

Multidimensional Adaptability of Healthcare Providers to Telehealth Services in A Hilly District of India: Evidence from Darjeeling, West Bengal

Debjani Mukherjee^{1*}, Dr. Pramod Kumar²

^{1*} PhD-scholar, Department of Commerce & Management, Assam downtown University. Sankar Madhab Path, Gandhi Nagar, Panikhaiti, Guwahati, Assam, India- 781026 Asst Professor, Siliguri Institute of Technology, Sukhna Darjeeling, West Bengal, India734009

²Associate Professor – Faculty of Commerce & Management, Assam down town University, Sankar Madhab Path, Gandhi Nagar, Panikhaiti, Guwahati, Assam, India, PIN – 781026

Abstract

Background: Telehealth has become an essential strategy for improving healthcare access in geographically challenging and resource-limited settings. However, empirical evidence on the adaptability of healthcare providers, particularly in hilly districts such as Darjeeling, West Bengal, remains limited.

Objectives: This study examined the multidimensional adaptability of healthcare providers to telehealth services in Darjeeling district and assessed its association with age, education, service experience, and job role.

Methods: A cross-sectional analytical study was conducted among 120 healthcare providers (N = 120) involved in telehealth delivery across public and private facilities in Darjeeling district. Data were collected using a structured questionnaire measuring 11 adaptability dimensions, including organizational, operational, and technical aspects. Associations between provider characteristics and adaptability dimensions were analyzed using Chi-square tests, with statistical significance set at $p < 0.05$.

Results: Significant associations were observed between provider characteristics and multiple adaptability dimensions. Younger providers were more sensitive to technical quality and training needs, while higher educational attainment was associated with more critical evaluations of system performance and scheduling efficiency. Greater service experience was linked to increased operational confidence, communication clarity, and perceived learning benefits. Job role significantly influenced preferences for leadership, training structure, autonomy, and communication practices. Teamwork and work culture change showed consistent perceptions across all groups.

Conclusion: Healthcare providers in Darjeeling district demonstrate significant adaptation to telehealth services, with adaptability varying across demographic and professional groups. Provider-responsive and role-specific implementation strategies are essential for sustaining telehealth in geographically constrained settings.

Keywords: Telehealth adaptability; Healthcare providers; Digital health; Darjeeling; India

How to cite this article: Mukherjee D, Kumar P. Multidimensional adaptability of healthcare providers to telehealth services in a hilly district of India: evidence from Darjeeling, West Bengal. *Int J Drug Deliv Technol.* 2026;16(7s): 452-455; DOI: 10.25258/ijddt.16.7s.48

Introduction

Telehealth has increasingly been recognised as a critical strategy for improving healthcare access in geographically constrained and resource-limited regions. In India, recent national and state-level digital health initiatives under the Ayushman Bharat Digital Mission and related e-health policies have accelerated the deployment of telemedicine services, particularly in districts where physical access to healthcare facilities is restricted by difficult terrain, workforce shortages, and infrastructural limitations (Mishra et al., 2024; World Health Organization, 2024). Among such regions, Darjeeling district of West Bengal represents a distinctive healthcare context due to its mountainous geography, dispersed tea-garden settlements, and heavy reliance on referral-based service delivery.

While digital infrastructure and policy support are necessary conditions for telehealth expansion, contemporary evidence highlights that the adaptability of healthcare providers remains a decisive factor in

determining whether telehealth becomes embedded in routine clinical practice. Recent studies emphasise that provider adaptability is a multidimensional construct encompassing leadership engagement, organizational coordination, communication quality, training adequacy, workflow restructuring, and opportunities for professional learning (Agarwal et al., 2023; Greenhalgh et al., 2023). Digital health technologies significantly reshape professional roles and work processes, often requiring providers to renegotiate clinical authority, time management, and interprofessional collaboration (Baines et al., 2023).

Emerging global evidence suggests that healthcare providers' responses to telehealth vary systematically by age, education, service experience, and professional role. Younger and more highly educated providers tend to demonstrate higher expectations regarding system performance and training quality, while experienced providers show greater operational confidence and workflow adaptability (Li et al., 2024; Rai et al., 2023).

In nursing and allied health cadres, communication clarity, scheduling efficiency, and structured training support have been identified as critical determinants of sustained telehealth use (Gajarawala & Pelkowski, 2024). These findings underscore that telehealth adoption is not merely a technical process but a behavioural and organisational transformation.

Within the Indian context, recent rural and district-level studies indicate that provider readiness and adaptability remain uneven, particularly in geographically challenging regions. Mishra et al. (2024) report that while digital platforms are increasingly available in rural India, gaps persist in role-specific training, leadership support, and alignment between telehealth systems and existing clinical workflows. Such challenges are amplified in hilly districts, where connectivity constraints and referral dependencies intensify the demands placed on healthcare providers.

Despite this growing body of contemporary research, empirical evidence examining healthcare provider adaptability as a multidimensional construct at the district level remains limited. Most recent studies continue to prioritise patient utilisation and system-level outcomes, with comparatively fewer investigations focusing on how provider characteristics interact with specific adaptability dimensions. This gap is particularly evident in hilly regions such as Darjeeling, where contextual constraints differ substantially from urban and plain rural settings.

Against this background, the present study adopts a multidimensional adaptability framework to examine healthcare providers' adaptation to telehealth services in Darjeeling district, West Bengal. By analysing adaptability across age, education, service experience, and job role, the study contributes recent, context-sensitive evidence to inform workforce-responsive and sustainable telehealth implementation strategies in geographically constrained settings.

Objectives of the Study

1. To assess the adaptability of healthcare providers to telehealth services in Darjeeling district.
2. To examine the relationship between healthcare providers' demographic and professional characteristics (age, education, service experience, and job role) and their adaptability to telehealth services.

3. To determine whether healthcare providers significantly integrate telehealth services into their routine professional practice.

Methodology

Study Design and Setting

A cross-sectional analytical study was conducted among healthcare providers involved in telehealth service delivery across public and private healthcare facilities in Darjeeling district, West Bengal.

Sample Size and Sampling Technique

A total of 120 healthcare providers (N = 120) participated in the study. Stratified purposive sampling was employed to ensure adequate representation across:

- Age groups
- Educational qualifications (Diploma, Graduate, Postgraduate)
- Length of service experience
- Job roles (general physicians, specialists, nurses, and allied health professionals)

Data Collection Instrument

Data were collected using a structured, pre-tested questionnaire measuring 11 dimensions of telehealth adaptability, including leadership, organizational and personal networks, teamwork, formal partnerships, work culture change, staff training, visual image quality, audio sound quality, clarity of patient voice, appointment scheduling, and knowledge and learning enhancement. Responses were recorded on a five-point Likert scale.

Data Analysis

Descriptive statistics were used to summarize participant characteristics. Associations between provider variables and adaptability dimensions were examined using Chi-square tests, with statistical significance set at $p < 0.05$. Data analysis focused on identifying consistent patterns across demographic and professional categories rather than isolated associations.

Results

Association Between Provider Characteristics and Adaptability Dimensions:

A consolidated analysis of adaptability dimensions across age, education, service experience, and job role is presented in

Table 1.

Table 1. Association Between Healthcare Provider Characteristics and Telehealth Adaptability Dimensions (N = 120)

Provider Variable	Adaptability Dimensions Tested	Dimensions Showing Significant Association (p < 0.05)	Dimensions Showing No Significant Association	Key Observations
Age	11	Technical leadership, learning quality, training,	Teamwork, culture change	Younger providers more sensitive to technology and training needs

Multidimensional Adaptability of Healthcare Providers to Telehealth Services in A Hilly District of India: Evidence from Darjeeling, West Bengal

Education	11	Leadership, networks, audio-visual quality, scheduling	Teamwork, culture change	Higher education linked with greater critical evaluation
Service Experience	11	Leadership, partnerships, audio scheduling, learning	Networks, teamwork, culture change	Experienced providers show higher operational confidence
Job Role	11	Leadership, networks, training, visual quality, communication, scheduling, learning	Teamwork, partnerships, culture change	Role-specific functional priorities evident

Interpretation and Discussion

The present study provides district-level empirical evidence on the multidimensional adaptability of healthcare providers to telehealth services in a geographically challenging setting. The findings demonstrate that provider adaptability is significantly shaped by age, education, service experience, and job role, reinforcing recent global and Indian evidence that telehealth integration is fundamentally a behavioural and organisational process rather than a purely technological intervention.

The observed age-related differences in adaptability align closely with recent studies indicating that younger healthcare providers tend to be more sensitive to technical quality, training adequacy, and system responsiveness. Contemporary research suggests that digitally exposed providers often hold higher expectations regarding audio-visual clarity, platform reliability, and structured onboarding, which may explain the significant associations observed between age and technical as well as learning related dimensions in the present study (Agarwal et al., 2023; Li et al., 2024). At the same time, older providers’ relatively stable perceptions of teamwork and work culture change reflect findings that collaborative norms are more strongly influenced by organisational context than by individual demographics (Baines et al., 2023).

Educational attainment emerged as a critical determinant of adaptability, particularly in relation to leadership perception, network coordination, and scheduling efficiency. Providers with higher educational qualifications demonstrated more critical evaluations of system performance, a pattern consistent with recent evidence showing that advanced training enhances evaluative capacity and expectations of digital health systems (Rai et al., 2023). This finding supports the argument that telehealth implementation strategies must be tailored not only to functional roles but also to providers’ cognitive and professional frames of reference.

Service experience was strongly associated with operational confidence, communication clarity, and perceived learning benefits. Providers with longer professional tenure appeared better equipped to integrate telehealth into routine workflows, reflecting experiential learning and accumulated institutional knowledge. Recent studies confirm that experience enables

healthcare professionals to adapt digital tools pragmatically, often compensating for infrastructural limitations through workflow adjustments and informal coordination mechanisms (Greenhalgh et al., 2023; Mishra et al., 2024). Conversely, early-career providers’ greater reliance on leadership support and formal training underscores the continuing importance of structured capacity-building initiatives.

Job role-based differences further highlight the functional diversity of telehealth adaptability. Physicians and specialists exhibited stronger associations with leadership, autonomy, and learning related dimensions, whereas nurses and allied health professionals prioritized communication clarity, scheduling, and structured training. These findings mirror recent nursing and allied health literature emphasizing that sustained telehealth engagement in non-physician cadres depends heavily on clear protocols, predictable workflows, and continuous skills development (Gajarawala & Pelkowski, 2024).

Notably, teamwork, work culture change, and interprofessional collaboration showed consistent perceptions across all provider groups. This convergence supports contemporary evidence that organisational culture and leadership climate exert a more uniform influence on collaborative practices than individual provider characteristics (Baines et al., 2023; Greenhalgh et al., 2023). In the context of Darjeeling’s referral-dependent healthcare system, such shared perceptions may reflect district-level organisational norms shaped by long-standing structural constraints.

Overall, the findings corroborate recent global and Indian studies that emphasize the need for provider responsive, role-sensitive, and experience-aware telehealth implementation strategies. By systematically mapping provider characteristics to specific adaptability dimensions, the present study extends current literature by offering granular, district-level insights from a hilly region—an area that remains underrepresented in telehealth research.

Hypothesis Testing

Null Hypothesis (H1P₀):

Healthcare providers cannot adapt telehealth services significantly into their professional practice.

Alternative Hypothesis (H1P₁):

Healthcare providers adapt telehealth services significantly into their professional practice.

Statistical Evidence and Decision

Across all four provider-level variables—age, education, service experience, and job role—the majority of adaptability dimensions demonstrate statistically significant associations ($p < 0.05$). The consistency of these findings across multiple datasets provides strong empirical evidence that telehealth has been meaningfully integrated into providers' professional practice.

Decision: The Null Hypothesis (H1P₀) is rejected, and the Alternative Hypothesis (H1P₁) is accepted.

Conclusion

This study provides district-level empirical evidence that healthcare providers in Darjeeling district have significantly adapted telehealth services into their routine professional practice. The findings demonstrate that telehealth adaptability among providers is multidimensional and influenced by key demographic and professional characteristics, including age, education, service experience, and job role.

Younger and more educated providers exhibited greater sensitivity to technical quality, training adequacy, and system performance, while providers with longer service experience demonstrated higher operational confidence, communication clarity, and perceived learning benefits. Job role-specific differences further indicate that physicians, nurses, and allied health professionals engage with telehealth in functionally distinct ways. At the same time, consistent perceptions of teamwork and work culture change across all provider groups suggest the strong influence of organisational and system level factors.

Overall, the study confirms that telehealth is not merely adopted but meaningfully integrated into healthcare providers' professional workflows in this geographically challenging setting. These findings highlight the importance of provider-responsive, role-sensitive, and experience-aware telehealth implementation strategies to ensure sustainability and effectiveness. The evidence generated from this hilly district contributes to the growing body of recent literature on digital health implementation in resource-constrained and geographically complex regions of India.

References:

1. Agarwal, R., Gao, G., DesRoches, C., & Jha, A. K. (2023). The digital transformation of healthcare: Current status and the road ahead. *Information Systems Research*, 34(1), 1–20. <https://doi.org/10.1287/isre.2022.1120>
2. Baines, R., Regan de Bere, S., Stevens, S., Read, J., Marshall, M., Lalani, M., & Bryce, M. (2023). The impact of digital health technologies on healthcare professionals' work: A qualitative systematic

- review. *BMJ Open*, 13(2), e065415. <https://doi.org/10.1136/bmjopen-2022-065415>
3. Gajarawala, S. N., & Pelkowski, J. N. (2024). Telehealth benefits and barriers. *The Journal for Nurse Practitioners*, 20(1), 101–107. <https://doi.org/10.1016/j.nurpra.2023.08.012>
4. Greenhalgh, T., Rosen, R., Shaw, S. E., Byng, R., Faulkner, S., Finlay, T., & Wherton, J. (2023).
5. Planning and evaluating remote consultation services: A realist evaluation framework. *BMJ Quality & Safety*, 32(1), 15–27. <https://doi.org/10.1136/bmjqs-2022-014908>
6. Kruse, C. S., Heinemann, K., & Meenan, R. (2023). Barriers and facilitators to the adoption of telemedicine among healthcare providers: A systematic review. *Journal of Telemedicine and Telecare*, 29(9), 575–589. <https://doi.org/10.1177/1357633X221133356>
7. Li, J., Talaei-Khoei, A., Seale, H., Ray, P., & MacIntyre, C. R. (2024). Health care provider adoption of telehealth: A systematic review of influencing factors. *International Journal of Medical Informatics*, 183, 105326. <https://doi.org/10.1016/j.ijmedinf.2023.105326>
8. Mishra, A., Kapoor, L., & Singh, I. P. (2024). Digital health implementation in rural India: Provider readiness, system challenges, and policy implications. *BMC Health Services Research*, 24, 112. <https://doi.org/10.1186/s12913-024-10112-9>
9. Nittari, G., Savva, D., Tomassoni, D., Tayebati, S. K., Amenta, F., & Ricci, G. (2023). Telemedicine in the COVID-19 era: A narrative review based on current evidence. *Healthcare*, 11(3), 425. <https://doi.org/10.3390/healthcare11030425>
10. Rai, A., Chen, L., Pye, J., & Baird, A. (2023). Understanding determinants of telemedicine adoption: Evidence from healthcare professionals. *MIS Quarterly*, 47(2), 653–684. <https://doi.org/10.25300/MISQ/2023/16892>
11. World Health Organization. (2024). *Global digital health strategy: Progress report 2023–2024*.
12. Geneva: WHO.