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ORIGINAL PAPER

TELEMEDICINE AS A DRIVER OF EFFICIENCY IN REGIONAL HEALTHCARE THROUGH SERVICE OPTIMIZATION IN ALBANIA

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Abstract

Background. Telemedicine enhances access to specialist care in remote regions, where distance from tertiary hospitals remains a challenge. This study evaluates its impact on patient outcomes, transfer patterns, and specialty-specific utilization to assess effectiveness and sustainability.
Material and methods. This retrospective cohort study analyzed 373 patients who utilized telemedicine services at Korça Regional Hospital, Albania, between March 2022 and December 2023. Data were systematically extracted from medical records, capturing key variables such as age, gender, medical specialty, time of consultation, season, year, and patient transfer status. Chi-square test was applied to explore associations between telemedicine utilization patterns and patient outcomes.
Results. The mean age of study participants with complete data was 58.4±2.2 years, with 59.1% being male and 40.9% female. Most consultations occurred in autumn (32.4%) and during the afternoon (45.3%). Overall, 64.2% of patients required transfer to tertiary hospitals, while 35.8% were successfully managed remotely. Younger patients (0-55 years) had a higher transfer rate (65%), whereas older patients (>55 years)

Résumé

Télémédecine en tant que moteur d' efficacité dans les soins de santé régionaux: l'optimisation des services en Albanie

Contexte. La télémédecine améliore l'accès aux soins spécialisés dans les régions périphériques, où l'éloignement des hôpitaux tertiaires constitue un défi majeur. Cette étude examine son impact sur les résultats des patients, les transferts hospitaliers et l'utilisation selon les spécialités.
Matériels et méthodes. Une cohorte rétrospective de 373 patients ayant recouru à la télémédecine à l'Hôpital régional de Korça entre mars 2022 et décembre 2023 a été analysée. Les données comprenaient l'âge, le sexe, la spécialité médicale, le moment de la consultation, la saison, l'année et le statut de transfert. Le test du chi carré a permis d'explorer les associations entre l'utilisation de la télémédecine et les résultats cliniques.
Résultats. L'âge moyen était de 58,4±2,2 ans, avec 59,1 % d'hommes. La majorité des consultations se sont tenues en automne et l'après-midi. Globalement, 64,2 % des patients ont été transférés vers un hôpital tertiaire, tandis que 35,8 % ont été pris en charge

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were more often treated locally after teleconsultations ($p < 0.05$). General surgery had the highest transfer rate (88.9%), while endocrinology patients were more frequently managed remotely (57.1%) ($p < 0.05$). Transfers increased in 2023 (69.3%) compared to 2022 (57.8%) ($p = 0.06$).

Conclusions. Telemedicine has improved access to specialist care and reduced unnecessary transfers, though variability across specialties and demographics calls for ongoing optimization to ensure sustainability.

Keywords: telemedicine efficiency, regional healthcare, speciality utilization, transfer patterns.

List of abbreviations:
INSTAT – Institute of Statistics (Albania)
SD – standard deviation
SPSS – Statistical Package for the Social Sciences
N – mumber (sample size indicator)
USAID – United States Agency for International Development

localement. Les ≤55 ans avaient un taux de transfert plus élevé, alors que les >55 ans étaient plus souvent traités sur place ($p<0,05$). La chirurgie générale présentait le taux le plus élevé (88,9 %), tandis que l'endocrinologie était plus souvent gérée à distance (57,1 %) ($p<0,05$). Les transferts ont augmenté en 2023 par rapport à 2022 ($p=0,06$).

Conclusions. La télémédecine a amélioré l'accès aux soins spécialisés et réduit certains transferts. Toutefois, la variabilité selon les spécialités et les caractéristiques démographiques justifie une optimisation continue pour assurer sa durabilité et son intégration dans la pratique clinique.

Mots-clés: télémédecine, efficacité, soins régionaux, utilisation par spécialité, transferts.

Introduction

Telemedicine emerged as a means to extend specialist care to underserved rural regions, initially viewed as a promising solution to overcome geographic barriers, and has evolved over time with technological advancements, enabling remote physician visits that were once resource-intensive and costly[1]. Albania is a small Southeastern European country that has undergone a demographic and epidemiological transition in recent years[2]. Despite ongoing improvements in infrastructure, the development of telemedicine interventions within the public healthcare system is viewed as a promising opportunity to optimize healthcare services, particularly for remote regions still facing significant geographic barriers. Scientific evidence highlights a range of benefits associated with telemedicine for both patients and healthcare providers in regional settings, including enhanced access to specialist care across vast geographic distances, reduced travel time for patients, and improved engagement with diverse health services[3]. Albania implemented an integrated telemedicine program in 2009, featuring secondary and tertiary hospital services, with the National Center of Telemedicine in Tirana as its focal point, developed through the "Start-Build-Operate-Transfer" strategy to enhance healthcare access and efficiency[4,5]. Globally, telemedicine is predominantly utilized in specialties such as psychiatry, health education, endocrinology, cardiology, and rheumatology, facilitating continuous care for many conditions, while in Albania, in addition to these fields, asynchronous telemedicine plays a crucial role in neurotrauma, neurosurgery, neurology, surgery, and radiology, enabling remote diagnostic evaluations and consultations[6–8]. Korça, one of the 12 regions of Albania, is located at a considerable distance from tertiary hospitals in Tirana, highlighting the necessity of developing and optimizing hospital telemedicine to improve access to specialized healthcare for the region's population of approximately 200,000 (INSTAT, 2023), particularly in emergency situations and the management of chronic diseases[9,10]. Korça has proven to have telemedicine champions crucial for the sustainability and optimization of services, justifying the need to evaluate their impact on patient outcomes, particularly in relation to transfer status, seasonal and time-based variations, and specialty-specific utilization, to determine the overall effectiveness and efficiency of hospital telemedicine in the region[11].

The objective of the study was to evaluate the impact of telemedicine on patient outcomes, transfer patterns, and specialty-specific utilization in a peripheral region such as Korça, Albania, where distance from tertiary hospitals remains a challenge.

Material and methods

This retrospective cohort study was conducted on patients who utilized telemedicine services at Korça Regional Hospital, Albania, between March 2022 and December 2023.

The inclusion and exclusion criteria were established to ensure the selection of appropriate cases from the telemedicine records of Korça Regional Hospital.

Inclusion criteria:

- Patients who utilized telemedicine services between March 2022 and December 2023.
- Patients of any age, regardless of transfer status.

Exclusion criteria:

- Patients who were transferred to a more specialized service without utilizing telemedicine services.
- Patients who did not meet the defined study period criteria.
- Cases with totally incomplete data in telemedicine records.

Out of 1497 patients referred for tertiary hospital care, 373 patients who utilized telemedicine services at Korça Regional Hospital were consecutively selected during this period.

Data extraction and analysis were performed through a desk review of medical records from this hospital.

From the review of these documents and data obtained from the registries, a series of variables were defined. Age, measured in years, was classified as a scale variable. Gender (males vs. females), medical specialties (neurosurgery, neurotrauma, endocrinology, imaging, neurology, surgery, orthopedics), time periods (morning, afternoon, evening, night), seasons (spring, summer, autumn, winter), year (2022 vs. 2023), and patient status (transferred vs. treated in the referring hospital) were all classified as categorical variables. The classification of time periods was based on a predefined framework, categorizing hours into four distinct intervals: Morning (05:00 – 11:59), Afternoon (12:00 – 17:59), Evening (18:00 – 21:59), and Night (22:00 – 04:59).

Cases with missing values for key variables were excluded from both descriptive and inferential statistical analyses. No imputation methods were applied.

For data analysis, the mean and standard deviation were calculated for the scale variable (age), while frequencies and percentages were used to describe categorical variables. To assess differences and associations between variables such as age, gender, time periods, seasons, year, and patient status, the chi-squared test was applied, as appropriate. Data analysis was conducted using IBM SPSS Statistics software, version 25. A p-value of less than 0.05 was considered statistically significant.

The study was conducted in full compliance with the principles of the Helsinki Declaration for scientific research involving human subjects. Participants' confidentiality and privacy were strictly maintained throughout the study. Ethical approval for the study was obtained from the Ethics Committee at the Ministry of Health and Social Protection (approval number 131/63, dated 29.12.2022).

Results

The mean age of study participants with complete data was 58.4±2.2 years, with 59.1% being male and 40.9% being female. Seasonal distribution showed that the highest utilization occurred in autumn (32.4%), followed by summer (27.1%), spring (23.6%), and winter (16.9%). Regarding the time of use, telemedicine services were most frequently accessed in the afternoon (45.3%), followed by morning (26.1%), evening (16.7%), and night (11.9%). The distribution across years indicated that 39.9% of consultations took place in 2022, while 60.1% were recorded in 2023. In terms of patient management, 64.2% of cases required transfer to another medical facility, whereas 35.8% were managed remotely. When analyzing medical specialties, the highest proportion of telemedicine consultations was related to neurotrauma (33.6%) and neurosurgery (33.2%), followed by endocrinology (13.8%), neurology (10.8%), surgery (6.9%), and other specialties (1.7%) (Table 1).

Table 1. Characteristics of telemedicine users at Korça Regional Hospital

Variables	*Descriptive Statistics N** (%)*
Age (mean, SD*)	58.4±2.2 years
Gender	
Males	191 (59.1)
Females	132 (40.9)
Season	
Spring	88 (23.6)
Summer	101 (27.1)
Autumn	121 (32.4)
Winter	63 (16.9)
Time periods	
Morning	92 (26.1)
Afternoon	160 (45.3)
Evening	59 (16.7)
Night	42 (11.9)
Year	
2022	149 (39.9)
2023	224 (60.1)
Transfer status	
Transferred	158 (64.2)
Non-transferred	88 (35.8)
Medical specialities	
Endocrinology	32 (13.8)
Neurology	25 (10.8)
Neurosurgery	77 (33.2)
Neurotrauma	78 (33.6)
Surgery	16 (6.9)
Others	4 (1.7)

*SD – standard deviation
**N – numbers

Table 2. Factors influencing the transfer status of telemedicine users at Korça Regional Hospital

Variables	Non-transferred count (%)	Transferred count (%)	p-value (Chi-square test)*
Age			
0-55 years	7 (35.0)	13 (65.0)	p<0.05
Over 55 years	27 (62.8)	16 (37.2)	
Gender			
Males	40 (29.9)	94 (70.1)	p=0.09
Females	39 (40.6)	57 (59.4)	
Medical specialities			
Endocrinology	8 (57.1)	6 (42.9)	p<0.05
Neurology	5 (20.0)	20 (80.0)	
Neurosurgery	31 (47.7)	34 (52.3)	
Neurotrauma	26 (44.1)	33 (55.9)	
Surgery	1 (11.1)	8 (88.9)	
Others	1 (25.0)	3 (75.0)	
Seasons			
Winter	15 (40.5)	22 (59.5)	p<0.01
Spring	21 (33.3)	42 (66.7)	
Summer	15 (21.7)	54 (78.3)	
Autumn	37 (48.1)	40 (51.9)	
Time periods			
Morning	21 (31.3)	46 (68.7)	
Afternoon	45 (47.4)	50 (52.6)	p<0.05
Evening	12 (30.8)	27 (69.2)	
Night	5 (14.3)	30 (85.7)	
Year			
2022	46 (42.2)	63 (57.8)	p=0.06
2023	42 (30.7)	95 (69.3)	

Younger patients (0–55 years) were more frequently transferred to tertiary hospitals (65%) compared to older patients (>55 years), who were more often managed at Korça Regional Hospital ($p < 0.05$). Male patients had a higher transfer rate (70.1%) compared to females (59.4%) ($p = 0.09$). Among medical specialties, surgery had the highest transfer rate (88.9%), followed by neurology (80.0%), others (75%) neurotrauma (55.9%) and neurosurgery (52.3%), whereas endocrinology patients were more likely to be managed locally (57.1%) ($p < 0.05$). Transfers varied by time of consultation, with the highest transfer rate occurring at night (85.7%) and the lowest in the afternoon (52.6%) ($p < 0.05$). Seasonal differences were observed, with the highest transfer rate in summer (78.3%) and the lowest in autumn (51.9%) ($p < 0.01$). Regarding the year of consultation, transfers were more frequent in 2023 (69.3%) than in 2022 (57.8%) ($p = 0.06$).

Discussion

This study demonstrates the significant impact of telemedicine in improving access to specialist care, optimizing patient management, and reducing unnecessary transfers in regional healthcare settings, while also highlighting its growing integration into routine clinical practice as an effective tool for bridging geographic barriers and enhancing healthcare delivery. Although the establishment of the Telemedicine Center by the International Virtual E-Hospital Foundation in collaboration with the Ministry of Health and with the support of USAID Albania led to several studies between 2014 and 2018, a sustainability gap persists, which, in alignment with the project's philosophy, can only be effectively addressed through the active engagement and leadership of telemedicine champions[6-7, 11-13]. The role of regional policymaking in healthcare is crucial for sustaining and optimizing telemedicine services, as evidenced by the continued implementation of teleconsultations at the Regional Hospital of Korça, which serves as a valuable case study for analyzing evolving utilization patterns and demonstrating how structured telemedicine programs can enhance access to specialized care while reducing the burden on tertiary hospitals. Clinicians integrate telehealth into the care of older adults across various clinical roles, healthcare settings, and medical purposes[14]. This aligns with our findings, where older patients were

less frequently transferred, suggesting that telemedicine may contribute to their management locally, reducing the necessity for in-person hospital transfers. Limited access to timely neurotrauma care remains a significant challenge in low- and middle-income countries, where geographic distance, inadequate ambulance services, financial constraints, and a lack of neurosurgeons contribute to critical delays in reaching specialized treatment[15,16]. In our study, the predominance of teleconsultations in neurotrauma and neurosurgery underscores the role of telemedicine as a practical solution to these barriers, facilitating rapid specialist input and improving access to urgent neurosurgical care in resource-limited settings.

Regarding transfer rates, specialties such as surgery, neurology, neurosurgery, and neurotrauma show transfer rates exceeding 50%, whereas endocrinology remains below this threshold. Indeed, telemedicine is emerging as a valuable tool in surgical care, offering improved patient access and collaboration among healthcare providers, despite existing challenges related to cost, training, and privacy[17]. Telemedicine may also increase endocrinology care access for under-resourced patients with diabetes and heart disease by mitigating barriers such as geographic distance, transportation challenges, and specialist shortages[18]. Regional telemedicine utilization follows distinct temporal and seasonal patterns, with peak usage in the afternoon and higher transfer rates occurring at night and during the summer months, suggesting that both accessibility and clinical urgency influence telemedicine consultation and patient management dynamics. Beyond its temporal and seasonal variations, telemedicine serves as a crucial tool for optimizing emergency care by reducing unnecessary transfers, enabling local hospitals to manage patients effectively, and preserving community healthcare systems while minimizing logistical and financial burdens on patients and their families[19]. Telemedicine stands as a transformative force in regional healthcare, bridging critical gaps in specialist access, reducing unnecessary transfers, and reinforcing the sustainability of local healthcare systems, making its continued integration and support a strategic imperative for the future of emergency and specialized care.

Despite the valuable insights provided by this study, certain limitations should be acknowledged. First, as a retrospective cohort study relying on medical records, the accuracy and completeness of data may have been influenced by documentation variability. Additionally, the study was conducted in a single regional hospital, which may limit the generalizability of findings to other healthcare settings with different telemedicine infrastructures and patient populations. Furthermore, the study did not assess patient satisfaction or provider perspectives, which are crucial factors in evaluating the long-term sustainability and effectiveness of telemedicine services.

Conclusions

This study underscores the role of telemedicine in enhancing access to specialist care, optimizing patient management, and reducing unnecessary transfers, ultimately strengthening the efficiency of regional healthcare systems. The findings highlight the importance of continuous service optimization and policy support to sustain telemedicine's impact, particularly in addressing specialty-specific needs and seasonal variations in utilization. Future efforts should focus on integrating telemedicine into routine clinical practice, expanding its reach in underserved areas, and reinforcing infrastructure to ensure long-term sustainability and equitable healthcare access.

Author Contributions:

E.B. was responsible for study design, data collection, data analysis, literature review, data interpretation, manuscript drafting, and overall coordination. A.SH. and A.A. contributed to study design, data analysis and interpretation. All authors approved the final version of the manuscript.

Compliance with Ethics Requirements:

"The authors declare no conflict of interest regarding this article"

"The authors declare that all the procedures and experiments of this study respect the ethical standards in the Helsinki Declaration of 1975, as revised in 2008(5), as well as the national law"

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