



Acceptability, Feasibility, and Perceived Barriers of Video-Assisted Telemedicine Training Among Nursing Officers for Hypertension Management: A Pre-Post Implementation-Focused Study

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ABSTRACT

Keywords:

*Telemedicine;
Telehealth Education;
Video-Assisted
Teaching; Nursing
Officers;
Hypertension
Management;
Acceptability;
Feasibility; Barriers;
Implementation
Readiness; India.*

Background: Telemedicine-supported hypertension care requires nursing officers who are willing, confident and institutionally supported to use remote blood pressure review, medication adherence counselling, documentation and referral escalation. Structured video-assisted training may strengthen telemedicine readiness, but implementation success depends on acceptability, feasibility and reduction of perceived barriers.

Objective: To evaluate the effect of a video-assisted telemedicine training pathway on telemedicine acceptance, perceived barriers, feasibility, acceptability, satisfaction and implementation readiness among nursing officers involved in hypertension management in a tertiary care hospital at Bengaluru, Karnataka.

Methods: A hospital-based pre-post implementation-focused study was conducted among 180 nursing officers. The training pathway included core telemedicine videos and a hypertension-specific nursing module covering home blood pressure log review, medication adherence counselling, salt restriction counselling, red-flag recognition, documentation, privacy and physician escalation. Telemedicine acceptance was assessed across telemetry, telephaxis and telepraxis functions and across phone, video-call and asynchronous communication modes. Perceived barriers were measured before and after training. Post-training acceptability, feasibility, appropriateness, adoption intention and satisfaction were assessed using structured Likert-type items. Median scores, interquartile ranges (IQRs), Wilcoxon signed-rank tests, effect sizes, reliability indices, correlations and multivariable logistic regression were used.

Results: The final N=180 analysis showed a significant improvement in total telemedicine acceptance from a median of 61 (IQR 24) to 76 (IQR 16) out of 96 ($P<.001$; $r=0.43$). Significant gains were observed for telemetry, telephaxis, telepraxis, phone-based, video-call-based and asynchronous telemedicine. The total barrier influence score decreased from 60 (IQR 18) to 39 (IQR 16) out of 96 ($P<.001$; $r=0.52$). Post-training acceptability was high (mean 4.42, SD 0.39), feasibility was favourable (mean 4.24, SD 0.45), appropriateness was high (mean 4.47, SD 0.37) and high implementation readiness was observed in 157/180 nursing officers (87.2%). Post-test competency, previous telemedicine exposure and perceived administrative support independently predicted high implementation readiness.

Conclusion: Video-assisted telemedicine training was acceptable, feasible and implementation-ready for nursing officers involved in hypertension care. Nursing officers can be prepared for telemedicine-supported hypertension follow-up when video-based learning is paired with practical case examples, checklists, privacy guidance, reliable connectivity, protected documentation time and clear physician escalation pathways.



INTRODUCTION

Telemedicine has moved from an emergency response model to a routine component of health service delivery, creating a need for health professionals who can communicate, assess, document and educate patients through digital platforms. Rettinger et al. demonstrated that a structured web-based telehealth course can improve professional acceptance and reduce perceived barriers, supporting the value of pre-post educational evaluation rather than knowledge assessment alone.¹ Reviews of telehealth education also show that professional preparation is often inconsistent, especially when training does not address legal aspects, technology use, patient communication and clinical workflow integration.²⁻⁴

Hypertension is a strong clinical area for nurse-supported telemedicine because long-term control depends on repeated blood pressure monitoring, medication adherence, lifestyle reinforcement and early referral when readings remain outside individualized targets. Nursing officers can contribute by reviewing home blood pressure logs, reinforcing salt restriction, counselling on medication adherence, reminding patients about follow-up and notifying the treating physician when red-flag features or uncontrolled readings are identified. Telehealth implementation studies indicate that such clinical use requires not only willingness but also clear protocols, patient accessibility and reliable organizational support.⁵⁻⁸

Telemedicine implementation cannot be assumed after a teaching session. A nursing officer may understand telemedicine concepts but still perceive barriers related to network reliability, device availability, patient digital literacy, documentation burden, privacy concerns, language difficulty, lack of administrative support and emergency escalation uncertainty. The present study therefore used an implementation-focused approach, assessing acceptability, feasibility, appropriateness, adoption intention, satisfaction and perceived barriers in addition to telemedicine acceptance. This structure is aligned with implementation outcome frameworks and with telehealth acceptance models used in recent health professional education research.^{1,9-11}

The aim of this article was to evaluate acceptability, feasibility and perceived barriers of a video-assisted telemedicine training pathway among nursing officers for hypertension management in a tertiary care hospital at Bengaluru. The study specifically examined whether the training improved telemedicine acceptance, reduced perceived barriers and produced high post-training implementation readiness for nurse-supported telemedicine in hypertension care.

METHODS

Study Design and Setting

A hospital-based pre-post implementation-focused study was conducted to evaluate a video-assisted telemedicine training pathway for nursing officers involved in hypertension care. The design followed the logic of pre-training and post-training measurement used in telehealth education studies, with adaptation to nursing officers and hypertension management in a tertiary care hospital at Bengaluru, Karnataka.^{1,12} The study focused on practical implementation outcomes rather than only knowledge gain.



Participants

The target population comprised nursing officers working in medical wards, cardiology and outpatient services, emergency areas, critical-care units and general outpatient services with potential responsibility for hypertension-related follow-up or patient education. Nursing officers on extended leave, those without direct patient-care responsibility and those unwilling to participate in the implementation evaluation were excluded. The final analysed sample included 180 nursing officers with complete paired pre-training and post-training responses.

Sample Size Calculation

The sample size was calculated for a single-proportion implementation outcome. Assuming an expected high acceptability proportion of 80%, a 95% confidence level and 6% absolute precision, the estimated minimum sample size was 170.7, rounded to 171, using the formula $n = Z^2 p(1-p)/d^2$. To increase precision and maintain stability for exploratory regression analysis, 180 complete paired responses were included in the final analysis. This approach is consistent with pre-post telehealth training evaluations in which only participants with adequate exposure and complete outcome measurement are analysed.¹

Video-Assisted Telemedicine Training Pathway

The training pathway was organized into a core telemedicine component and a nursing hypertension-specific component. The core component covered concept clarification, forms of telemedicine communication, legal and ethical considerations, data privacy, digital communication etiquette, technology requirements and practical implementation steps. The hypertension-specific nursing component covered verification of home blood pressure technique, home blood pressure log review, salt restriction counselling, medication adherence support, missed follow-up reminders, red-flag recognition, documentation and physician referral escalation.

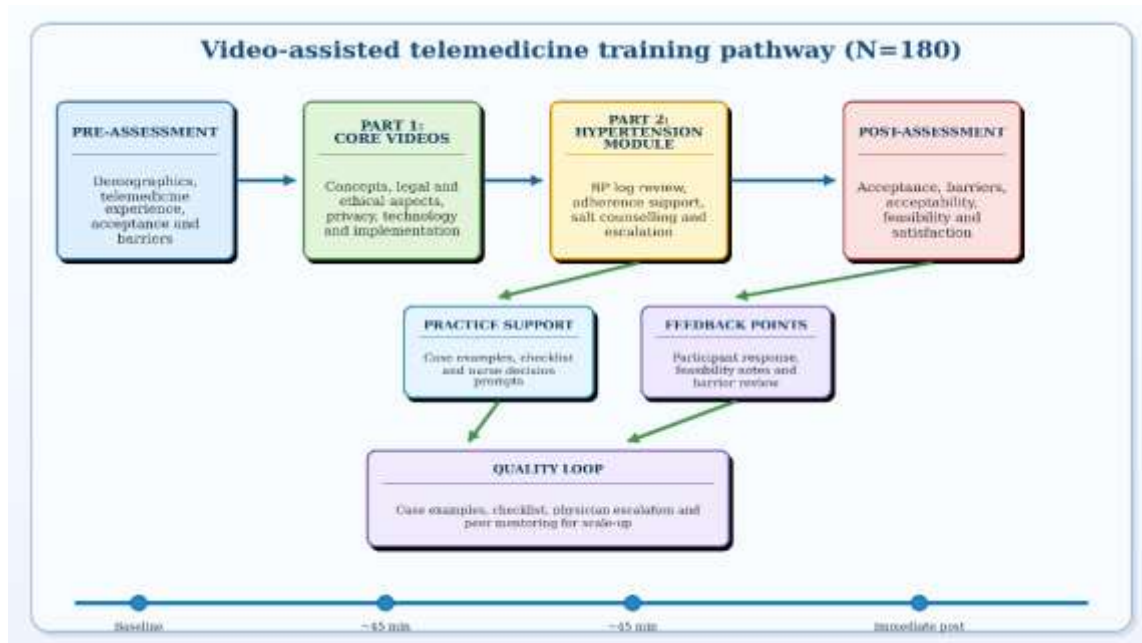


Figure 1. Structure of the Assessments and Video-Assisted Telemedicine Training Pathway for Nursing Officers



Outcome Measures

Telemedicine acceptance was measured using a functional framework organized around telemetry, telephaxis and telepraxis, adapted from telehealth communication-process classification.¹⁰ Telemetry represented remote assessment and monitoring activities such as reviewing home blood pressure readings and recording patient history. Telephaxis represented information transmission such as reminders, health education materials and result notifications. Telepraxis represented remote nursing support, counselling, patient education and escalation-related clinical action. Each function was assessed across phone, video-call and asynchronous communication modes using a 0 to 4 willingness scale. The total acceptance score had a maximum of 96.

Perceived barriers were scored on a 0 to 4 influence scale, where higher scores indicated stronger negative influence on willingness to use telemedicine. The barrier set covered technology access, network reliability, own digital skills, patient digital literacy, privacy and confidentiality, legal or medicolegal uncertainty, perceived quality of observation, workload and time pressure, documentation burden, language or communication difficulty and emergency escalation uncertainty. Post-training acceptability, feasibility, appropriateness, adoption intention, confidence and readiness were assessed on 1 to 5 scales, where higher scores indicated a more favourable implementation response. Training satisfaction was assessed after completion using items aligned with training evaluation domains such as clarity, usefulness, difficulty, knowledge gain and willingness to recommend the training.^{11,13}

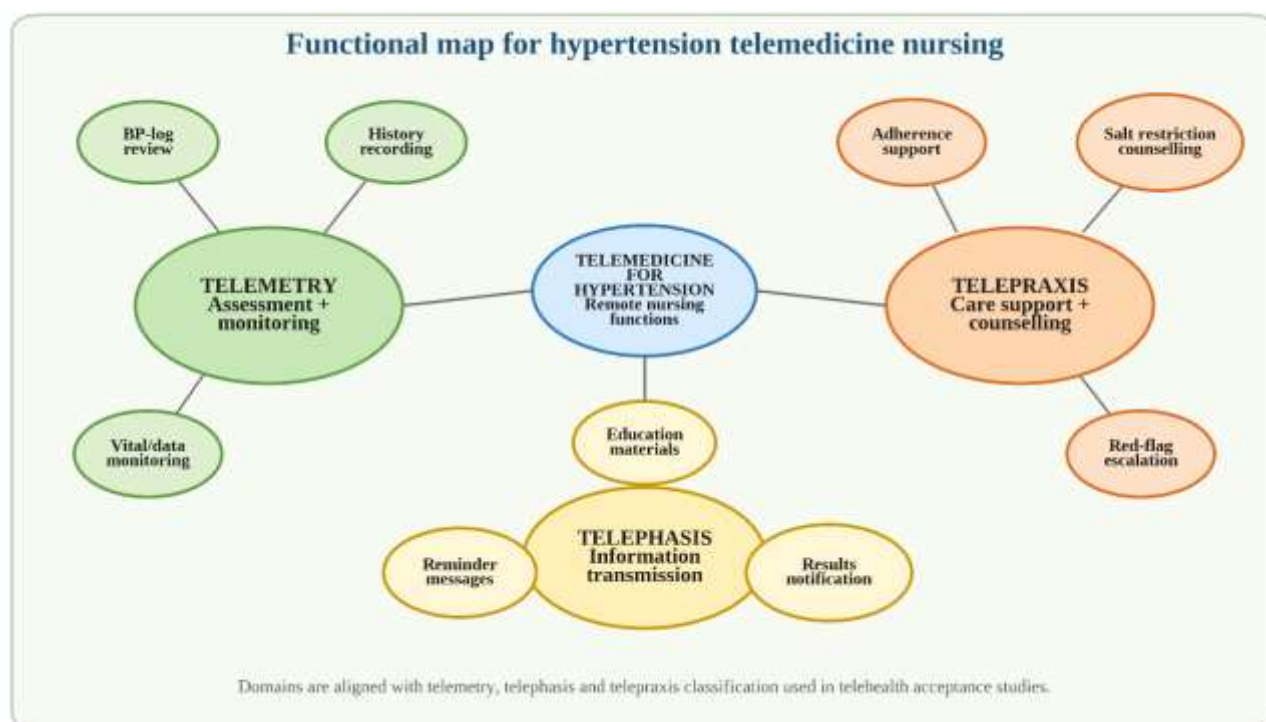


Figure 2. Adapted Telemedicine Functional Map for Hypertension Nursing Care, Aligned with Telemetry, Telephaxis and Telepraxis Domains



Data Collection Procedure

Participants completed a baseline questionnaire before viewing the videos. The baseline form collected demographic and professional characteristics, previous telemedicine exposure, routine digital clinical communication, telemedicine acceptance and perceived barriers. After completion of the training pathway, participants completed the post-training acceptance, barrier, acceptability, feasibility, appropriateness, confidence, readiness and satisfaction measures. Participants were encouraged to complete the training in a quiet setting and to review all video segments before submitting the post-training responses.

Statistical Analysis

Descriptive statistics were reported as frequency, percentage, mean, standard deviation, median and IQR as appropriate. Because acceptance and barrier outcomes were ordinal scale-derived scores, pre-post differences were analysed using Wilcoxon signed-rank tests. Effect sizes were calculated as $r = z/\sqrt{N}$, with higher values indicating stronger favourable post-training change. Internal consistency was assessed using Cronbach alpha. Pearson correlation was used to examine relationships between post-test telemedicine competency and implementation outcomes. Multivariable logistic regression identified independent predictors of high implementation readiness, defined as an overall readiness score of 4.0 or higher on a five-point scale. Statistical significance was set at $P < .05$.

Ethical Considerations

The study was planned in accordance with the Declaration of Helsinki and institutional requirements for educational and digital-health research. Administrative permission and Institutional Ethics Committee approval were obtained before data collection as per institutional requirements. Written informed consent, voluntary participation, confidentiality, secure storage of anonymized data and the right to withdraw without penalty were maintained. The exact ethics approval number and date can be inserted in the journal submission form wherever the journal requests this administrative detail.

RESULTS

Participant Characteristics

The final analysed dataset included 180 nursing officers. The mean age was 35.8 years (SD 7.2), and the mean duration of nursing experience was 7.7 years (SD 4.7). Female nursing officers constituted 136/180 (75.6%) of the sample. Previous telemedicine exposure was reported by 99/180 (55.0%), and 85/180 (47.2%) had previously attended hypertension-related training. Routine digital clinical communication was reported by 66/180 (36.7%).



Table 1. Demographic and Professional Characteristics of Nursing Officers (N=180)

Characteristic	Value	Category/scale
Age, years	35.8 (7.2)	Mean (SD)
Female sex	136 (75.6%)	n (%)
Years of nursing experience	7.7 (4.7)	Mean (SD)
Qualification: GNM	52 (28.9%)	n (%)
Qualification: BSc Nursing	84 (46.7%)	n (%)
Qualification: Post Basic BSc Nursing	28 (15.6%)	n (%)
Qualification: MSc Nursing	16 (8.9%)	n (%)
Department: Medical ward	65 (36.1%)	n (%)
Department: Cardiology/OPD	32 (17.8%)	n (%)
Department: Emergency	24 (13.3%)	n (%)
Department: Critical care	32 (17.8%)	n (%)
Department: General OPD	27 (15.0%)	n (%)
Telemedicine experience: never	81 (45.0%)	n (%)
Telemedicine experience: past use	56 (31.1%)	n (%)
Telemedicine experience: current use	43 (23.9%)	n (%)
Previous hypertension training	85 (47.2%)	n (%)
Routine digital clinical communication	66 (36.7%)	n (%)

Baseline Telemedicine Experience

Baseline experience varied by nursing function and communication mode. Phone-based experience was more common for history description, notification and patient support. Video-call experience was comparatively higher for examining, monitoring and education-related tasks, whereas asynchronous experience was prominent for announcing health information and notifying patients. This pattern supports the need to train nursing officers in more than one telemedicine mode.

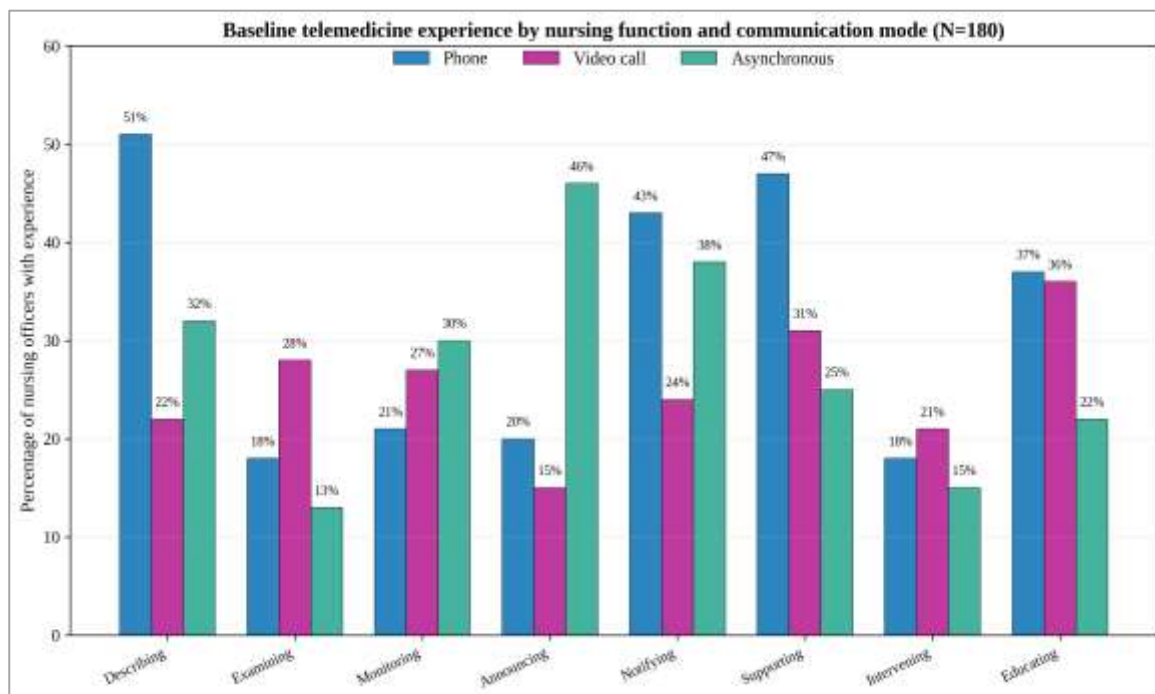


Figure 3. Baseline Telemedicine Experience of Nursing Officers by Function and Communication Mode. Participants Could Report More Than One Function

Telemedicine Acceptance Before and After Training

Overall telemedicine acceptance improved significantly after the video-assisted training pathway. The total acceptance score increased from a median of 61 (IQR 24) to 76 (IQR 16) out of 96 ($P < .001$; $r = 0.43$). Significant improvements were observed for telemetry, telephaxis and telepraxis, indicating that training improved willingness to use telemedicine for assessment, information transmission, counselling, education and escalation-related nursing activities.

Table 2. Telemedicine Acceptance Change Before and After Video-Assisted Training (N=180)

Acceptance score	Pre-training median (IQR)	Post-training median (IQR)	P value	Effect size r	Interpretation
Total acceptance (0-96)	61 (24)	76 (16)	<.001	0.43	Large favourable effect
Telemetry total (0-36)	20 (10)	27 (7)	<.001	0.42	Large favourable effect
Telephaxis total (0-24)	16 (8)	19 (5)	<.001	0.31	Large favourable effect



Telepraxis total (0-36)	24 (11)	30 (7)	<.001	0.39	Large favourable effect
Phone-based telemedicine (0-32)	20 (9)	24 (7)	<.001	0.29	Favourable effect
Video-call-based telemedicine (0-32)	22 (10)	28 (5)	<.001	0.45	Large favourable effect
Asynchronous telemedicine (0-32)	21 (10)	25 (6)	<.001	0.35	Large favourable effect

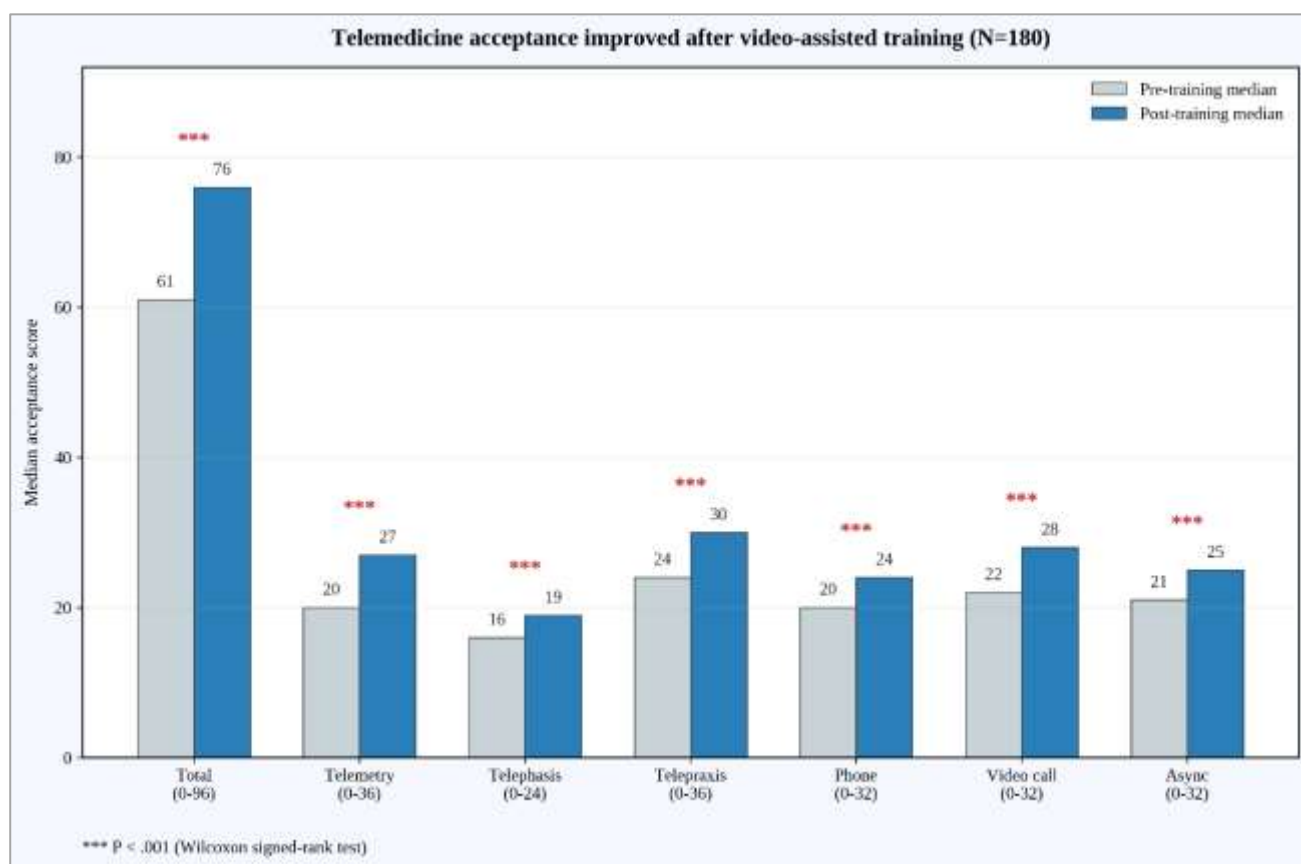


Figure 4. Telemedicine Acceptance Improved After Video-Assisted Training. Asterisks Indicate P<.001.



Perceived Barriers Before and After Training

The perceived influence of telemedicine barriers decreased significantly after training. The total barrier influence score decreased from a median of 60 (IQR 18) to 39 (IQR 16) out of 96 ($P<.001$; $r=0.52$). The largest improvements were seen in legal or medicolegal uncertainty, data privacy concerns, emergency escalation uncertainty and perceived quality of observation. Operational barriers such as network issues, device availability, workload and patient digital literacy remained relevant and require administrative correction before scale-up.

Table 3. Change in Perceived Barriers to Telemedicine Adoption Before and After Training (N=180)

Barrier domain	Pre score, median (IQR)	Post score, median (IQR)	P value	r	Implementation meaning
Total barrier influence (0-96)	60 (18)	39 (16)	<.001	0.52	Substantial reduction
Legal/medicolegal uncertainty	3 (2)	1 (1)	<.001	0.48	Improved clarity
Data privacy/confidentiality concern	3 (2)	1 (1)	<.001	0.41	Improved confidence
Internet/network instability	3 (2)	2 (2)	<.001	0.35	Still needs system support
Limited technology/device access	3 (2)	2 (1)	<.001	0.33	Still needs resources
Workload/time pressure	3 (2)	2 (2)	<.001	0.32	Needs workflow adjustment
Patient digital literacy concern	3 (2)	2 (2)	<.001	0.30	Needs patient support
Documentation burden	2 (2)	1 (1)	.002	0.22	Improved but relevant
Emergency escalation uncertainty	2 (2)	1 (1)	<.001	0.41	Improved protocol readiness
Language/communication issues	2 (2)	1 (1)	.011	0.18	Improved communication planning

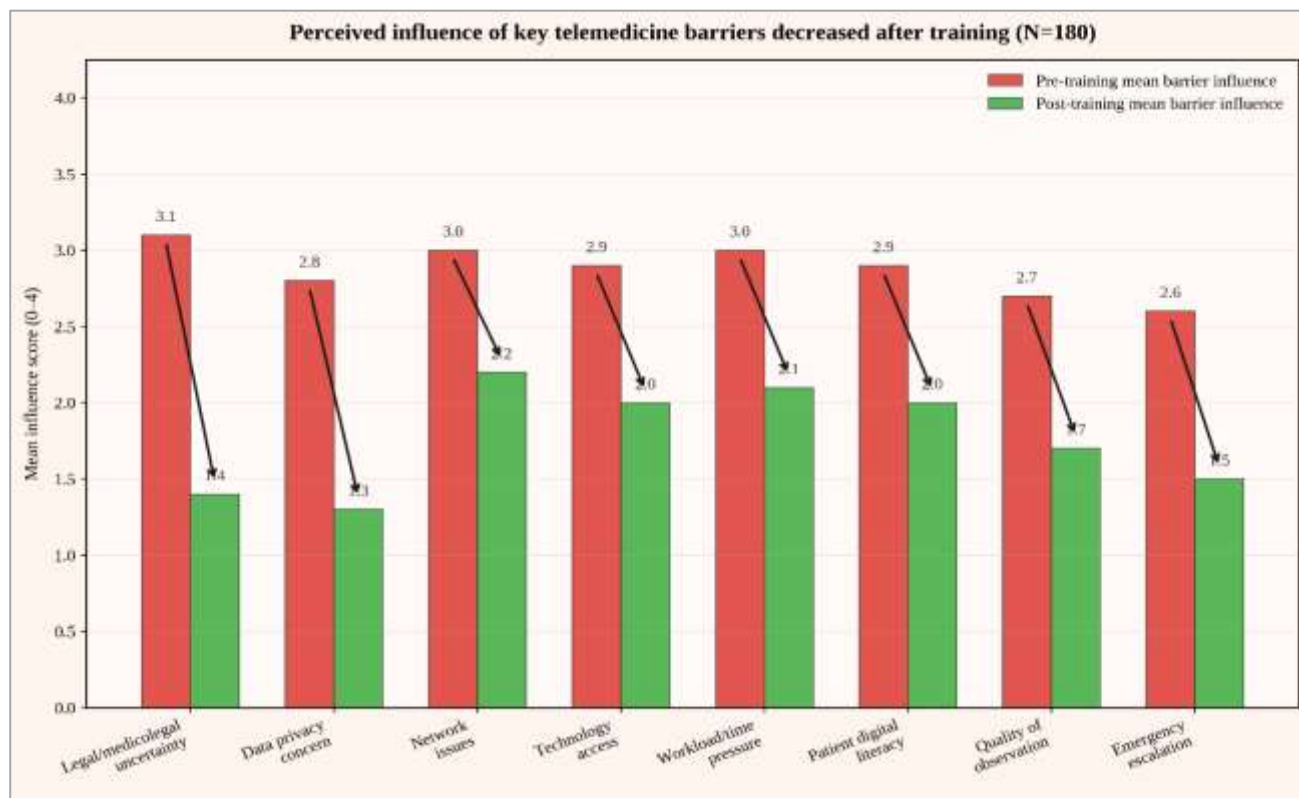


Figure 5. Perceived Influence of Key Telemedicine Barriers Decreased After Training

Acceptability, Feasibility, Appropriateness, Adoption Intention and Satisfaction

Post-training implementation outcomes were highly favourable. Acceptability, feasibility, appropriateness, adoption intention, confidence and overall readiness all exceeded the favourable threshold of 4.0 on a five-point scale. High implementation readiness was observed in 157/180 nursing officers (87.2%). Training satisfaction was also high, with a median total satisfaction score of 76 (IQR 8) out of 80. Nursing officers rated clarity, usefulness, hypertension-specific examples and willingness to recommend the training to colleagues very positively.

Table 4. Post-Training Implementation Outcome and Satisfaction Scores (N=180)

Implementation outcome	Mean (SD) or median (IQR)	High score, n (%)	Scale/maximum
Acceptability	4.42 (0.39)	158 (87.8%)	1-5
Feasibility	4.24 (0.45)	148 (82.2%)	1-5
Appropriateness	4.47 (0.37)	160 (88.9%)	1-5
Adoption intention	4.38 (0.43)	154 (85.6%)	1-5
Confidence for telemedicine use	4.32 (0.44)	150 (83.3%)	1-5
Overall implementation readiness	4.36 (0.31)	157 (87.2%)	1-5
Training satisfaction total	76 (8)	164 (91.1%)	0-80

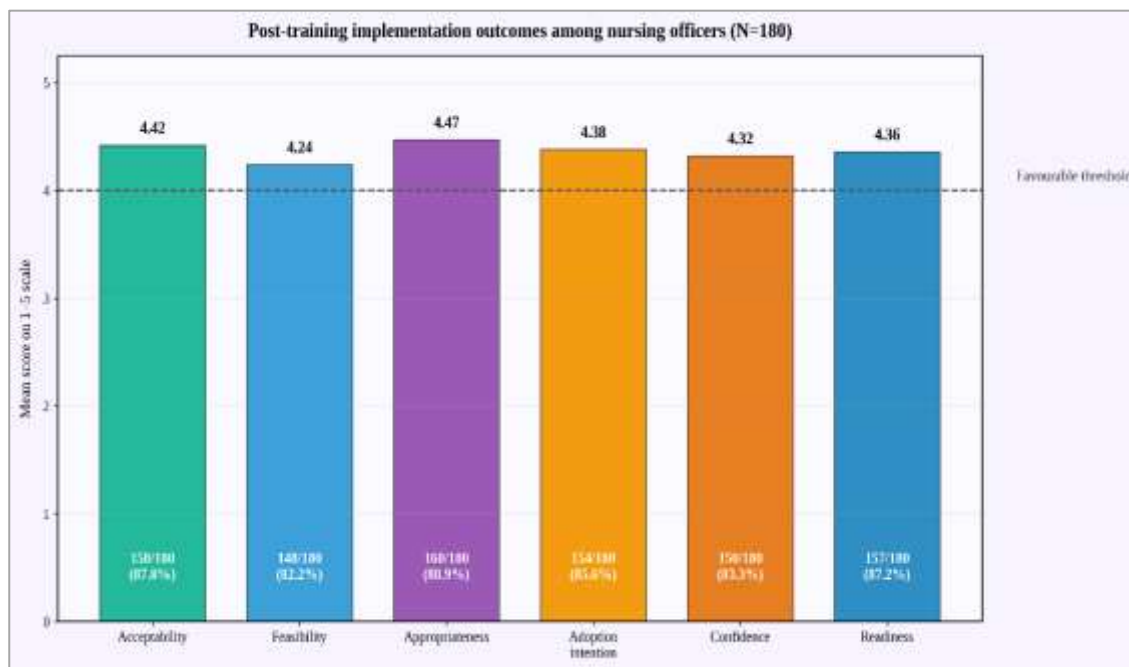


Figure 6. Post-Training Acceptability, Feasibility, Appropriateness, Adoption Intention, Confidence and Implementation Readiness

Reliability, Correlations and Predictors of Implementation Readiness

The internal consistency of the acceptance and implementation scales was acceptable to excellent. Cronbach alpha values were 0.91 for baseline acceptance, 0.93 for post-training acceptance, 0.88 for baseline barrier influence and 0.90 for post-training barrier influence. Implementation outcome scales ranged from 0.84 to 0.92. Post-test telemedicine competency showed positive correlations with acceptability, feasibility, appropriateness, satisfaction and readiness, indicating that improved competency was associated with more favourable implementation response.

Table 5. Reliability Indices and Correlations with Post-Test Telemedicine Competency (N=180)

Scale/outcome	Cronbach alpha or r	P value	Interpretation
Acceptance scale, pre-training	0.91	<.001	Excellent internal consistency
Acceptance scale, post-training	0.93	<.001	Excellent internal consistency
Barrier influence scale, pre-training	0.88	<.001	Good internal consistency
Barrier influence scale, post-training	0.90	<.001	Excellent internal consistency
Post-test competency with acceptability	r=0.54	<.001	Moderate positive correlation



Post-test competency with feasibility	r=0.49	<.001	Moderate positive correlation
Post-test competency with appropriateness	r=0.52	<.001	Moderate positive correlation
Post-test competency with readiness	r=0.58	<.001	Moderate positive correlation
Post-test competency with satisfaction	r=0.46	<.001	Moderate positive correlation

In multivariable logistic regression, post-test telemedicine competency, previous telemedicine exposure and perceived administrative support independently predicted high implementation readiness. The model showed acceptable discrimination for identifying nursing officers who achieved high readiness for telemedicine-supported hypertension care.

Table 6. Multivariable Logistic Regression Predicting High Implementation Readiness (N=180)

Predictor	Adjusted odds ratio	95% CI	P value	Interpretation
Post-test telemedicine competency, per SD increase	2.31	1.42-3.76	.001	Independent positive predictor
Previous telemedicine exposure	1.96	1.01-3.79	.047	Independent positive predictor
Perceived administrative support	2.74	1.38-5.45	.004	Independent positive predictor
Routine digital clinical communication	1.68	0.86-3.28	.126	Not statistically significant
Nursing experience ≥ 5 years	1.22	0.62-2.41	.566	Not statistically significant

Model note: Outcome variable was high implementation readiness (score ≥ 4.0). Model c-statistic=0.79; Hosmer-Lemeshow P=.62.

Qualitative Implementation Feedback

Open-ended feedback supported the quantitative findings. Nursing officers described the training as clear, clinically relevant and directly applicable to hypertension follow-up. The most frequently suggested improvements were hands-on demonstrations of telemedicine documentation, short scripts for patient counselling, local-language patient education materials, clearer escalation protocols and institutional support for protected telemedicine time. These comments indicate that the training was acceptable but should be paired with service-level resources for sustainable scale-up.



DISCUSSION

This pre-post implementation-focused study found that video-assisted telemedicine training was associated with significant improvement in telemedicine acceptance and significant reduction in perceived barriers among nursing officers involved in hypertension care. The pattern of change was consistent across telemetry, telephysis and telepraxis domains, showing that training improved willingness to use remote assessment, information transmission, counselling, education and referral escalation functions. The findings align with telehealth education studies showing that structured training can increase professional acceptance, confidence and readiness to use telehealth in clinical practice.^{1,3,4,14,15}

The reduction in barrier scores is particularly important for implementation. Legal or medicolegal uncertainty, data privacy concern, emergency escalation uncertainty and perceived quality-of-observation concerns showed strong improvement after training, suggesting that clear explanations and clinical examples can reduce uncertainty. However, network instability, device access, workload, documentation burden and patient digital literacy remained relevant. These barriers are not solved by education alone and require administrative support, infrastructure planning and simplified workflow design.^{6-8,16}

High post-training acceptability and feasibility indicate that nursing officers viewed the intervention as suitable for their work. The hypertension-specific module was important because it connected telemedicine concepts to tasks already familiar to nursing officers, such as reviewing blood pressure records, reinforcing lifestyle advice and escalating uncontrolled readings to the physician. This applied design likely explains the favourable adoption intention and confidence scores. Training formats that are profession-specific and clinically contextualized are more likely to translate into implementation readiness than generic awareness sessions.^{1,4,12}

The regression findings provide a practical message for scale-up. Higher post-test competency, previous telemedicine exposure and perceived administrative support independently predicted high implementation readiness. This means that clinical education should be combined with supportive supervision, local policy clarity, checklists, connectivity support and time allocation for documentation. Nursing officers who have no previous exposure may need additional mentoring and demonstration sessions before independent telemedicine follow-up is expected.

Strengths and Limitations

A strength of the study is its implementation-focused design, which examined acceptance, barriers, feasibility, appropriateness, satisfaction and readiness rather than only knowledge improvement. The use of a functional telemedicine framework allowed analysis across telemetry, telephysis and telepraxis domains. The main limitations are the pre-post design without a control group, the use of self-reported implementation outcomes and short-term post-training assessment. Future research should evaluate longer-term telemedicine utilization, patient outcomes, nurse workload, cost-effectiveness and sustainability after institutional scale-up.



Implications for Nursing Practice

The findings support integration of telemedicine training into nursing continuing education for hypertension care. Hospitals can use brief video-assisted modules, competency checklists, local-language patient scripts, privacy guidance and escalation pathways to prepare nursing officers for remote follow-up. For sustained practice, administrators should ensure reliable network access, patient digital support, clear documentation formats and protected time for telemedicine-related work.

CONCLUSION

Video-assisted telemedicine training was acceptable, feasible and implementation-ready for nursing officers involved in hypertension management. In the final analysed sample of 180 nursing officers, telemedicine acceptance improved significantly and perceived barriers decreased significantly after training. The strongest implementation message is practical and positive: nursing officers can be rapidly prepared for telemedicine-supported hypertension follow-up when structured video-based education is linked with hypertension-specific case examples, privacy and documentation guidance, reliable connectivity, protected workflow time and clear physician escalation pathways.

Data Availability

The de-identified dataset supporting the analysis may be made available from the corresponding author on reasonable request, subject to institutional approval and applicable ethical restrictions.

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Conflicts of Interest

The authors declare no conflicts of interest related to this manuscript.

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Author Contributions

Mr. Sreekanth A.N. conceptualized the study, coordinated data collection, analysed the data and prepared the manuscript. Dr. Rama Taneja supervised the study design, methodological refinement, interpretation and manuscript review. Both authors approved the final version for submission.

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