Anesthesia Services Can be Provided via Telemedicine: An Assessment of the Readiness

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ABSTRACT

Background: Telemedicine technology can not only improve service quality, reduce costs, and broaden access to specialized and subspecialty healthcare services, but also be utilized to provide certain anesthesia services.

Objective: The objective of this study was to translate and assess the validity and reliability of the Telehealth Readiness Assessment (TRA) tool, used to evaluate the readiness of healthcare providers, for anesthesia services to implement telemedicine for delivering anesthesia services to patients.

Material and Methods: In this cross-sectional study, the initial step involved translating the questionnaire followed by an assessment of its validity and reliability. The questionnaire was then distributed to the staff members in the Anesthesiology Research Center. The readiness assessment encompassed various aspects, including Core Readiness, Financial Considerations, Operations, Staff Engagement, and Patient Readiness.

Results: The Content Validity Index (CVI) and Content Validity Ratio (CVR) were 93% and 72%, respectively. The internal consistency of each item and the overall TRA score demonstrated excellent reliability, with all values exceeding 0.90. The internal consistency coefficients ranged from 0.92 to 1.00, indicating high reliability and consistency in the measurements of the TRA questionnaire. Cronbach's alpha was 99%. The TRA subscales mean scores were 71.77±14.76, 63.25±16.14, 67.36±20.46, 68.81±18.50, and 72.52±14.39, respectively. The TRA total mean score was 68.61±17.33.

Conclusion: The Persian version of the TRA questionnaire exhibits acceptable levels of validity and reliability. The readiness level related to the implementation of telemedicine for anesthesiologists was obtained as moderate. To ensure the success of telemedicine projects, it is of the utmost importance to pay close attention to the relevant indicators, with particular focus on financial considerations, as this area received the lowest score.

Keywords

Telemedicine; Anesthesia; Psychometrics; Telemedicine Readiness Assessment; Delivery of Health Care; Information Technology

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Introduction

Anesthesia, as a key component in modern medicine, leads to surgical procedures without any pain or discomfort. Sure, here's the revised sentence. Also, anesthesia can facilitate safe and

effective surgery while minimizing the risk of complications and unfavorable outcomes [1]. Preoperative assessment, intra-operative consultation, post-operative management, critical care, simulation and education, and efforts can provide remote access to anesthesiology services. The expertise in specialized centers is helpful to physicians in treating patients in remote areas. Telemedicine services, including anesthesiology, are reimbursed in some US states across various specialties [2]. However, the term "telemedicine" has different meanings over time, the majority of these meanings align with the fundamental principles outlined by the American Telemedicine Association, showing that telemedicine utilizes electronic communications to enhance patients' clinical health [3]. Telemedicine uses information and remote communications technology to send medical data, audio, video, and other information interactively to provide distant medical and health services and enable remote patient-provider interactions [4]. Some applications of telemedicine are as follows: online consultations for patients, remote management, telenursing, and physical and psychiatric rehabilitation with remote access [5]. Furthermore, telemedicine improves access to high-quality healthcare [6], making clinical services more personalized. Telemedicine enhances medical practice by enabling clinicians to spend less time in remote areas and care for a larger number of patients. Electronic records and telemedicine facilitate easier access to patient data, thereby enhancing patient care safety. Remote appointments also enable doctors to allocate less time per patient, resulting in the ability to treat a greater number of patients [7,8]. Telemedicine technology holds immense potential for patients in rural areas, particularly in nations with limited or no healthcare facilities. In such regions, clinics are providing internet video conferencing services, causing patients to have virtual medical visits, which leads to continue receiving treatment from their regular doctors when an in-person visit is not required or necessary. Additionally, patients can engage in interactive appointments with nurse practitioners or physicians through online platforms. Furthermore, some large companies offer automated doctor's offices, while nursing call centers provide at-home treatment recommendations in a question-and-answer format. Telemedicine advancements are closing the healthcare access gap for individuals in remote areas [9-11]. Medical practices have been optimized in developed countries, particularly in European countries, through the effective implementation of telemedicine. To promote the usage of telemedicine programs, developing countries, particularly those in the Middle East, are advanced in information technology, policies, and guidelines [12]. Alaboudi et al. estimate that roughly 75% of telemedicine projects are abandoned or ultimately fail, which can reach 90% in developing countries [13]. The Middle East region presents cultural, financial, organizational, personal, technological, legal, and regulatory barriers when implementing telemedicine services. The growth of telemedicine is significant in Middle Eastern countries, as developing nations have faced challenges in adopting and achieving success rates despite its potential benefits [14]. The government's performance in areas, in which program adoption is crucial, can affect the assessment of the readiness of an area for telemedicine [15]. Moreover, readiness becomes a crucial requirement before telemedicine implementation [16] can assess health institutions and professional readiness for a new system. Preparedness evaluation involves assessing the readiness of healthcare systems and personnel to adapt to changes in computerized systems [15]. Studies have been conducted to evaluate the readiness of telemedicine [17-20].

There is a noticeable research gap in the utilization of telemedicine in the field of anesthesia in Iran, despite its significant importance, advantages, and usefulness. Additionally, there is currently no Persian version of the

Telehealth Readiness Assessment (TRA) tool, which is commonly used to assess the readiness for telemedicine implementation. Therefore, the objective of this study is twofold: 1) to translate the TRA questionnaire into Persian and evaluate its validity and reliability, and 2) to assess the readiness for implementing telemedicine in order to provide anesthesiologists' services, using the translated TRA questionnaire.

Material and Methods

Setting and Data Collection

This cross-sectional study was carried out at the Anesthesiology Research Center (ARC) of Shahid Beheshti University of Medical Sciences from April to May 2023. A two-section questionnaire was utilized, as follows: 1) to gather demographic characteristics information, including gender, educational level, and academic field, and 2) to TRA tool. To assess the readiness of small physician practices, such as the ARC, a questionnaire was developed and administered to all staff members affiliated with the telemedicine system of the ARC, including anesthesiologists (n=14), system management and support personnel (n=4), and medical informatics specialists (n=2). The comprehensive data collection necessitated the inclusion of all staff members due to the small size of the ARC. Two members of the research team provided a verbal explanation of the study's objectives to all participants, addressed any inquiries, and provided clarification before offering the questionnaire. Participants had the option to withdraw from the research at any point. No personal data, such as full names, phone numbers, email addresses, or similar details, were collected or utilized for the participants. Furthermore, the confidentiality of participants' responses was ensured and maintained.

Instrument

The Maryland Health Care Commission developed TRA in 2019 [21], used to assess the readiness of small physician practices for telemedicine. The TRA tool can be also used by practices to determine their readiness for providing telehealth services, identify problem areas, and prioritize essential areas for development. The TRA tool's results are meant to inform practices regarding the readiness of providers, patients, caregivers, and organizations for telehealth. The TRA tool's five major domains (Core Readiness, Financial Considerations, Operations, Staff Engagement, and Patient Readiness) are related to the implementation of telehealth successfully [21]. Table 1 shows the domains, concepts, and weight of each concept.

The original TRA questionnaire consists of fifty-four questions scored by a 3-point Likert scale ("No" or "Unsure" responses receive 1 point, "Somewhat" or "Partially" responses receive 2 points, and "Certainly" or "Fully" responses receive 3 points). Responses of" Not Applicable" are not scored, and these items are not used in the denominator to calculate the concept score. Excluding items from the denominator has been skipped. Adding the points awarded for each concept to get the final score. The score was calculated using the following formula (1):

$$\text{Score} = \frac{\textit{Sum of response points}}{(\textit{Total number of items answered} - \textit{Number of items answered N / A}) \times 3} \quad (1)$$

Readiness Levels are described as follows:

Poor Readiness: ≤50% - The practice is in the early stages or needs to consider more aspects related to the concept or domain. It would be beneficial to review the relevant supporting guidance document(s) and take appropriate steps for improvement.

Moderate Readiness: >50% and ≤75% - The practice has considered some relevant components of the concept or domain. Evaluating the relevant supporting guidance document(s) can help identify areas for further improvement.

High Readiness: >75% - The practice has taken into account a broad range of ideas or factors related to the concept or domain [21].

Table 1: Domains, concepts, and weight of each concept.

Domains	Concepts	Concept Weights (%)	Total Domain Weight
Core Readiness	Need for Telehealth	10	20
	Organizational Leadership Buy-In	10	
Financial Considerations	-	-	15
Operations	Telehealth Roles	5	40
	Scheduling	10	
	Operational Requirements	5	
	Assessment Approach	5	
	Technology	10	
	Physical Space	5	
Staff Engagement	Education and Awareness	7.5	15
	Innovators/Champions	7.5	
Patient Readiness	Patient Engagement	5	10
	Health Literacy	5	

Translation

In the current study, the researchers sought approval from Dr. Andrew N. Pollak, one of the authors of the TRA tool, before the validation process for the Persian translation and use of the TRA. The tool was initially translated into Persian by two proficient English translators, and the two translations were then merged to identify any potential significant discrepancies and create a single Persian translation. No semantic or language changes were identified at this stage. In the next step, the Persian questionnaire was back-translated into English by two native English translators. The original scale and the synthesized translation were compared. As the translated items were semantically similar to the original ones at this stage, no changes were made to the Persian version. The Persian version of the questionnaire remained unchanged. (Available from the address: http://www.telehealth-readiness-assessment-tool.ir).

Validity and Reliability

The Persian version of the TRA scale was evaluated for content, face, internal consistency, and stability after translation.

Content Validity

A panel of 14 experts in medical informatics assessed the content validity in quantitative and qualitative ways. The expert panel assessed the scale's content validity based on the items' contents, the scale's overall structure, and the need to add or remove items. Likewise, the expert panel provided feedback on the item's assignment, word choice, grammatical conventions compliance, and item scoring. Modifications were made despite suggestions from a Panel of experts. Both the Content Validity Ratio (CVR) and the Content Validity Index (CVI) [22], were used to evaluate the quantitative content validity. By determining CVR, the panel of experts assessed the items' needs. The CVR index calculation can cause the most valuable and essential information [23]. The usefulness of the items in evaluating the constructs was also assessed using the CVI. It is important to note that CVI values greater than 0.79 are considered acceptable, values between 0.70 and 0.79 may require additional modifications, and values equal to or lower than 0.70 should be removed [22]. The experts evaluated the items using a three-point Likert scale to assess their relevance,

simplicity, and clarity.

Face validity

Face validity was assessed using quantitative and qualitative methods. For the quantitative evaluation, a 5-point Likert scale ranging from "quite important" (5) to "insignificant" (1) was utilized to rate the items of the measure. The experts on the content validity panel completed the scale. The number of individuals who scored each item as 3 or 4, as well as the total scores and mean scores assigned, were determined. The impact score for each item was calculated using the following formula (2):

$$\text{impact} = \text{frequency} \times \text{importance} \quad (2)$$

An acceptable impact score for this study is one of at least 1.5. The expert panel contributed to the legitimacy of the qualitative face. Participants were asked to rate the items' clarity, level of difficulty, and the possibility of word and phrase ambiguity [22,24].

Reliability

Cronbach's alpha coefficient was employed to evaluate the internal consistency of the TRA scale as a whole and for each individual item. The Intraclass Correlation Coefficient (ICC) with a 95% confidence interval was utilized to assess reproducibility. ICC values were calculated for both the overall score of the TRA scale and each individual question and interpreted as follows: values less than 0.50 indicate poor interrater dependability, those between 0.50 and 0.75 indicate moderate dependability, those between 0.75 and 0.90 show good dependability, and also those greater than 0.90 present outstanding dependability [25-27].

Data Analysis

All statistical interpretations were performed using SPSS v18.0 (SPSS Inc, Chicago, IL, USA).

Results

In this study, all staff members of the Anesthesiology Research Center were recruited, consisting of 12 female and 8 male participants with a mean age of 36.25±4.95 years. Table 2 provides a summary of the demographic characteristics of the participants.

Validity and Reliability analysis

Content validity

Relevancy, clarity, and ambiguity were used to evaluate the content validity. The panel of experts' feedback was applied to qualitatively evaluate the scale's content validity, and any modifications required were applied. A total of 54 items were evaluated for CVR, resulting in a value of 0.72, an acceptable level of content validity. Additionally, the CVI was calculated and obtained a value of 0.93. Table 3 provides a summary of the content validity findings

Table 2: Demographical characteristics of participants (n=20)

Variables		n (%)
Gender	Female	12 (60)
	Male	8 (40)
Educational level	Master degree	4 (20)
	PhD	2 (10)
	Anesthesiologist	14 (70)
Academic field	Computer sciences	4 (20)
	Medical informatics	2 (10)
	Anesthesiologists	14 (70)

Table 3: Content validity and Reliability Statistics for the Telehealth Readiness Assessment (TRA).

Items of TRA	N	CVR	CVI	ICC	α
Q1	10	0.72	0.93	0.98	0.93
Q2	5	0.79	0.95	0.98	0.94
Q3	24	0.70	0.94	0.98	0.98
Q4	7	0.73	0.95	0.98	0.91
Q5	8	0.67	0.91	0.99	0.96
Total	54	0.72	0.93	0.98	0.99

N: Number of Questions, ICC: intraclass correlation coefficient, CVR: Content Validity Ratio, CVI: Content Validity Index, α Cronbach's alpha, TRA: Telehealth Readiness Assessment

from the study.

Face validity

The current study's expert panel approved each item and evaluated the quantitative face validity by calculating the impact score for each question. All fifty-four items impacted scores, higher than 1.5, indicating their significance in the study. Therefore, all of these items were considered for the subsequent phases of the research.

Reliability analysis

The subscales of the TRA demonstrated high internal consistency, with Cronbach's alpha coefficients ranging from 0.93 to 0.98. For the entire scale, Cronbach's alpha was 0.99, indicating excellent internal consistency, the ICC of the TRA items varied from 0.92 to 1, while the ICC for the entire scale was 0.98. Table 3 provides a summary of the reliability findings from the study.

Items Responses

Table 4 displays the frequency, at which participants responded to the items on the scale, while Table 5 presents the mean scores obtained for each item.

Mean scores for the readiness of subscales are shown in Figure 1. Among the operations items, the scheduling and workflow subscale had the lowest mean score of 62.78±18.56, indicating that it requires the most improvement. On the other hand, the technology subscale of the operations items had the highest mean score of 76.94±18.57 and requires the least amount of improvement.

The mean scores obtained for the five key domains are shown in Figure 2. The maximum mean is related to Patient Readiness with a score of 72.52±14.39, and the minimum mean score is 63.25±16.14 for financial considerations. The total mean score obtained for measuring the readiness to implement telemedicine in the ARC was 68.61±17.33.

Discussion

In this study, the readiness of the ARC to implement telemedicine was assessed using the Persian version of the TRA tool. The findings show that the Persian version of the TRA is a valid and reliable tool with excellent psychometric qualities. Accordingly, the ARC's entire staff received access to this tool.

Core Readiness

The mean scores obtained for the subscales "Need for Telemedicine" and "Organizational Leadership Buy-in" indicate that the core readiness of the ARC for telemedicine implementation is moderate. Before deploying telemedicine, it is important to consider various actions for different sections, including finding other leaders, assessing preparedness and experience for change, engaging individuals who have shown opposition to telemedicine, reinforcing the benefits of telehealth, and providing support to staff members.

Financial Considerations

The moderate mean score of this subscale indicates that the financial readiness of the ARC for telemedicine implementation requires careful consideration. Therefore, the ARC managers should evaluate various alternative courses of action before implementing telemedicine. These actions include determining costs and benefits, conducting a Return-on-Investment (ROI) study, seeking clarification from payers, exploring grant funding options, and addressing implementation challenges [28-30].

Operations

The means of subscales Telehealth Roles, Scheduling and Workflows, Operational Requirements, Assessment Approach, and Physical Space were moderate, and subscale Technology was high. Before implementing telemedicine to improve the operations subscale items, action includes: 1) involving staff members in the planning process: engage staff members in the planning phase to identify changing roles and develop strategies to incorporate new telehealth roles into their

Table 4: Frequency of the staffs' responses to the scale's items of Telehealth Readiness Assessment (n=20).

Items of TRA	Certainly N(%)	to some extent N(%)	No, I'm not sure N(%)	I have no answer N(%)
Q1.1.1	16 (80)	1 (5)	3 (15)	0 (0)
Q1.1.2	0 (0)	11 (55)	8 (40)	1 (5)
Q1.1.3	9 (45)	7 (35)	3 (15)	1 (5)
Q1.1.4	15 (75)	2 (10)	3 (15)	0 (0)
Q1.1.5	7 (35)	4 (20)	8 (40)	1 (5)
Q1.1.6	7 (35)	4 (20)	9 (45)	0 (0)
Q1.2.1	10 (50)	9 (45)	1 (5)	0 (0)
Q1.2.2	5 (25)	8 (40)	6 (30)	1 (5)
Q1.2.3	4 (20)	5 (25)	10 (50)	1 (5)
Q1.2.4	8 (40)	7 (35)	2 (10)	3 (15)
Q2.1	7 (35)	5 (25)	8 (40)	0 (0)
Q2.2	3 (15)	8 (40)	8 (40)	1 (5)
Q2.3	3 (15)	9 (45)	6 (30)	2 (10)
Q2.4	7 (35)	9 (45)	2 (10)	2 (10)
Q2.5	3 (15)	7 (35)	9 (45)	1 (5)
Q3.1.1	3 (15)	12 (60)	5 (25)	0 (0)
Q3.1.2	7 (35)	8 (40)	5 (25)	0 (0)
Q3.1.3	2 (10)	11 (55)	7 (35)	0 (0)
Q3.1.4	4 (20)	7 (35)	8 (40)	1 (5)
Q3.2.1	2 (10)	9 (45)	6 (30)	3 (15)
Q3.2.2	4 (20)	11 (55)	4 (20)	1 (5)
Q3.2.3	5 (25)	10 (50)	5 (25)	0 (0)
Q3.2.4	4 (20)	8 (40)	8 (40)	0 (0)
Q3.2.5	3 (15)	10 (50)	6 (30)	1 (5)
Q3.3.1	4 (20)	8 (40)	7 (35)	1 (5)
Q3.3.2	5 (25)	4 (20)	10 (50)	1 (5)
Q3.3.3	3 (15)	7 (35)	8 (40)	2 (10)
Q3.3.4	8 (40)	6 (30)	3 (15)	3 (15)
Q3.4.1	8 (40)	7 (35)	5 (25)	0 (0)
Q3.4.2	6 (30)	12 (60)	1 (5)	1 (5)
Q3.4.3	4 (20)	9 (45)	6 (30)	1 (5)
Q3.4.4	4 (20)	10 (50)	5 (25)	1 (5)
Q3.5.1	7 (35)	10 (50)	2 (10)	1 (5)
Q3.5.2	9 (45)	7 (35)	3 (15)	1 (5)
Q3.5.3	8 (40)	9 (45)	3 (15)	0 (0)
Q3.5.4	10 (50)	6 (30)	3 (15)	1 (5)
Q3.6.1	10 (50)	5 (25)	5 (25)	0 (0)
Q3.6.2	10 (50)	5 (25)	5 (25)	0 (0)
Q3.6.3	3 (15)	5 (25)	10 (50)	2 (10)
Q4.1.1	6 (30)	9 (45)	4 (20)	1 (5)
Q4.1.2	8 (40)	9 (45)	3 (15)	0 (0)
Q4.1.3	2 (10)	10 (50)	8 (40)	0 (0)
Q4.2.1	7 (35)	4 (20)	6 (30)	3 (15)
Q4.2.2	11 (55)	7 (35)	1 (5)	1 (5)
Q4.2.3	4 (20)	8 (40)	8 (40)	0 (0)
Q4.2.4	7 (35)	9 (45)	3 (15)	1 (5)
Q5.1.1	12 (60)	8 (40)	0 (0)	0 (0)
Q5.1.2	3 (15)	8 (40)	3 (15)	6 (30)
Q5.1.3	8 (40)	9 (45)	2 (10)	1 (5)
Q5.1.4	6 (30)	10 (50)	2 (10)	2 (10)
Q5.1.5	6 (30)	13 (65)	1 (5)	0 (0)
Q5.2.1	6 (30)	13 (65)	1 (5)	0 (0)
Q5.2.2	3 (15)	13 (65)	3 (15)	1 (5)
Q5.2.3	4 (20)	10 (50)	6 (30)	0 (0)

Q: Questions, TRA: Telehealth Readiness Assessment

regular work routines, 2) minimizing disruption: modify current processes and practices to minimize disruption when implementing telemedicine, 3) providing training on workflow changes: ensure that staff members receive training on changes in clinical and administrative workflow as they are identified and documented, 4) fostering positive site relationships: establish contact points at both the origin and distant locations to foster and maintain positive relationships between sites. Formalize relations between sites, understand licensing and credentialing requirements, and implement privacy measures, 4) planning evaluation activities: arrange for the completion of practice evaluation activities and plan for the expected results, 5) assessing physical space requirements: determine the necessary quantity of physical space and ensure that the area is suitable for telemedicine operations, and 6)

Table 5: The mean score of the staffs' responses to the scale's items (n=20).

R	Q1.1	Q1.2	Q2	Q3.1	Q3.2	Q3.3	Q3.4	Q3.5	Q3.6	Q4.1	Q4.2	Q5.1	Q5.2
R1	93.33	83.33	66.67	66.67	44.44	66.67	50.00	55.56	83.33	55.56	66.67	77.78	66.67
R2	66.67	50.00	53.33	33.33	53.33	55.56	66.67	91.67	66.67	55.56	77.78	58.33	66.67
R3	77.78	75.00	66.67	66.67	80.00	75.00	66.67	75.00	88.89	66.67	75.00	73.33	66.67
R4	38.89	58.33	60.00	33.33	33.33	41.67	41.67	50.00	33.33	33.33	50.00	66.67	55.56
R5	77.78	75.00	53.33	66.67	60.00	58.33	83.33	83.33	66.67	77.78	75.00	93.33	77.78
R6	83.33	75.00	60.00	58.33	73.33	58.33	58.33	91.67	44.44	77.78	58.33	60.00	66.67
R7	83.33	75.00	66.67	83.33	73.33	66.67	83.33	91.67	66.67	88.89	83.33	86.67	77.78
R8	83.33	83.33	66.67	66.67	66.67	100.00	88.89	100.00	66.67	83.33	33.33	66.67	66.67
R9	77.78	83.33	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
R10	44.44	58.33	53.33	33.33	46.67	33.33	33.33	41.67	33.33	33.33	58.33	66.67	33.33
R11	66.67	66.67	60.00	66.67	46.67	50.00	58.33	50.00	44.44	66.67	58.33	53.33	55.56
R12	61.11	66.67	58.33	66.67	77.78	55.56	58.33	66.67	55.56	55.56	66.67	60.00	66.67
R13	88.89	66.67	53.33	66.67	53.33	91.67	75.00	83.33	55.56	66.67	66.67	80.00	55.56
R14	38.89	91.67	80.00	33.33	66.67	41.67	50.00	83.33	100.00	66.67	83.33	91.67	66.67
R15	38.89	58.33	33.33	33.33	33.33	41.67	41.67	50.00	33.33	33.33	50.00	66.67	55.56
R16	88.89	66.67	46.67	66.67	46.67	50.00	91.67	75.00	88.89	66.67	58.33	77.78	66.67
R17	94.44	66.67	46.67	66.67	46.67	50.00	91.67	75.00	88.89	66.67	58.33	88.89	77.78
R18	77.78	66.67	100.00	100.00	86.67	100.00	83.33	100.00	100.00	100.00	100.00	100.00	88.89
R19	83.33	75.00	60.00	83.33	86.67	75.00	83.33	100.00	66.67	88.89	100.00	86.67	77.78
R20	88.89	75.00	80.00	66.67	80.00	75.00	66.67	75.00	88.89	66.67	83.33	80.00	77.78

R: Responder, Q: Questions

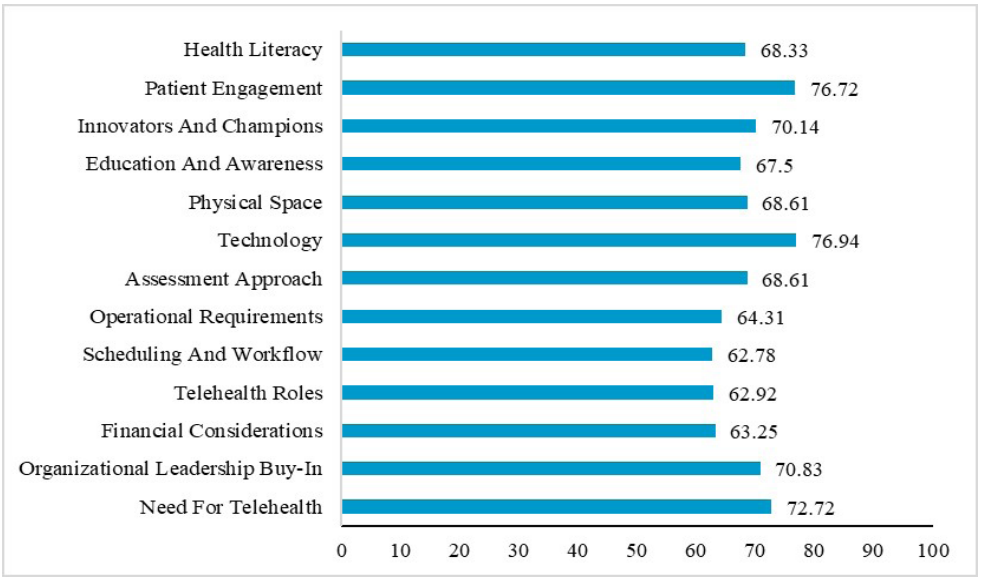

Figure 1: The Mean scores for the readiness of subscales

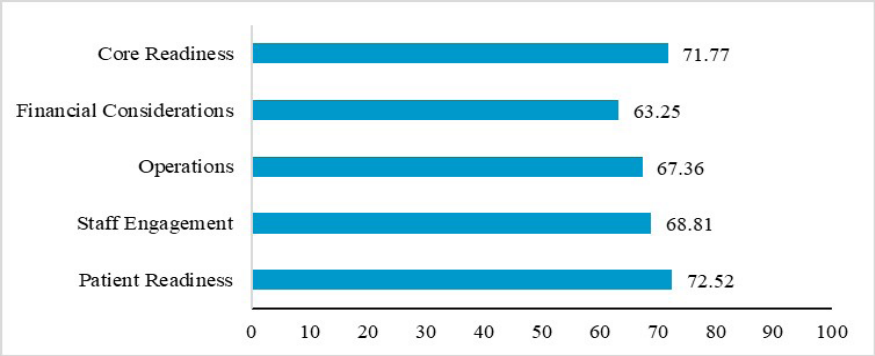

Figure 2: The mean scores of the five key domains

selecting appropriate technology: choose technology that aligns with the project's objectives and the practice's existing situation. Consider the bandwidth requirements for a robust connection capable of supporting telemedicine.

The current clinical and administrative workflows significantly change to use telemedicine effectively, and many staff and providers need to invest time in learning new workflows and techniques [31,32]. In the USA, interviews with seventeen tele-dermatologists revealed that 71% had no telehealth training, and 94% lacked the necessary staff to set up a teleconsultation clinic [33]. According to Alverson's research, the development of various types of telemedicine has been challenged by the lack of broadband infrastructure, particularly high-demand video, in store-and-forward services, which depend need extensive health networks [34]. Bali and Alghatani's studies indicate that legal challenges pose a significant barrier to the widespread adoption of telemedicine [35]. In addition, other notable challenges that impede the progress and expansion of telemedicine networks in developing countries include insufficient ICT literacy and knowledge, linguistic disparities, cultural differences between healthcare providers and patients, and related issues [36].

Staff Engagement

The mean scores for the subscales Education and Awareness, as well as Innovators/Champions, were moderate. When establishing the ARC, it is important to consider various efforts to educate and raise awareness among innovators and champions before introducing telemedicine. These efforts include: developing a training program, engaging with telemedicine suppliers, identifying champions, and providing support to champions: offering ongoing support and resources to the identified champion(s). This can include mentoring, additional training, and access to relevant materials. By implementing these efforts, the ARC can enhance education and awareness and foster a supportive environment for innovators and champions during the telemedicine implementation process [36].

Patient Readiness

The mean scores of subscales of Patient Engagement and Health Literacy were high and moderate, respectively. Establishing telemedicine implementation involves several essential steps for the ARC to consider, including assessing the patient population: evaluate the patient population to understand their specific needs and determine how telemedicine can effectively meet those needs, helping customize telemedicine offerings accordingly. Evaluating technological skills and requirements: assessment of the technological skills and requirements of the community to determine the feasibility of establishing telemedicine facilities for specific individuals. This evaluation will

aim to identify the services and determine the necessary educational and outreach initiatives to support successful telemedicine adoption.

The study by Gurupur et al. found that while patients were somewhat prepared to use telemedicine, they still required additional exposure, instruction, and opportunities to maximize the benefits of the telemedicine services. Understanding patient motivations can assist practices in identifying solutions that meet their needs and encourage continued utilization of telemedicine [37]. Understanding what motivates patients can assist practices in identifying the solutions that meet their needs and encourage them to keep utilizing telemedicine [38].

The limitation of this research lies in the novelty of the questionnaire, which has not been widely utilized in previous studies. As a result, comparing the results of this study with others becomes challenging. For future studies, it is recommended to employ the Persian version of the TRA tool to assess the readiness to implement telemedicine.

Conclusion

The telemedicine readiness score for anesthesiologists was moderate, indicating that the ARC requires further interventions to set up telemedicine effectively. The crucial intervention is removing obstacles related to financial issues. Moreover, items: Core Readiness, Financial, Telehealth Roles, Scheduling and Workflows, Operational Requirements, Assessment Approach, Technology, Physical Space, Staff Engagement, and Patient Readiness need improvement and managers' attention to reach the desired level. This can be achieved through the modification or modification of hospital, organizational, and clinical strategies. The effective implementation of a system for telemedicine reduces the obstacles to effective patient engagement while improving the geographical accessibility of the care providers. An ideal approach for the efficient and successful utilization of telemedicine services must be adopted to address the obstacles identified to encourage the quick adoption of telemedicine.

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Authors' Contribution

Sh. Rahamtizadeh conceived the idea. Introduction of the paper was written by Sh. Rahmatizadeh and Ze. Kohzadi. Sh. Rahmatizadeh and Ze. Kohzadi gathers the data. Ze. Kohzadi and Za. Kohzadi gathers the related literature and also help with writing of the related works. The method implementation was carried out by Sh. Rahmatizadeh and Ze. Kohzadi and Za. Kohzadi. Results and Analysis were carried out by Sh. Rahmatizadeh and Ze. Kohzadi. The research work was proofread and supervised by A. Dabbagh and Sh. Rahmatizadeh and H. Emami. Writing-original draft preparation by Ze. Kohzadi, Sh. Rahmatizadeh. Writing-review and editing by A. Dabbagh and Sh. Rahmatizadeh. All the authors read, modified, and approved the final version of the manuscript.

Ethical Approval

This research has been approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Ethics Code: IR.SBMU.RETECH.REC.1401.658).

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Conflict of Interest

None

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