & Referral	Difficulty in ophthalmologist referral (60% concerned about wait time)	Inadequate access to ophthalmologist, concern about diagnosis accuracy	High satisfaction with tele-retinal screening process
Alharbi K et al., 2021 [17]	Cost-effectiveness	Not directly discussed	Inability to meet healthcare professionals face-to-face, doubts about diagnostic accuracy	Clear information on how to use telemedicine, trust in health information, convenience
Alomar M et al., 2025 [18]	Cost-effectiveness & Advantages	Time-saving, reduced travel costs	Limited video use, communication limitations	High satisfaction with time-saving, convenience
Alqahtani S et al., 2022 [19]	Cost-effectiveness	Positive impact on job effectiveness and productivity	Lack of face-to-face interaction, occasional dissatisfaction	Time-saving, greater productivity, cost-effectiveness
AlFawaz I et al., 2023 [20]	Barriers to Effective Training	Reduced clinical experience, supervision, and interaction	Lack of in-person visits, less interaction with supervisor	Communication skill improvement, future career impact
Alanazi A et al., 2022 [21]	Cost-effectiveness	Telemedicine provided substantial cost savings	Travel costs, need for in-person visits	Lower cost, less absence from work, improved convenience
Abass G et al., 2021 [22]	Satisfaction Domains	Low satisfaction with pain management, doctor time, and medication information	Long waiting times, communication issues	Follow-up care questions, quality of care within 30 minutes
Alshareef M et al., 2021 [23]	Cost-effectiveness	Time and cost efficient	Privacy concerns, no video option	Easy access to specialist care, cost and time

				savings
Almalky A et al., 2021 [24]	Barriers and Facilitators	Not discussed explicitly	Technical issues with communication	Comfort, easy access to clinicians, skillfulness of clinicians
Bin Traiki T et al., 2020 [25]	Surgical Outcomes	Low ICU admission rate, few complications	Infection risk, emergency surgeries	High satisfaction with hospital environment, communication, and respect
Alharbi R, 2023 [26]	Awareness & Practice	90.44% of HCPs aware, 59.3% practicing	Resistance to telehealth adoption	Positive attitudes towards validity, reliability, and benefits of telehealth
Habib S et al., 2023 [27]	Barriers & Facilitators	Telemedicine use increased during COVID-19	Technical difficulties, privacy concerns	Reduces need for face-to-face visits, convenience in emergency settings

Discussion

This systematic review reveals the various results related with telemedicine adoption in tertiary hospitals in Riyadh, Saudi Arabia, therefore exposing both its benefits and drawbacks in the healthcare system. Although patient satisfaction with telemedicine services is generally strong, according to research results from different studies it is affected by elements including accessibility, service kind, and communication. Most research indicated overall patient satisfaction scores ranging from 68.1% to 93%, some studies found particular factors including gender, age, and familiarity with telehealth. as major determinants affecting patient satisfaction [26]. For instance, in investigations like those by Alfalah et al. (2021) and Alomar et al. (2025), the satisfaction rates were very high, with patients appreciating Telemedicine visits provide time-saving qualities [15,18]. These results correspond with earlier studies showing that telemedicine increases customer satisfaction by offering comfort and lowers travel expenses [1, 13, 29, 30].

But the review also notes that patient satisfaction differs depending on the kind of telemedicine service being used. Because of their ease and availability, telemedicine systems providing phone consultations such as those used in tele-psychiatry and rhinology seem to get greater degrees of satisfaction [23, 24]. On the other hand, more technically demanding services like video consultations were linked with somewhat

less satisfaction since problems like audio and video quality arose. which can influence the patient experience [18]. These results support research underlining the essential part of communication quality in telemedicine sessions, in which patients' pleasure is dependent mostly on clear, effective communication [31–33].

Nevertheless, the contradictory results on physician satisfaction highlight serious issues about the constraints of telemedicine for healthcare practitioners. Alqahtani et al. (2022) observed that Just 27.8% of doctors were content with telemedicine; discontent resulted from the incapacity to conduct physical exams and the lack of personal patient contacts [19]. This is in line with other research showing that many healthcare professionals preferred in-person visits, especially for more challenging clinical evaluations [34]. Healthcare professionals [27] saw nevertheless the ability of telemedicine to raise efficiency, shorten wait times, and expand access to treatment. Though telemedicine is practical, these results imply that it does not quite substitute for the need for in-person contacts especially in areas needing hands-on physical exam.

The secondary results of this study support the theory that although telemedicine provides great accessibility and cost-effectiveness, obstacles prevent its extensive use. Especially for patients who would otherwise have to travel great distances for in-person visits, numerous studies found telemedicine saves both time and money [21]. Moreover, the time-saving component of telemedicine was thought of as a major enabler for its adoption, helping to raise patient satisfaction with services such tele-emergency and tele-psychiatry [35,36]. Although in terms of ease and financial savings there are evident advantages, problems like technological problems, privacy concerns, and the lack of video consultation exist. Options were noted as obstacles to successful telemedicine deployment [24,27]. The literature has repeatedly flagged these obstacles; technical problems and security data concerns have impeded the easy acceptance of telemedicine services [37,38].

The research also showed that the cost-effectiveness of telemedicine is seen differently across many specialties and services. For instance, Alharbi et al. (2021) observed that questions about diagnostic accuracy may result from the failure to meet healthcare professionals face-to--face. Shared worry from other research on telemedicine in clinical environments [26]. Moreover, while numerous research emphasized cost reductions, some studies did not specifically discuss the financial

effects of telemedicine, therefore suggesting a need for Further study will assess how telehealth affects healthcare professionals and patients economically [26].

Although telemedicine seems to benefit healthcare distribution—especially by lowering patients' travel expenses and time spent—it also introduces particular challenges about technical problems and the dearth of physical contact between patients and healthcare professionals. Telemedicine solutions provided in hospitals with proper infrastructure, open communication channels, and efficient patient management as seen in studies like Bin Traiki et al. (2020) Higher satisfaction and superior results were linked with systems [25]. This suggests that the success of telehealth depends mostly on how well it is incorporated into the level of readiness of patients and healthcare professionals as well as healthcare system.

Conclusion

Finally, although telehealth has been shown to be a useful tool for enhancing patient satisfaction, accessibility, and efficiency in tertiary hospitals in Riyadh, there still Problems to be tackled by barriers. To guarantee that telemedicine can completely reach its potential in improving healthcare delivery, technical problems, privacy issues, and the drawbacks of remote consultations in some fields must be defeated. Future studies should investigate solutions to reduce these obstacles, advance technology, and guarantee that telemedicine services are incorporated into the main healthcare infrastructure to maximize their advantages.

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