

Original Article

A Qualitative Exploration of Stakeholder-Perceived Telerehabilitation Needs in Saudi Arabia

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Abstract

Background. Tele rehabilitation (TR) implementation often fails to persist beyond research phases due to various factors and one of them being absence of comprehensive needs assessment. Despite growing TR adoption in Saudi Arabia aligned with Saudi Vision 2030, we are not aware of any studies that have systematically explored stakeholder perceived needs for TR across rehabilitation disciplines. This qualitative study aimed to explore the "felt" needs for TR among key stakeholders in Saudi Arabia, (1) identify stakeholder-specific needs that TR could address; (2) determine patient populations most suitable for TR; (3) explore preferences regarding modes of TR delivery; and (4) examine clinicians' perceptions of how TR might influence their professional practice, including time utilization, productivity, and patient prioritization. **Methods.** This qualitative study employed a descriptive, inductive thematic analysis approach. Between September 2021 and September 2022, semi-structured interviews were conducted with a purposive sample of 32 participants across four stakeholder groups: 20 rehabilitation clinicians (physical therapists, occupational therapists, speech-language pathologists), 8 patients, 2 parents of pediatric patients, and 2 rehabilitation service managers. **Results.** Clinicians reported that TR could address patients' needs for education, home exercise program compliance, monitoring, and access to care. Patients emphasized convenience, accessible services, education, and compliance support. Managers identified patient progress monitoring and convenient access as priority needs addressed by TR. Additionally, clinicians expressed that TR could optimize time utilization, increase productivity, and enable patient prioritization. Videoconferencing emerged as the most preferred delivery mode. **Conclusion.** These findings provide foundational, context-specific evidence to inform TR implementation planning, policy development, and resource allocation in alignment with national digital health transformation goals. Findings should be interpreted within the context of this purposive qualitative sample.

Keywords: Telemedicine, Tele Rehabilitation, Physiotherapy, Patient services, Healthcare Policy

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Introduction

Tele rehabilitation (TR) is a part of the broader umbrella of Telehealth and can be defined as “the use of telecommunication technology to provide health care and health information over a distance” (Niknejad et al., 2021 and Burns et al., 1998). It was established initially by the National Institute on Disability and Rehabilitation Research, US Department of Education in 1997 (Winters, 2002). TR encompasses the remote delivery of rehabilitation services across disciplines including physical therapy (PT), occupational therapy (OT), and speech-language pathology (SLP), using technologies such as videoconferencing, sensor-based systems, and virtual reality.

Internationally, TR has demonstrated potential to improve access to rehabilitation services, enhance patient compliance with home exercise programs, and reduce healthcare costs while maintaining clinical outcomes comparable to face-to-face care for selected populations (Mani et al., 2017; Jirasakulsuk et al., 2022). Systematic reviews have shown acceptable reliability for remote musculoskeletal and neurological assessments when structured protocols are followed (Brito et al., 2022). The COVID-19 pandemic accelerated TR adoption globally, as healthcare systems sought to ensure continuity of services while adhering to precautionary measures (Bican et al., 2021).

In Saudi Arabia, TR remains relatively nascent but is gaining traction, particularly within PT, OT, and SLP services. This momentum is driven by two intersecting forces: the urgent need for remote care during the COVID-19 pandemic, and the longer-term digital health transformation agenda under Saudi Vision 2030. The Ministry of Health (MOH, 2021) considers e-health an essential transformation agent and has crafted an e-Health Strategy and five-year plan aimed at improving patient care, connecting providers at all levels, measuring

healthcare delivery performance, and transforming services to a consistent, world-class standard. E-health encompasses digital tools such as health information systems, telemedicine, mobile health (m-health) applications, electronic health records (EHRs), and remote patient monitoring (Eysenbach, 2001).

Early studies from Saudi Arabia indicate generally positive perceptions of TR usability among musculoskeletal physical therapists, measured via the Telehealth Usability Questionnaire (TUQ). The clinical effectiveness of TR has been reported as favorable for patients with musculoskeletal conditions in improving pain self-efficacy, function, and patient satisfaction (Alrobaiee & Alzahrani, 2025; Alsobayel et al., 2021).

However, a majority of the studies acknowledge that technical difficulties, expense, staff expertise, lack of IT knowledge, policy/guidelines, and confidentiality concerns were the primary obstacles to TR implementation or use. Despite these positive indicators, implementation remains challenging. A majority of existing studies acknowledge that technical difficulties, expense, staff expertise, lack of information technology (IT) knowledge, absence of clear policies or guidelines, and confidentiality concerns are primary obstacles to TR implementation or sustained use (Aloyuni et al., 2020; Ullah et al., 2021). Furthermore, existing research has largely focused on monitoring and follow-up applications, with less attention to initial assessments or comprehensive interventions (Alrobaiee & Alzahrani, 2025). Critically, even where TR has been introduced, it often fails to persist beyond research phases—a phenomenon attributed in part to the absence of systematic, multi-stakeholder needs assessment prior to implementation (AlDossary et al., 2017).

Even though the use of TR has been growing, there is little information available regarding the felt need,

long-term utilization of TR by various stakeholders including clinicians, patients, and managers, cost-effectiveness, usability, adherence and usage of TR from the perspective of the above defined stakeholders, especially the patients from different demographic groups (elderly, rural, low tech-literacy).

This study is guided by the NASSS (Non-adoption, Abandonment, and challenges to the Scale-up, Spread, and Sustainability) framework (Greenhalgh et al., 2017), which provides a structured approach to analyzing the multiple interacting domains that influence technology implementation success, including the condition, technology, value proposition, adopters (patients and clinicians), organization, and wider system. This lens ensures that our needs assessment captures not only stakeholder desires but also potential implementation barriers.

Aim of the Study:

To address the identified gap in needs assessment for TR within the Saudi Arabian context, this qualitative study was designed to explore the "felt" needs of multiple rehabilitation stakeholders. The study aimed to:

- (a) Identify the perceived needs of rehabilitation clinicians (physical therapists, occupational therapists, speech-language pathologists), patients, parents of pediatric patients, and rehabilitation service managers that TR could potentially satisfy;
- (b) Determine which patient populations (by age, diagnosis, chronicity, residence, and immune status) stakeholders consider most suitable for TR;
- (c) Explore stakeholder preferences for TR delivery modes, including videoconferencing, sensor-based systems, and virtual reality; and
- (d) Examine clinicians' perspectives on how TR might

impact their professional practice, particularly regarding time utilization, productivity, patient prioritization, therapeutic connection, and quality of care.

Through these aims, this study provides stakeholder-informed evidence to guide the systematic planning and implementation of TR services in alignment with Saudi Arabia's digital health transformation goals.

Materials and Methods

Study Design

This qualitative study employed a descriptive, inductive thematic analysis approach to explore the "felt" needs for tele rehabilitation (TR) across multiple stakeholder groups in Saudi Arabia. The study was conducted between September 2021 and September 2022.

Study Population and Setting

A purposive sample of n=32 participants was recruited from various health care facilities across rehabilitation hospital in Kingdom of Saudi Arabia (KSA). Participants comprised four stakeholder groups as outlined in Table 1.

Table 1. Stakeholders Group

Stakeholder Group	N
Rehabilitation clinicians	20
└ Physical Therapists	15
└ Occupational Therapists	3
└ Speech and Language Pathologists	2
Patients	8
Parents of pediatric patients	2
Rehabilitation service managers	2
Total	32

N: Number of participants

Participants Recruitment and Sample Size

Participants were purposively recruited from rehabilitation departments in tertiary and regional

hospitals across Saudi Arabia to ensure maximum variation in profession, geographic location, and experience with TR. Potential participants were approached by the research team via email and of the 45 individuals approached, 32 agreed to participate (71% response rate). The reasons for non-participation included lack of time (n=8) and lack of interest (n=5). The sample size was determined by information power, aiming for sufficient depth across multiple stakeholder groups. Thematic saturation was discussed within the research team when no new codes or themes emerged from the final three consecutive interviews in each stakeholder group.

Inclusion criteria for clinicians required active employment in rehabilitation services with at least six months of clinical experience. Patients were included if they had received rehabilitation services (either face-to-face or via TR) within the preceding 12 months. Parents of paediatric patients were included if their child had received ongoing rehabilitation care. Managers were included if they held supervisory responsibility over rehabilitation services

Data Collection

Semi-structured interviews were conducted by the first author (HA), a qualified physical therapist with over 10 years of clinical experience in rehabilitation and 5 years of experience in telehealth research. HA had no prior supervisory or clinical relationship with any participants. Interviews were conducted either face-to-face in a private room at the participant's workplace or via Zoom, based on participant preference (one parent was interviewed by phone). The average interview duration was 45 minutes (range: 28–65 minutes). All interviews were audio-recorded using a digital recorder or Zoom's recording function. Recordings were transcribed verbatim, and transcripts were checked for accuracy against the original recordings. Field notes were taken during and immediately after each interview to capture non-verbal cues and contextual observations.

Statistical Analysis

The interview questions were adapted from the works of DeGaetano & Shore (2015, p.28). The questions were structured on the proven advantages of TR like access, patient compliance and cost effectiveness to find out if they can satisfy the needs of the involved stakeholders. Simple inductive thematic analysis was used to present the felt need as reported by the participants. The interview transcript is attached to Appendix I.

Data were analyzed using reflexive thematic analysis as described by Braun and Clarke (2006, 2021). The primary author HA independently coded the transcripts, compared coding, and resolved discrepancies through discussion to ensure consistency. No member checking was performed, as the study aimed for a cross-sectional snapshot of perceptions rather than individual validation.

Coding process

All audio-recorded interviews were transcribed verbatim by the first author (HA). HA read each transcript multiple times to achieve familiarization prior to coding. Initial coding was inductive, meaning codes were derived from the data rather than imposed from pre-existing frameworks. HA generated descriptive codes (e.g., "education as a need," "travel burden," "compliance support"), which were subsequently grouped into candidate themes.

Theme development process

Following initial coding, HA grouped related codes into candidate themes (e.g., all codes related to "time saving" or "travel reduction" were grouped under a "convenience" theme). Candidate themes were reviewed in team meetings against the coded data extracts and the full transcripts. Themes were iteratively refined, split, merged, or discarded based on whether they accurately represented the dataset.

The final thematic structure comprised four domains: (1) patients' needs addressable by TR, (2) therapists' needs addressable by TR, (3) patient populations most suitable for TR, and (4) preferred modes of TR delivery. Within each domain, subthemes were defined and named (e.g., within Domain 1: education, access, compliance, monitoring, convenience, multidisciplinary care, reassurance, frequent sessions).

Trustworthiness was established using Lincoln and Guba's criteria (Alexander 2019). Credibility was enhanced through investigator triangulation and prolonged engagement with the data. Dependability was supported by the audit trail and detailed documentation of the analysis process. Confirmability was achieved by grounding themes in participant quotes and bracketing researcher assumptions through reflexive memoing. Transferability is supported by thick description of participant characteristics and context, allowing readers to assess applicability to other settings.

Ethical Considerations

Ethical approval was obtained from the institutional review board of Frankfurt School of Finance and Management, Germany (8427701). All participants were informed of their right to withdraw at any time without consequences to their care or employment. Confidentiality was maintained throughout data collection, analysis, and reporting.

Results

Participant Characteristics

A total of 32 participants were included: 20 rehabilitation clinicians (15 physical therapists, 3 occupational therapists, 2 speech-language pathologists), 10 patients/parents (8 patients, 2 parents), and 2 rehabilitation service managers. Demographic characteristics are presented in Tables 2.

Table 2: Demographic Characteristics of Study Participants (N=32)

Characteristic	Managers (n=2)	Patients / Parents (n=10)	Clinicians (n=20)	Total / Notes
Sex, n (%)				
Male	1 (50.0%)	7 (70.0%)	12 (60.0%)	20 (62.5%)
Female	1 (50.0%)	3 (30.0%)	8 (40.0%)	12 (37.5%)
Age				
Mean (years)	45.0	See range below	36.0	–
Range / Distribution	40 – 50	2–14 yrs: 2 (20.0%) 22–30 yrs: 1 (10.0%) 31–39 yrs: 4 (40.0%) 50–59 yrs: 1 (10.0%) ≥60 yrs: 2 (20.0%)	–	–
Profession / Specialty, n (%)				
Physical Therapy	2 (100%)	–	15 (75.0%)	17 (53.1%)
Occupational Therapy	–	–	3 (15.0%)	3 (9.4%)
Speech & Language Pathology	–	–	2 (10.0%)	2 (6.3%)
Experience				
Mean (range)	17.5 (15–20)	–	1–5 yrs: 6 (30.0%)	–

			6–10 yrs: 7 (35.0%) >10 yrs: 7 (35.0%)	
Prior Use of TR, n (%)				
Used TR before	–	Patients: 4 (40.0%)	12 (60.0%)*	–
Did not use TR before	–	Patients: 6 (60.0%)	5 (25.0%)*	–
Used TR prior to COVID-19	–	–	2 (10.0%)	–

*Note: Percentages reflect the distribution within the clinician group.

Thematic analysis revealed four domains of "felt" needs for tele rehabilitation (TR): (1) patients' needs addressable by TR; (2) therapists' needs addressable by TR; (3) patient populations most suitable for TR;

and (4) preferred modes of TR delivery. Table 3 summarizes the key themes and their interpretive dimensions.

Table 3. Research engagement indicators among respiratory therapists in Saudi Arabia (N = 291).

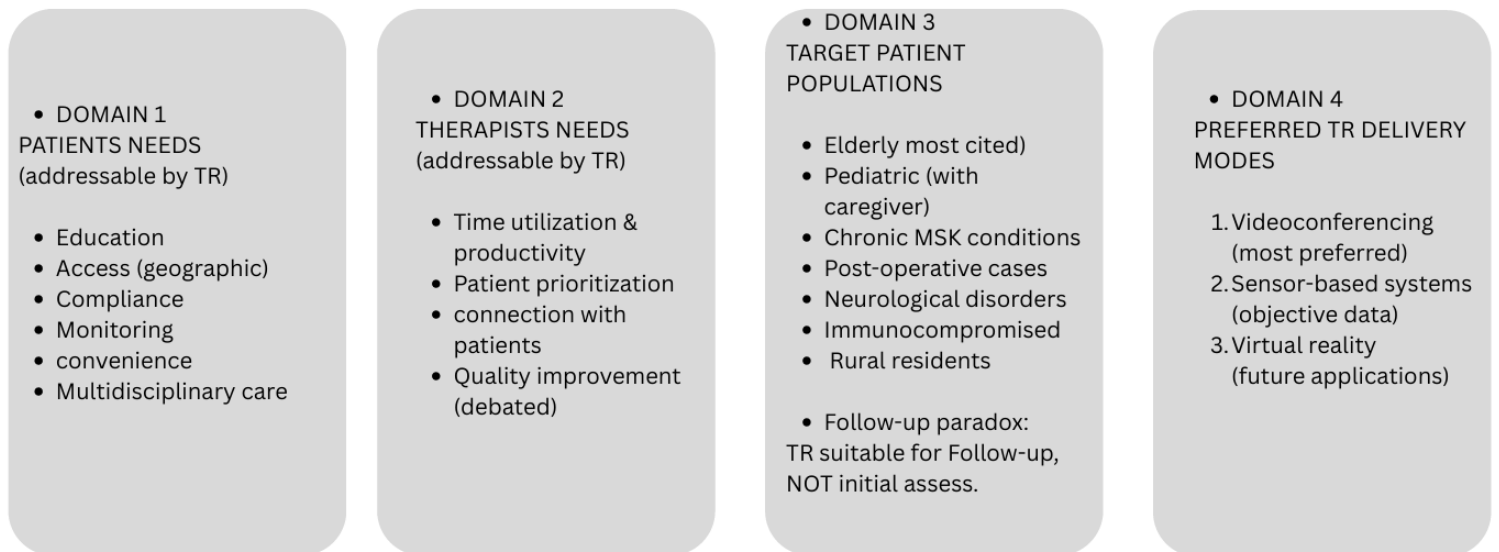
Domain	Descriptive Finding	Interpretive Layer	Implementation Implication	Representative Quotes
Patients' Needs	Education, compliance, monitoring, convenience	TR is framed as solution to accountability gap between visits, not clinical treatment gap	Design TR around home program reinforcement, not remote hands-on therapy	"Education is the stronger part of TR" (Practitioner 4) "TR would at least remind me" (Patient 4)
Therapists' Needs	Time utilization, productivity, patient prioritization	Productivity framing reflects unspoken organizational pressures (caseload targets, waitlists)	Address workload expectations before TR rollout; clarify productivity metrics	"I could double that with well-set-up TR" (Practitioner 18) "Would decrease crowdedness in the clinic" (Practitioner 20)
Target Populations	Elderly, chronic MSK, rural, immunocompromised	"Suitability" is socially constructed around perceived risk of travel, not clinical evidence	Expand criteria based on evidence, not perceived risk alone	"Elderly will have sons or grandsons familiar with technology" (Practitioner 6) "Vestibular rehabilitation can be achieved easily by TR" (Practitioner 12)
Preferred Modes	Videoconferencing (17/20)	Preference reflects lowest technological barrier, not clinical optimization	Tiered model: VC for education/follow-up; sensor-based for objective monitoring	"Let us use the tools already being used by patients" (Practitioner 4) "How can I know if my patient has stable heart rate seeing only his face?" (Practitioner 17)
Manager Perspective	Access, convenience,	TR viewed as resource	Align organizational and clinical	"Most patients could be helped remotely with less

	monitoring, efficiency	optimization tool filling structural gaps	incentives; adjust productivity metrics	resources" (Manager 1) "Two hours... can be saved by TR" (Manager 2)
Clinician–Manager Divergence	Clinicians: education, connection; Managers: efficiency, throughput	Misaligned incentives threaten adoption	Provide protected training time; recognize TR labor in workload models	"Quality will not be improved or even be comparable to face-to-face" (Practitioner 14) "It should be integrated into preventive care" (Practitioner 17)
Digital Literacy	Variable among patients and clinicians	eHealth literacy as modifiable determinant of TR suitability	Structured digital literacy assessments; family/caregiver involvement	"Therapist close to correct me" (Patient 6) "Elderly will have sons or grandsons familiar with technology" (Practitioner 6)

The Figure 1 below illustrates the thematic structure comprised four domains: patients' needs addressable by TR, therapists' needs addressable by

TR, target populations, and preferred delivery modes.

**A Qualitative Exploration of Stakeholder-Perceived Telerehabilitation Needs in Saudi Arabia
THEMATIC FRAMEWORK (4 Domains)**



Note: Based on inductive thematic analysis of 32 participants (clinicians n=20, patients/parents n=10, managers n=2), September 2021 - September 2022.

Figure 1: Thematic framework of stakeholder-perceived Telerehabilitation needs across four domains, derived from inductive thematic analysis of interviews with 32 participants (clinicians, patients, parents, and managers).

Patients' Needs Addressable by TR: An interpretive Analysis

Clinician Perspective

Clinicians identified eight patient needs that TR could address: education, access, compliance, multidisciplinary care, reassurance, monitoring, convenience, and frequent sessions.

Education: Considered the strongest part of TR; needed to provide guidance so patients don't miss services due to lack of knowledge.

Access: Critical for remote patients lacking local facilities, though some clinicians limit TR access to follow-up patients (face-to-face needed for initial hands-on assessment).

Compliance & Monitoring: TR can boost compliance via weekly virtual sessions, reduce no-show rates, help patients commit to home programs, and allow monitoring of exercise correctness especially for chronic paediatric conditions.

Convenience: Valued in paediatrics (e.g., using dolls to demonstrate exercises, reducing crying/kicking) and for working patients (reduces need for official time off; care can be received at work).

Multidisciplinary Care: TR can unify care team messages (reducing confusion, especially for elderly patients) and address complex cases like Complex Regional Pain Syndrome.

Reassurance & Frequent Sessions: Needed particularly for speech therapy; also includes "co-therapy" (e.g., combining speech rehab with behavioural/psychological support).

Interpretive analysis:

The analysis highlights a key tension in how tele-

rehabilitation (TR) is framed: prioritizing education an informational, non-manual task legitimizes TR by aligning with clinician concerns over scope, safety, and professional identity. While this framing enables low-risk adoption, it risks marginalizing TR's broader capabilities (e.g., remote assessment, monitoring, active interventions like vestibular rehab). Thus, the very strategy that facilitates initial acceptance may inadvertently constrain TR's therapeutic potential.

Clinicians accept telehealth (TR) for geographic access but reject it for clinical access, privileging touch-based assessment as the gold standard. This persists despite evidence that structured remote exams are reliable, indicating the real barrier is not evidential but professional preserving hands-on assessment as a core site of professional identity.

The analysis also identifies the core problem as an accountability gap between in-person visits, where clinicians have no visibility into patient adherence. Tele-rehabilitation (TR) is valued not for superior treatment, but for compressing the feedback loop turning weeks of uncertainty into days or hours of oversight. Practitioner 12's quote "I want to know if he is doing exercises correctly in between" highlights that the real need is remote supervision, not remote treatment. This distinction warns against over-investing in synchronous, real-time sessions; for many patients, asynchronous monitoring (e.g., video submissions with delayed feedback) may suffice, whereas real-time videoconferencing risks over-engineering the solution relative to the actual demand.

Furthermore, the interpretation reframes convenience as an equity issue rather than an efficiency one. It argues that what appears as preference for ease actually masks structural exclusion: for caregivers of disabled children (e.g., clinic visits triggering distress like crying or kicking,

home allowing child-led play), and for employed adults facing rigid work schedules. Consequently, tele-rehabilitation (TR) addresses not just hassle but fundamental barriers to access, making convenience a social determinant of health.

Lastly, the analysis highlights that multidisciplinary therapeutic radiography (TR) is currently aspirational, not operational. Unlike education, compliance, and convenience which clinicians

support with concrete examples multidisciplinary care is discussed hypothetically using vague terms like “unify the message.” This gap stems from organizational barriers (scheduling, data sharing, reimbursement), not technology. Given that no clinician described an active multidisciplinary TR workflow, implementation should first establish single-discipline TR (e.g., physical therapy follow-ups), then target multidisciplinary applications as a later-stage goal.

Table 4 Summary of Interpretive Patterns (1.1 Clinician Perspective).

Descriptive Category	Interpretive Insight	Implementation Implication
Education	TR's legitimized function; protects hands-on therapy from substitution	Position TR as education platform first; add clinical functions incrementally
Access	Stratified into geographic (good) vs. clinical (inferior); reflects professional identity protection	Address cognitive barriers to remote initial assessment through competency training, not evidence alone
Compliance & monitoring	TR compresses accountability gap; desire for supervision, not treatment	Consider asynchronous monitoring; synchronous sessions may be over-engineered
Convenience	Reveals hidden labour of access; equity issue, not mere preference	Target TR to high-burden populations (caregivers, rural, working patients)
Multidisciplinary care	Aspirational, not current; no described workflows	Stage implementation: single-discipline first, multidisciplinary later

Patient Perspective:

Patients identified four primary needs: convenience, compliance, access, and education.

Convenience (Poor): Travel time significantly burdens patients (e.g., 2 hours 40 mins total for Patient 6; complex logistics for Parent 2).

Compliance (Improvable via TR): Patients cite lack of motivation and desire for therapist monitoring/reminders as factors that TR could address.

Access & Education (Improved via TR): Home care is

critical (e.g., 50% of care), and TR would provide connection and guidance.

Interpretive analysis: The "convenience" in telehealth (TR) is often dismissed as a preference over clinical rigor, but patient experiences reveal it as a clinical and economic necessity. For Patient 6, travel is counter therapeutic, exacerbating back pain before treatment making TR's convenience a means of preventing iatrogenic harm. For Parent 2, in-person care incurs lost wages, disrupted schedules, and caregiver burden costs that affect adherence

and family functioning. Thus, TR's convenience is a

hard outcome, not a soft benefit.

The patients value structured accountability, not surveillance. As Patient 6's desire for a therapist "close to correct me" indicates, proximal feedback not real-time control bridges the gap between infrequent visits. Asynchronous Telerehabilitation (e.g., recorded exercises with clinician feedback within 24 hours) likely meets this need with less scheduling burden than live videoconferencing.

Furthermore, this analysis highlights that for parents

in pediatric rehabilitation, access and education are functionally inseparable: access enables the real-time guidance needed to implement home-based care, while education without ongoing access is unworkable. The parent's quote illustrates that TR's value lies in maintaining connection to clinical expertise between visits, not replacing hands-on therapy. Consequently, hybrid models alternating in-person with remote sessions may be more acceptable and effective than fully virtual rehabilitation, as they preserve the therapeutic relationship while extending its reach into the home.

Table 5. Interpretive Analysis of Patient-Reported Needs.

Stated Need	Patient Quote	Interpretive Layer	Hidden Dimension	Implementation Implication
Convenience	"My back pain increases before I even arrive" (Patient 6)	Travel is counter therapeutic exacerbates condition	Clinical necessity, not preference	TR should be offered to patients with travel-related symptom aggravation as clinically indicated, not optional
Convenience	"Don't need to leave work... 45 minutes to pick up... 45 minutes to clinic" (Parent 2)	Hidden opportunity costs (wages, caregiver burden)	Economic and family functioning outcome	Include caregiver time and lost wages in cost-effectiveness analyses
Compliance	"TR would at least remind me" (Patient 4)	Patients recognize own accountability limitations	Desire for structured external feedback	Asynchronous check-ins may be sufficient; real-time VC not always necessary
Compliance	"If I feel the therapist is close to correct me" (Patient 6)	Proximal feedback, not surveillance	Accountability gap between visits	Design for 24-hour feedback loop, not real-time monitoring
Access + Education	"50% of my son's care depends on what we do at home" (Parent 1)	Access to <i>expertise</i> , not just appointment	Education as mechanism of access	

Manager Perspective:

Managers identified access, convenience, and

monitoring as key patient needs addressable by TR. *Manager 1 reported: "During the pandemic, most patients could be helped remotely with less

resources, especially those outside Riyadh and those with compromised immunity." *Manager 2 emphasized use of TR in monitoring plateaued patients to prevent deterioration and also suggested that TR may add convenience to the service provided stating that "the patient receives excuse from his work, drives for 45 min to attend the session that takes 30 min and then spends 45 min to go back to his work, about two hours, that can be saved by TR." Furthermore, she also suggested that the access to rehabilitative care would be improved for those receiving home health care stating "Although Home Health Care is implemented in our organization, my staff do not go, however, through TR we can integrate rehabilitation into such care, I believe that TR would satisfy the need for access and in a safe way."

Interpretive analysis: The manager perspectives reveal a distinct organizational logic that differs qualitatively from clinician and patient perspectives in three important ways. Firstly, the managers viewed TR as an efficiency tool saving time, resources, and visits unlike clinicians (who focus on education and connection) and patients (who prioritize access). This organizational framing creates tension because TR's efficiency logic may clash with clinicians' perception of it as added work. Successful implementation requires aligning incentives (e.g., training time, productivity metrics) with efficiency goals. Secondly, the managers identified a underserved group "plateaued patients" who are typically discharged from conventional rehab despite remaining at risk of decline. Unlike clinicians, managers saw TR as enabling a low-intensity maintenance model (periodic check-ins, not full visits) that conventional systems can't easily support, highlighting a potential service innovation for surveillance and early detection. And lastly, the key strategic insight is that TR's value lies in filling structural gaps not substituting for clinic-based rehab. Specifically, TR was seen as something that

can add rehabilitation to home health care where none previously existed (e.g., nursing or personal care visits without a therapist).

2. Therapists' Needs Addressable by TR

Clinicians identified four professional needs that TR could address: patient prioritization, time utilization and productivity, connection with patients, and quality improvement.

Time utilization and productivity was the most commonly identified need (14 clinicians). They highlighted that better time utilization can be achieved by TR as appointment can be scheduled for 15 minutes "...while we see around 10 patients daily; I could double that with well-set-up TR."

Patient prioritization was noted by six clinicians. Practitioner 20 reported that TR "would decrease crowdedness in the clinic," while *Practitioner 12 emphasized, as specialist in rehabilitating patients with vestibular disorders, the need to expand his patient population which is very achievable by TR and outreach programs.

Connection with patients was valued by many. Practitioner 2 stated that "TR will increase my connection with my patients who sometimes go through hassle by calling the operator who transfers their calls to me to ask simple questions." Practitioner 17 reported that her need for connection with the patient can be met by TR. She stated that "post-operative patients may deteriorate without good and continuous rehabilitation." Practitioner 5 who is dealing with lymphedema patients had similar response when she reported that TR will satisfy her need to be connected with her patients in order to help them maintain good health and prevent deterioration. Practitioner 6 reported that TR will enable him to guide his patients and to address their concerns. Practitioner 7 also emphasized the need

for TR to build connection with patients for better commitment. He stated that "When a therapist builds a rapport with patients' overtime, when they are required to come physically, they will realize that it is important and will be more committed." Practitioner 11 reported that TR is the way of "bonding" her with the kids and families stating that "I need to signal care by knowing the daily routine of those kids in their own environment, sometimes we use snapchat! I need to know if they use walker or need assistance, I should be reaching out to them." Practitioner 15 stated that "The continuity of care is what I like the most about TR." Practitioner 16 highlighted that TR will help him to remain posted about his patients' conditions and thus will be able to advise. Practitioner 10 claimed that if she stays in connection with her patients, she will be able to guide them instead of them waiting for the next appointment. Practitioner 20 reported that TR will help her to stay connected with patients who either received face-to-face sessions or TR.

Quality improvement was debated. Some clinicians (1,2,6) felt TR improved quality; others disagreed. *Practitioner 14 stated: "Quality will not be improved or even be comparable to face-to-face." *Practitioner 20 noted: "Lack of hands-on care will affect quality."

3. Patient Populations Most Suitable for TR

3.1 Clinician Perspective

Age: Opinions varied. Elderly patients were most frequently cited as suitable (Practitioners 4,7,8,10,12,15,17). *Practitioner 6 noted: "Elderly will have sons or grandsons familiar with technology to help them." Younger and paediatric populations were also identified, *Practitioner 1 reported that in the paediatrics population aged between 11 and 14 years with no cognitive issues may have a good potential to utilize TR. Furthermore, *Practitioners 3,

11 and 15 noted that TR is suitable for paediatric patients with chronic conditions, which was further supported by *Practitioner 20, a paediatric rehabilitation specialist, that indirect TR (educating caregiver) can be provided to patients up to 2 years old and direct TR can also benefit all paediatric ages.

Diagnosis/chronicity: Chronic musculoskeletal conditions, post-operative cases, neurological disorders, cancer, organ transplants, immunocompromised patients, and vestibular disorders were all cited as suitable to TR. Paediatric cases, including spina bifida and those needing neuromuscular facilitation for developmental milestones, were noted by *Practitioner 1. Acute and subacute post-operative cases were endorsed by five practitioners (2,10,11,14,19), while *Practitioner 2 extended applicability to neurological disorders, orthopaedic conditions, cancer, and organ transplants. Beyond treatment, *Practitioner 17 advocated for TR in preventive care: "It is not smart to use TR only for post-operative care... it should be integrated into preventive care for cardiovascular disorders." Furthermore *Practitioner 6 identified less severe language and voice disorders as suitable, challenging the view that TR is only for subacute or chronic cases, *Practitioner 7 stated: "TR can help acute cases that just need tweaking of their program immediately after injury," a view shared by Practitioners 16 and 18.

Interestingly, Immunocompromised patients (Practitioners 10,12) and those with vestibular/balance disorders were also deemed suitable, with Practitioner 12 noting that "vestibular rehabilitation can be achieved easily and sufficiently by TR." *Practitioner 19 noted that splint-fitting follow-ups could be managed virtually: "We only need to ensure the splint fits well, is comfortable, and has no pressure." However, Practitioners 2,4,7,13,14, and 18 emphasized that TR is suitable

for chronic musculoskeletal cases but limited to follow-up sessions, as "precise hands-on examination needs to be conducted initially" (Practitioner 4). Practitioners 2,13,14 concurred that TR should not be used for first sessions. Finally, Practitioner 20 reported benefits for articulation disorders, stuttering, and language disorders, adding that "teaching feeding can be an example of indirect TR."

Living place: Seven clinicians identified rural residents as ideal TR candidates.

3.2 Manager Perspective

Managers identified paediatrics, post-mastectomy patients, immunocompromised individuals, osteogenesis imperfecta, and chronic musculoskeletal disorders as priority populations (Table 6). *Manager 1 suggested a hybrid model: "One in-person session, one TR, then another in-person," and also saw paediatrics as main target for TR service. She stated that "Paediatric cases come every three to six months for reassessment, they can have a pattern like one in-person session, one TR and then one other in-person." She also suggested that post mastectomy and cancer patients with low immunity are good candidates for TR. She stated that "Reassessment of the range of motion and reinforcement of some manual drainage techniques can be done by TR." *Manager 2 highlighted that neonate with compromised immunity and osteogenesis imperfecta patients are "at risk during movement from home to hospital" and are well-suited for TR.

Preferred Modes of TR Delivery

Clinician preferences varied across three modalities: videoconferencing (image-based), sensor-based, and virtual reality while Five clinicians (1,5,7,14) suggested all modes could be useful depending on

the case.

Videoconferencing was the most widely preferred mode (endorsed by 17 clinicians) as they stated "Let us use the tools already being used by patients."

Sensor-based TR was preferred by 8 clinicians, primarily for objective data. *Practitioner 17 (cardiac rehabilitation) argued: "How can I know if my patient has stable heart rate seeing only his face on the screen? This contradicts medicolegal basics! What we used during COVID-19 is virtual care, not TR!"*

Virtual reality was preferred by 7 clinicians, however they had reservations on use of technology as stated, "Virtual reality will be used by the new generation of rehabilitation specialists."

Discussion

This qualitative study provides, to our knowledge, the first systematic multi-stakeholder exploration of "felt" needs for TR in KSA. Our findings reveal convergence across stakeholder groups clinicians, patients, and managers regarding the potential of TR to address needs for education, convenience, access, compliance, and monitoring. Concurrently, we identified important nuance regarding target populations, delivery modes, and professional practice implications. These findings contribute foundational evidence to inform TR implementation planning within Saudi Arabia's digital health transformation agenda under Vision 2030.

The patients' need for education has been identified by the practitioners as a critical need that can be met by TR followed by the need to improving compliance of patients with their treatment sessions and their home exercise program. Clinicians unanimously reported that "education is the stronger part of TR," while patients and parents similarly valued guidance and teaching, which aligns with the findings by Aljabri

et al (2023) where occupational therapists viewed patient and family education as a key application of Telerehabilitation, enabling "increased therapy availability and access".

Similarly, the prioritization of compliance and monitoring as TR addressable needs resonates with international evidence. Georgas et al (2025) study demonstrated that digital interventions incorporating real-time monitoring and adherence tracking significantly improved patient compliance. These findings are in agreement with ours where the clinicians found TR help addresses the accountability gap between face-to-face visits.

A striking finding was that 14 of 20 clinicians framed TR primarily as a tool for time optimization and productivity gain, with Practitioner 9 stating they "could double" their daily caseload using 15-minute virtual appointments. Interpretively, this productivity framing reveals an implicit organizational pressure unspoken but tangible where clinicians perceive efficiency as a professional expectation. However, this view was not unanimous. Practitioner 14 explicitly countered: "Quality will not be improved or even be comparable to face-to-face." This tension between productivity and quality is not merely theoretical; it reflects a fundamental implementation risk. Contextualizing with literature, Drake et al. (2019) demonstrated that productivity gains from TR are contingent on infrastructure (broadband access), reimbursement parity, and workflow integration—conditions not yet uniformly present in Saudi Arabia. Thus, the productivity clinicians anticipate may not materialize without parallel investments. The implication is that implementation planning must explicitly address quality assurance metrics alongside productivity targets, or risk clinician disillusionment when efficiency gains fail to materialize.

This raises a very important caveat when rolling out the TR services that good internet connection / broadband is although necessary but not sufficient for a successful Tr session and policymakers must address both infrastructure gaps and the broader healthcare system barriers to enable telemedicine use especially in the rural areas.

A notable and potentially consequential finding was the "follow-up paradox": numerous clinicians (Practitioners 2,4,7,13,14,18) explicitly stated that TR should be limited to follow-up sessions, with initial assessments requiring face-to-face hands-on examination. Practitioner 4's caution that "precise hands-on examination needs to be conducted initially" reflects a legitimate clinical concern. However, the paradox lies in the evidence base: systematic reviews have demonstrated acceptable reliability for remote musculoskeletal and neurological assessments when structured protocols are followed (Mani et al., 2017; Jirasaksuluk et al., 2022; Brito et al., 2022). Interpretively, this divergence between perception and evidence suggests that the barrier is not primarily clinical but professional. Hands-on assessment functions as a boundary object for physiotherapy identity a core competency that distinguishes rehabilitation clinicians from other remote healthcare providers. Restricting TR to follow-up preserves this professional boundary. The implication for implementation is critical: simply presenting evidence of reliability is unlikely to change clinician behaviour. Instead, implementation strategies must include competency-based training that explicitly demonstrates remote assessment protocols, supervised practice with feedback, and professional recognition (e.g., continuing education credits) for acquiring remote assessment skills. Without this, the follow-up paradox will persist as a de facto policy that limits TR's scope, regardless of its evidence base.

The evidence base for initial assessment via telerehabilitation is more developed than clinicians in our study perceived. Systematic reviews have demonstrated acceptable reliability for remote musculoskeletal and neurological assessments when structured protocols are followed (Mani et al 2017, Jirasakulsuk et al 2022 and Brito et al 2022). The divergence between clinical perception and evidence highlights the need for structured training programs that build clinician confidence in remote assessment and integration into workflow via competency-based training to enable appropriate TR utilization.

The strong preference for videoconferencing (VC) among 17 clinicians aligns with prior evidence demonstrating that VC supports more accurate clinical decision-making than telephone consultations (TC) (Meyer et al., 2008; Demaerschalk et al., 2012), enhances diagnostic accuracy in emergency neurological assessments (Janssen et al., 2018), and is associated with lower mortality rates (Yuan et al., 2021). Nevertheless, one practitioner (Practitioner 17) expressed a preference for sensor-based systems in cardiac rehabilitation, highlighting a critical limitation of VC. The practitioner's concern "how can I know if my patient has stable heart rate seeing only his face on the screen?" reflects a genuine clinical safety issue. This suggests that while VC may suffice for patient education and exercise demonstration, it is inadequate for rehabilitation contexts that require continuous physiological monitoring. Sensor-based intelligent telemedicine systems have demonstrated utility across various medical domains, including diabetes and cardiac risk prediction, as well as the remote management of heart rate, electrocardiogram signals, glucose levels, pulmonary function, and blood pressure (Poonguzhali & Chakravarthi, 2021; Shivakumar et al., 2014). However, integrating such technologies

into healthcare organizations remains challenging due to barriers such as high costs, technical limitations regarding sensor accuracy and reliability, data transmission and connectivity stability, interoperability, data storage and analysis, security concerns, and user compliance (Albahri et al., 2018). Importantly, the finding that clinicians recognize the value of sensor-based systems for objective monitoring even as they currently prefer VC suggests a readiness for more advanced telemedicine models as infrastructure and training continue to develop.

A cross-cutting theme emerging from our data, though not explicitly coded, is the variable digital literacy among both patients and clinicians. Patient 6's comment about needing "therapist close to correct me" and clinicians' observations about elderly patients requiring family assistance with technology both point to eHealth literacy as a determinant of TR suitability. Differences in the digital literacy of the population remain a major obstacle to widespread adoption of digital health interventions, particularly for elderly populations, especially patients with cognitive and visual impairment, communication barriers, and hearing problems (Narasimha et al 2017 and Merrell 2015). However, eHealth literacy is not a fixed patient characteristic but a modifiable factor that can be assessed and addressed through structured interventions, a well-designed telemedicine workflow, which is combined with appropriate clinician and patient education, can significantly enhance telemedicine use (Che et al 2025).

Lastly, the divergence between how managers and clinicians conceptualize TR's value. Managers framed TR primarily as a resource optimization tool achieving equivalent outcomes with fewer organizational resources, filling structural service gaps (home health integration), and maintaining plateaued patients at low intensity. Clinicians, by

contrast, framed TR around patient education, therapeutic connection, and professional practice concerns (time utilization, productivity, quality). This divergence is not merely semantic; it reflects potentially misaligned incentives. If organizations implement TR to reduce costs or increase throughput (manager logic) but clinicians experience TR as additional uncompensated labor (learning new platforms, troubleshooting technical failures, documenting remote encounters), adoption will likely fail. Implementation science research consistently identifies such incentive misalignment as a primary barrier to technology uptake (Greenhalgh et al., 2017). The implication is that TR implementation strategies must explicitly align organizational and clinical incentives for example, by adjusting productivity metrics to credit remote encounters equivalently to in-person visits, providing protected training time, and recognizing TR-related labor in workload models. Absent such alignment, TR risks becoming another "initiative of the month" that clinicians resist not because they doubt its clinical value but because it makes their work harder without commensurate organizational support.

Contribution to knowledge

This study makes three novel contributions to the literature. First, while prior Saudi research has examined clinician perspectives on TR usability (Alrobaiee & Alzahrani, 2025; Alsobayel et al., 2021) or barriers (Aloyuni et al., 2020; Ullah et al., 2021), no study to our knowledge has systematically integrated the perspectives of clinicians, patients, parents, and managers within a single needs assessment framework. Our findings reveal that while stakeholders converge on TR's value for education and monitoring, they diverge in important ways managers view TR as an efficiency tool, clinicians as a connection tool, and patients as an access tool.

Second, our identification of the "follow-up paradox" (clinicians accepting TR for follow-up but rejecting it for initial assessment despite evidence to the contrary) provides a specific, modifiable implementation barrier previously undocumented in the Saudi context. Third, by applying the NASSS framework (Greenhalgh et al., 2017) to a needs assessment, we demonstrate how pre-implementation stakeholder mapping can predict where non-adoption is likely to occur specifically around clinician professional identity (hands-on assessment) and organizational incentive alignment.

Study Limitations:

The study was conducted between September 2021 and September 2022, during the latter phases of the COVID-19 pandemic when emergency telehealth provisions were active. Stakeholder perspectives may have been influenced by this exceptional context, potentially overestimating willingness to adopt TR in non-pandemic circumstances. Longitudinal research examining post-pandemic TR attitudes is needed.

The sample, while diverse across stakeholder groups, was predominantly physical therapists (15 of 20 clinicians). Occupational therapist (n=3) and speech-language pathologist (n=2) perspectives, while valuable, may not fully represent those professions' views.

The study did not systematically collect data on non-adopters or stakeholders who tried TR and discontinued use, potentially introducing positive response bias.

While we included patients across age ranges, the small sample of pediatric patients (represented through parents) limits understanding of child and adolescent perspectives on TR, which recent research has identified as distinct from caregiver

views.

While efforts were made to bracket assumptions, the interviewer's background as a physical therapist may have introduced professional bias into data collection and interpretation.

The small number of manager participants (n=2) limits the depth and representativeness of organizational perspectives.

Findings are based on data collected during the COVID-19 pandemic, a period when attitudes toward telehealth were exceptionally favorable. Current post-pandemic perceptions may differ, and these findings should be interpreted with this context in mind.

Future research:

This study's findings generate several priorities for future investigation. First, quantitative validation through larger representative surveys across Saudi Arabia's five health regions is needed to establish generalizability of these qualitative findings and quantify regional variations in TR readiness and digital literacy.

Second, implementation science studies applying frameworks such as CFIR or NASSS are essential to systematically identify and address multi-level barriers to TR adoption. Hybrid effectiveness-implementation designs should be prioritized to simultaneously evaluate clinical outcomes and optimize implementation processes in real-world settings, accelerating translation of evidence into practice.

Third, comparative effectiveness research is needed to determine optimal TR configurations across clinical populations and treatment phases. Direct comparisons of videoconferencing, sensor-based,

and virtual reality modalities should examine clinical outcomes, satisfaction, adherence, and resource utilization to inform evidence-based service delivery models.

Fourth, comprehensive health economic evaluations adopting a societal perspective—including patient travel, lost wages, and caregiver burden—are critical to demonstrate TR's value proposition and inform resource allocation and policy decisions.

Fifth, research on digital literacy assessment and intervention is paramount. Studies should develop and validate culturally appropriate screening tools and evaluate structured training programs for both clinicians and patients, particularly for populations with low digital literacy, to ensure equitable TR access.

Finally, as Saudi Arabia advances its Vision 2030 digital health agenda, research on AI-assisted Telerehabilitation represents a strategic frontier. Investigations should explore AI-powered exercise analysis, predictive algorithms for early detection of deterioration or non-adherence, and natural language processing to enhance therapeutic engagement, positioning Saudi rehabilitation services at the global forefront of intelligent health technologies.

Pursuing these priorities will systematically build the evidence base needed for sustainable, equitable, and high-quality TR implementation aligned with national digital health transformation goals.

Conclusion

This multi-stakeholder qualitative study identified convergent "felt" needs for Telerehabilitation across

clinicians, patients, and managers in Saudi Arabia, specifically regarding education, convenience, access to care, and monitoring, indicating strong stakeholder alignment on core implementation priorities.

These findings provide stakeholder-informed evidence to guide systematic TR implementation planning, policy development, and resource allocation aligned with Saudi Arabia's national digital health transformation goals. As the Ministry of Health's eHealth Strategy advances from planning to execution, addressing the implementation prerequisites identified by stakeholders' infrastructure, training, guidelines, and data security can help determine whether TR's potential translates into sustained, equitable, and high-quality rehabilitation services.

Author Contributions

All authors contributed to the study conception and design, material preparation, data collection and analysis.

Ethical Approval and Patient Consent

Ethical approval was obtained from the institutional review board of Frankfurt School of Finance and Management, Germany (8427701). All participants were informed of their right to withdraw at any time without consequences to their care or employment. Confidentiality was maintained throughout data collection, analysis, and reporting. This research

carried on human data in compliance with Declarations of Helsinki (2013).

Data Availability Statement

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Conflicts of Interest

The authors declare no potential conflicts of interest in this study.

Declaration of generative AI and AI-assisted technologies

The author utilized AI tools to enhance the language quality and address any grammatical issues while preparing the manuscript. Following the use of this tool, the author carefully reviewed and edited the content as necessary and assumes full responsibility for the accuracy and integrity of the published work.

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