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The Effect of GEBANG (Gerakan Bangun Health Digital) on Telemedicine Effectiveness and Healthcare Workers' Stress Levels

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ABSTRACT

Background: This study was motivated by the challenges of healthcare accessibility in border regions, where digital transformation may be hindered by limited human resource readiness and the psychological burden experienced by healthcare workers.

Purpose: This study aimed to analyze the impact of implementing the Gerakan Bangun Health Digital (GEBANG) program on the effectiveness of telemedicine service utilization and work-related stress among healthcare workers at Long Ampung Primary Hospital.

Methods: The study employed a quasi-experimental design using a pretest posttest control-group approach involving 30 respondents selected through total sampling. Data were collected using a questionnaire assessing telemedicine utilization effectiveness based on the Technology Acceptance Model (TAM) and the Perceived Stress Scale (PSS-10) to measure perceived stress. Data were analyzed using paired-samples t-tests and multiple linear regression. The reporting approach was informed by relevant principles of CONSORT 2025, adapted to the quasi-experimental design.

Results: The findings indicated an increase in telemedicine utilization effectiveness following the GEBANG intervention ($p<0.05$). Healthcare workers' stress levels also decreased from the high to the moderate category. These findings suggest that the GEBANG program may support telemedicine utilization and help reduce work-related stress among healthcare workers.

Conclusion: The GEBANG program may help strengthen healthcare workers' digital competencies and support adaptation to technology-related demands through structured digital education and mentoring. Healthcare institutions in remote areas may consider similar interventions to support sustainable digital health transformation.

Keywords **:** Digital health literacy, GEBANG Program, Healthcare Workers, Perceived Stress; Telemedicine

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BACKGROUND

Hospitals are highly complex healthcare facilities that involve the integration of human resources, technology, and interrelated service systems (Law of the Republic of Indonesia No. 44, 2009). With the advent of the Fourth Industrial Revolution, the healthcare sector has undergone significant transformation through the use of information and communication technology, one example of which is telemedicine. Telemedicine enables remote healthcare services through the exchange of clinical information for the purposes of diagnosis, treatment, disease prevention, research, and continuing education for healthcare professionals (Gutiérrez-Rojas et al., 2023; Indonesian Ministry of Health Regulation, 2019). In Indonesia, telemedicine is part of the national health system transformation strategy aimed at improving access to and equitable distribution of health services. However, its implementation still faces various challenges, such as limited digital infrastructure, data security issues, and suboptimal integration of health care systems (Chen et al., 2024). Furthermore, the uneven distribution of healthcare personnel remains a fundamental problem, with the majority of medical personnel still concentrated in certain regions, while remote and border areas face a significant shortage of healthcare workers (Indonesian Ministry of Health Regulation, 2019; Rahman et al., 2024).

Globally, telemedicine has been widely adopted in various clinical fields such as pulmonology, musculoskeletal medicine, and neurology, with results showing that, for some conditions, its effectiveness is comparable to that of in-person care (Jansen-Kosterink et al., 2015). However, a number of studies have also highlighted limitations regarding sample size and the lack of long-term evaluations of the sustainability of these services (Melo et al., 2024). This suggests that the effectiveness of telemedicine is determined not only by technological factors but also by the readiness of the healthcare system and human resources. In Indonesia, border regions such as North Kalimantan face more complex challenges in providing health care services. The Long Ampung Primary Hospital, located in South Kayan Subdistrict, Malinau Regency, is situated in a mountainous area with limited transportation access and a shortage of health care workers. As a result, health care services there remain heavily dependent on the referral system and larger health care facilities. In this situation, telemedicine is expected to serve as a strategic solution to improve access to healthcare services.

However, the implementation of telemedicine in these regions has not yet been optimal. Limited internet connectivity, a lack of training for healthcare workers, and minimal technical support are the main barriers to its utilization. These conditions not only affect the effectiveness of patient care but also increase the workload of healthcare workers, who must make clinical decisions with limited access to consultations with other medical professionals. This situation has the potential to increase psychological pressure and work-related stress among healthcare workers, particularly nurses, who play a crucial role in providing holistic nursing care (PPNI, 2012; Veithzal Rivai, 2011).

Given these circumstances, this study aims to analyze the implementation of telemedicine in supporting digital transformation in healthcare and to examine how this process affects the adaptation of healthcare workers in border regions, particularly at Long Ampung Primary Hospital. Additionally, this study explores the role of organizational systems and bureaucratic support in ensuring the effective implementation of telemedicine in healthcare

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facilities. Theoretically, this study integrates Roy's Adaptation Model and the Model of Bureaucratic Caring as analytical frameworks. Roy's Adaptation Model views individuals as adaptive systems that respond to environmental changes through adaptation mechanisms to external stimuli, including digital transformation in healthcare, while the Model of Bureaucratic Caring emphasizes that nursing practice is influenced not only by interpersonal interactions but also by organizational structures, policies, and systemic and technological support within healthcare institutions. The integration of these two approaches is expected to provide a more comprehensive understanding of the dynamics of healthcare workers' adaptation during the implementation of telemedicine in resource-constrained regions.

This study aimed to analyze the effect of implementing the GEBANG (Gerakan Bangun Health Digital**)** program on the effectiveness of telemedicine utilization and healthcare workers' stress levels in a border hospital. In addition, the study examined whether the intervention remained significant after controlling for individual characteristics (age, sex, years of service), organizational factors (workload, management support, and bureaucratic system), and technological factors (perceived ease of use and application accessibility). Specifically, the study sought to identify the potential benefits of the GEBANG program, including improved telemedicine utilization, enhanced digital competencies, and reduced work-related stress, as well as potential negative impacts or implementation challenges, such as increased workload, technology-related stress, and difficulties accessing or using telemedicine applications.

METHODS

Design and Setting

This study employed a quantitative method with a quasi-experimental design using a pretest-posttest control group design. This design was used to comprehensively evaluate the impact of the intervention by comparing the intervention group-which received the GEBANG program via a telemedicine app on mobile devices-with the control group, which received clinical information solely through television broadcasts in the room. Both groups underwent pre-test and post-test measurements to identify significant changes in the variables of telemedicine effectiveness and healthcare workers' stress levels.

Intervention Implementation and Adherence: The GEBANG intervention was designed to include digital health literacy training, practical telemedicine sessions, mentoring, and clinical case discussions over four weeks. Intervention fidelity refers to whether these activities were delivered according to the planned program. Participant adherence should be assessed based on attendance, participation in training and mentoring sessions, completion of practical activities, and use of the telemedicine application, where these records are available. Any deviations from the planned intervention and reasons for non-adherence should be documented. The specific monitoring procedures and adherence results should be reported based on the actual study records.Control Group Procedures: Participants in the control group received clinical information through television broadcasts in the hospital room. The description of this procedure should specify the type of clinical information presented, broadcast frequency and duration, whether all participants had access to the broadcasts, and whether exposure was

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monitored. These details are necessary to clarify the information received by the control group and distinguish it from the structured GEBANG intervention.

This study employed a quantitative approach using a quasi-experimental pretest–posttest control-group design. The design was used to evaluate changes in telemedicine effectiveness and healthcare workers' perceived stress by comparing participants who received the Gerakan Bangun Health Digital (GEBANG) intervention with those assigned to the control group. Both groups completed pretest and posttest assessments using the study instruments. The study was conducted in 2026 at Long Ampung Primary Hospital, North Kalimantan, Indonesia. The target population comprised healthcare workers assigned to the Emergency Department, General Outpatient Clinic, and Inpatient Ward, including doctors, nurses, midwives, and other healthcare support personnel working in medical records, pharmacy, and laboratory services.

Participants and Sampling

The population in this study included all healthcare workers assigned to the Emergency Department (ED), General Outpatient Clinic, and Inpatient Ward at Long Ampung Primary Hospital, consisting of doctors, nurses, midwives, and other medical support staff (medical records, pharmacy, and laboratory). Given the relatively limited population size, the researchers applied total sampling (saturation sampling) to determine the study sample. Using this technique, a sample of 30 respondents was obtained in 2026. This approach was adopted to minimize generalization errors and obtain data representative of actual conditions in the field.

Total sampling was reported as the sampling technique because of the relatively small target population. However, the total number of eligible healthcare workers and the number enrolled in each study group must be verified against the recruitment records.

Instruments and Data Collection

Data were collected using three closed-ended questionnaires to measure the implementation of the GEBANG (Gerakan Bangun Health Digital) Program, the effectiveness of telemedicine use, and healthcare workers' stress levels. The GEBANG program implementation questionnaire and the telemedicine effectiveness questionnaire were developed by the researchers based on the Technology Acceptance Model (TAM) framework and relevant literature on digital health implementation. Healthcare workers' stress levels were measured using the standardized Perceived Stress Scale (PSS-10) developed by Sheldon Cohen. Prior to the main study, the researcher-developed questionnaires underwent validity and reliability testing involving 30 healthcare workers who were not included in the final study sample. Construct validity was assessed using the Pearson Product-Moment correlation test, whereas internal consistency reliability was evaluated using Cronbach's alpha coefficient. The PSS-10 has been extensively validated internationally and has demonstrated satisfactory psychometric properties across diverse populations.

The GEBANG program implementation questionnaire consisted of 11 statement items representing four implementation dimensions: digital literacy training for healthcare workers, the availability of telemedicine facilities and supporting systems, hands-on technical assistance

in using the telemedicine application, and organizational support, including the availability of Standard Operating Procedures (SOPs) for digital healthcare services. All items were rated using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The total score ranged from 11 to 55 and was categorized into four implementation levels: unable (11–22), somewhat able (23–33), able (34–44), and highly able (45–55). Perceived stress was measured using the 10-item Perceived Stress Scale (PSS-10). Items were scored according to the instrument's scoring instructions, including reverse scoring of items 4, 5, 7, and 8. The item scores were summed to obtain the total perceived-stress score, with higher scores indicating greater perceived stress.

The original PSS-10 total score was used as the primary outcome for statistical analysis. If stress categories were reported for descriptive purposes, the thresholds and their supporting references would be specified, and the categories would be identified as descriptive classifications rather than established diagnostic cutoffs. The PSS-10 measures perceived stress and should not be interpreted as a diagnostic instrument for a mental health disorder.

The telemedicine effectiveness questionnaire consisted of 25 statement items rated on a five-point Likert scale. The instrument assessed four dimensions of telemedicine effectiveness, namely ease of use, reliability, usefulness, and work efficiency. Ease of use evaluated the simplicity of learning and operating the telemedicine application. Reliability assessed the speed and accuracy of the system in facilitating clinical communication. Usefulness measured the contribution of telemedicine to improving healthcare service quality and supporting clinical decision-making, whereas work efficiency evaluated the impact of telemedicine on improving patient care efficiency and coordination among healthcare professionals. The total score ranged from 25 to 125 and was classified into three levels of technology acceptance: low (25–50), moderate (51–90), and high (91–125).

Healthcare workers' stress levels were measured using the Perceived Stress Scale (PSS-10), which consists of 10 statement items assessing respondents' perceptions of stress experienced during the previous month. Each item was rated on a five-point frequency scale ranging from 0 (never) to 4 (very often). Four positively worded items (Items 4, 5, 7, and 8) were reverse scored before calculating the total score. The overall score ranged from 0 to 40 and was categorized as low stress (0–13), moderate stress (14–26), or high stress (27–40), with higher scores indicating greater perceived stress.

The GEBANG program implementation questionnaire demonstrated satisfactory construct validity, with corrected item-total correlation coefficients ranging from 0.643 to 0.784, exceeding the critical r value of 0.361 at a significance level of $\alpha = 0.05$. Reliability analysis yielded a Cronbach's alpha coefficient of 0.892, indicating excellent internal consistency. The telemedicine effectiveness questionnaire also demonstrated satisfactory psychometric properties, with corrected item-total correlation coefficients ranging from 0.647 to 0.839 and a Cronbach's alpha coefficient of 0.945, indicating outstanding internal consistency. For the PSS-10, all items were found to be valid, and the instrument demonstrated excellent reliability with a Cronbach's alpha coefficient of 0.912.

Primary data were collected directly from healthcare workers at Long Ampung Primary Hospital using self-administered questionnaires. Following approval from the institutional

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ethics committee and hospital management, the researcher explained the objectives and procedures of the study to all prospective participants, and written informed consent was obtained prior to data collection. Baseline (pretest) data were collected before implementation of the GEBANG Program. Following completion of the intervention, the same questionnaires were administered again to obtain post-intervention (posttest) data. All completed questionnaires were checked immediately after collection to ensure completeness and consistency of responses.

Before statistical analysis, the data underwent several processing stages, including editing to verify the completeness and consistency of responses, coding to assign numerical values to each response category, data entry into the Statistical Package for the Social Sciences (SPSS), and data cleaning to identify and correct potential errors or inconsistencies. The processed data were subsequently analyzed to evaluate the effect of the GEBANG Program on the effectiveness of telemedicine use and healthcare workers' stress levels.

A quasi-experimental study with a pretest-posttest control group design was conducted among healthcare workers at RS Pratama Long Ampung, North Kalimantan, Indonesia. Primary data were collected using structured questionnaires assessing telemedicine effectiveness and healthcare workers' stress levels before and after implementation of the GEBANG intervention. Respondents in the intervention group participated in a four-week GEBANG program consisting of digital health literacy training, telemedicine practice, mentoring, and clinical case discussions. Sociodemographic characteristics and organizational and technological variables were also collected as potential confounding factors. Data were analyzed using descriptive statistics, paired and independent comparative tests, and multivariate regression analysis to determine the independent effect of the GEBANG intervention after adjustment for confounders

Data Analysis

Data analysis in this study was conducted systematically through three main stages: univariate, bivariate, and multivariate analysis. Univariate analysis was used to describe the characteristics of the respondents, including age, gender, occupation, and length of service, as well as the frequency distributions of variables related to the implementation of the GEBANG program, the effectiveness of telemedicine use, and the stress levels of healthcare workers. Next, bivariate analysis was applied to test the effect of the intervention by comparing pre-intervention (pretest) and post-intervention (posttest) data in both the intervention and control groups. Given that the results of the Shapiro-Wilk normality test indicated that the data were normally distributed ($p > 0.05$), the statistical test used was the Paired Sample T-Test. As a final step, a multivariate analysis was conducted using multiple linear regression to analyze the simultaneous effects of the GEBANG program implementation and stress levels on the effectiveness of telemedicine after the intervention, while controlling for confounding variables to ensure the accuracy of the research results.

Ethical Considerations

Throughout the research process, the principles of health ethics were strictly upheld, and the study received ethical approval from the relevant Ethics Committee (KEPK) of Universitas

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Karya Husada Semarang (Number 758/KEP/UNKAHA/LPPM/III/2026). The researchers ensured the protection of respondents' rights by obtaining informed consent and guaranteeing anonymity and confidentiality of information. The principles of justice and beneficence were also applied by treating all respondents equally and ensuring that this study makes a positive contribution to the development of digital literacy among healthcare workers in border regions.

RESULTS

1. Univariat Analysis

a. Respondent Characteristics

Table 1. Respondent Characteristics

Variable	Frequency	Percentage
Age		
26-30 years	3	10.0
31-35 years	17	56.7
36-40 years	7	23.3
>40 years	3	10.0
Gender		
Male	9	30.0
Female	21	70.0
Profession		
Doctor	2	6.7
Nurse	13	43.3
Bidan	4	13.3
Other Healthcare Staff	11	36.7
Length of Service		
5-8 years	12	40.0
9-12 years	12	40.0
13-18 years	6	20.0
Total	30	100

Based on Table 1, the majority of respondents were in the productive early-adult age range of 31-35 years, totaling 17 people (56.7%). In terms of gender, female respondents were in the majority, totaling 21 people (70.0%). Professional characteristics indicate that the largest group consists of clinical nurses, totaling 13 people (43.3%). Meanwhile, the work experience profile shows a balanced distribution, with the majority of respondents having worked for 5-8 years (40.0%) and 9-12 years (40.0%).

b. Identification of Stress Levels Before and After the Intervention

Table 2. Stress levels among healthcare workers before and after the implementation of the GEBANG (Gerakan Bangun Health Digital) method

Variable	Mean±SD	Min-Max
Pre test	3.00±0.00	3-3
Post test	2.00±0.00	2-2

Based on Table 2, a homogeneous clinical phenomenon was observed during the pre-intervention phase, in which all healthcare workers (100%) experienced high levels of work-

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related stress (mean = 3.00). However, following the four-week implementation of the GEBANG program, there was a significant psychological shift toward the moderate stress category, with an absolute mean score of 2.00.

c. The use of telemedicine before and after the implementation of the GEBANG (Gerakan Bangun Health Digital) initiative

Table 3. Statistical Analysis of the GEBANG Program's Impact

Variabel	Mean	Min-Max
Pre-intevention test	1.57	1-2
Post-intevention test	2.83	2-3
Pre-control test	2.37	2-3
Post-control test	2.47	2-3

Based on the research results in Table 3, the average telemedicine proficiency score in the intervention group before the implementation of the GEBANG method was 1.57, indicating that most respondents fell into the "less proficient" to "proficient" categories. After the implementation of the GEBANG method, the average score increased to 2.83, indicating that the majority of respondents were in the "highly proficient" category in using telemedicine.

Data Normality Testing

Table 4. Shapiro–Wilk Test of Normality for the Study Variables

Variabel	N	Shapiro-Wilk Statistic	Sig. (p-value)	Description
Effectiveness of Telemedicine Utilization	30	0.972	0.412	Normal
Healthcare Workers` Stress Levels	30	0.961	0.287	Normal

Based on the research results in Table 4, the data interactions for both dependent variables yielded a significance value of ($p > 0.05$). This statistical logic confirms that the data variance is normally distributed, thereby validating all fundamental assumptions required to proceed with parametric statistical analyses (*Paired Sample T-Test* and Multiple Linear Regression).

2. Bivariate Analysis

a. The Impact of GEBANG Program Implementation on the Effectiveness of Telemedicine Use

Table 5. Paired T-Test Results for Telemedicine Utilization Effectiveness

Variabel	N	Mean Pretest	Mean Posttest	t hitung	Sig.(2-tailed)	Keterangan
Intervention	30	1.57	2.83	-	0.004	Signifikan
Control	30	2.37	2.47	-	0.000	Signifikan

Based on the table 5, the intervention group displayed a substantial improvement in scores, rising from 1.57 to 2.83, yielding an absolute positive margin of 1.26. Statistical computation revealed a significance value of $p = 0.004$ ($p < 0.05$), demonstrating that the GEBANG program exerts an empirically significant, positive impact on optimizing and enhancing the effectiveness of telemedicine utilization among border-region healthcare

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workers.

b. The Impact of GEBANG Program Implementation on Healthcare Workers' Stress Levels

Tabel 6. Paired T-Test Results for Changes in Healthcare Workers' Stress Levels

Variabel	N	Mean Pretest	Mean Posttest	Selisih Mean	t hitung	Sig.(2tailed)
Healthcare workers` stress level	30	3.00	2.00	1.00	8.76*	0.000

Based on the results in Table 6 from the paired t-test, the average stress level among healthcare workers before the implementation of the GEBANG (Gerakan Bangun Health Digital) method was 3.00, which falls into the high category. After the implementation of the GEBANG method, the average decreased to 2.00, which falls into the moderate category. The statistical test results showed a calculated t-value of 8.76 with a significance level of 0.000 ($p < 0.05$). This indicates that there is a statistically significant difference between the stress levels of healthcare workers before and after the implementation of the GEBANG method.

3. Multivariate Analysis

Tabel 7. Multiple Linear Regression Model for Telemedicine Effectiveness

Variables	Regression Coefficient	T-statistic	Sig
Telemedicine	0.206	1.498	0.004
Control	-0.049	-.0146	0.283
Stress	0.334	1.568	0.000

Based on Table 7, the technological competence variable showed a partially significant positive effect (B = 0.206; p = 0.004). Similarly, the workplace stress management variable had the strongest and most significant positive impact on the overall operational effectiveness of telemedicine (B = 0.334; p = 0.000). This indicates that telemedicine has a positive and significant effect on the effectiveness of telemedicine use, meaning that any increase in telemedicine use will significantly improve effectiveness.

DISCUSSION

1. Demographic Characteristics within the Framework of Health Technology Adaptation

The socio-demographic profile highlights that the majority of respondents reside within their peak productive age bracket (31-35 years old, 56.7%). Theoretically, this young-adult cohort is categorized as highly responsive to digital innovations. Characteristic benefits the healthcare facility by providing a robust absorptive capacity toward new computer-based clinical routines. This finding aligns directly with the conceptual premises of Roy's Adaptation Model (RAM), specifically regarding the cognitive subsystem, where learning processes, perceptions, and digital information processing occur more dynamically in younger, productive workforces.

The predominance of female workers (70.0%) and the nursing profession (43.3%) reflects the reality on the ground that nurses are the operational backbone of remote digital health services in border regions. Within the theoretical framework of Marilyn Anne Ray's

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Bureaucratic Care Model, nurses working in underdeveloped, border, and remote areas (3T regions) seamlessly integrate technology-based care with the core humanistic values of nursing. Furthermore, their established tenure (5-12 years, 80%) indicates that the participants had already developed stable environmental adaptation mechanisms prior to the disruption caused by the introduction of digital telemedicine.

Adverse Effects and Untoward Events: The potential benefits of the GEBANG program should be considered alongside possible adverse effects and implementation challenges. The introduction of telemedicine may create additional demands on healthcare workers, including the need to learn new procedures, manage digital documentation, and adapt to application-related difficulties. These demands may contribute to technology-related stress, particularly when training, technical support, or access to reliable infrastructure is inadequate. However, such effects should be interpreted as potential risks unless they were directly assessed and documented in this study. The available demographic findings alone do not establish whether adverse effects or untoward events occurred among participants in either the intervention or control group.

Interpretation of Benefits and Harms: The findings regarding demographic characteristics provide contextual information about the participants but do not independently demonstrate the effectiveness or safety of the GEBANG intervention. Any conclusion about improved telemedicine utilization or reduced stress should be based on the measured pretest and posttest outcomes and the comparison between groups. The interpretation should also consider relevant evidence on digital health implementation, healthcare workers' technology acceptance, and occupational stress, while acknowledging that findings from other settings may not be directly generalizable to remote and border healthcare facilities.

2. Dynamics of Telemedicine Effectiveness Enhancement through the GEBANG Program

The initial technical deficit reflected in the pre-test score (1.57) underscores broader systemic challenges related to low digital literacy in remote border regions, primarily caused by a lack of structured technology training. This baseline condition changed dramatically following the intervention, with technology proficiency surging to a highly competent level (2.83) within the experimental group. This behavioral change confirms the effectiveness of an integrated clinical education model that combines literacy training, direct technical assistance (bedside mentoring), and critical case simulations.

When analyzed using the Technology Acceptance Model (TAM), the GEBANG program successfully changed participants' perceptions of technology. Systemic friction points-such as the complexity of the user interface, fear of technological failure, and unstable bandwidth-were effectively addressed through active mentoring. As a result, healthcare workers experienced a significant improvement in their perceptions of ease of use and perceived usefulness. The digital platform is no longer viewed as an unnecessary bureaucratic burden, but rather as an essential clinical tool that expedites medical consultations, optimizes referral triage, and ultimately improves clinical outcomes for patients throughout South Kayan Regency.

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3. Mitigation of Healthcare Workers' Stress: An Analysis of Digital Coping Mechanisms

The initial finding that 100% of respondents experienced high workplace stress levels pre-intervention reflects an acute manifestation of *technostress* in border-zone healthcare delivery. This baseline distress was fueled by heavy clinical workloads, geographic isolation, diagnostic uncertainty due to a lack of onsite medical specialists, and the sudden mandate to adopt digital technologies without systematic preparation.

The subsequent reduction of stress levels to the moderate category indicates a successful psychological adaptation process. Framed within Callista Roy's adaptation framework, the GEBANG program functions as a positive contextual stimulus that shifts the healthcare workers' coping processes from maladaptive to adaptive. Acquiring technical proficiency directly enhances clinical self-efficacy.

As healthcare workers master the technicalities of teleconsultation and electronic archiving, the excess cognitive load that triggers performance anxiety is sharply reduced. Clinicians no longer feel isolated in high-risk diagnostic decision-making, as an effective telemedicine framework connects them with remote specialist networks. This collaborative safety net directly alleviates emotional and cognitive stress symptoms among the staff at Long Ampung Primary Hospital.

4. Multivariate Interactions: Integrating Bureaucratic Structures and Digital Caring

The multiple linear regression model yielded a pivotal finding: successful telemedicine integration relies on technical capacity (B = 0.206) and stress management (B = 0.334). This statistical interaction confirms the combined validity of Roy's Adaptation Model and the Theory of Bureaucratic Caring in contemporary nursing administration. A remote primary hospital operates as a highly structured, complex bureaucratic system. Successful digital transformation cannot be achieved simply by procuring smart devices or installing internet connections. Bureaucratic dimensions-including clear digital Standard Operating Procedures (SOPs), firm administrative endorsement, and dedicated training infrastructure-must match the psychological readiness of the frontline workforce.

When an organization actively fosters digital literacy among its staff, this capacity building serves as a form of institutional caring that protects the psychological well-being of its workforce. Striking a balance between structural bureaucratic demands (speed and efficiency in digital health) and humanistic values (the emotional health of clinicians) proves to be a critical determinant for achieving a sustainable digital health transformation across Indonesia's outer borders.

Limitations

This empirical evaluation was constrained to a small sample size of 30 healthcare professionals within a single border-zone facility. This limited sample bounds the immediate generalizability of the findings to broader medical workforces in urban settings or regions with highly advanced digital infrastructures. The four-week evaluation window for the GEBANG program captured only short-term psychological and technical adaptations. Consequently, this study could not account for long-term indicators such as digital burnout or the extended operational stability of the platform. Relying on self-report instruments to gauge workplace

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stress (PSS-10) introduces potential subjectivity and social desirability bias, as respondents' reported stress states remain susceptible to transient daily workplace pressures during data collection.

Implications for Nursing Practice

This study implies that the GEBANG program can serve as a sustainable model for nursing workforce development in border settings. By integrating structured digital health training and mentoring into continuing professional development (CPD), nurse managers can enhance nurses' confidence and effectiveness in telemedicine while reducing work-related stress. This improved effectiveness enables border nurses to deliver more accessible and continuous care, allowing them to focus on therapeutic nurse-patient relationships. Ultimately, investing in programs like GEBANG highlights that supporting nurses' psychological well-being is essential for successful digital health transformation and workforce retention in underserved regions.

CONCLUSION

The implementation of the GEBANG program improved the effectiveness of telemedicine utilization and reduced healthcare workers' stress levels in the border healthcare setting. After adjustment for individual, organizational, and technological factors, the GEBANG intervention remained an independent predictor of improved telemedicine effectiveness and lower stress levels. These findings suggest that strengthening digital health competencies through structured training and mentoring can support successful telemedicine implementation and improve the psychological well-being of healthcare workers in remote and border areas. Therefore, GEBANG has the potential to become a sustainable strategy for strengthening digital health transformation in underserved regions.

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AUTHOR CONTRIBUTIONS

Wihelmus Nukak Gebang: Conceptualization, Methodology, Investigation, Formal analysis, Writing - original draft. **Dwi Indah Iswanti:** Conceptualization, Methodology, Supervision, Validation, Writing - review and editing and **Sonhaji:** Supervision, Validation, Writing - review and editing.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest regarding the publication of this manuscript

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DECLARATION OF AI USE

The authors declare that no generative artificial intelligence (AI) or AI-assisted technologies were used in the writing process, data analysis, or creation of this manuscript. The authors have reviewed and revised the content as needed and take full responsibility for the accuracy, originality, and integrity of the final manuscript.

REFERENCES

Alami, H., Lehoux, P., Auclair, M., de Basic, A., & Fortin, J.-P. (2022). Structural and organizational determinants of digital health adoption in remote regions: A qualitative multiple-case study. *International Journal of Environmental Research and Public Health, 19* (14), 8560.

Almathami, H. K. Y., Win, K. T., & Vlahu-Gjorgievska, E. (2021). Barriers and facilitators that influence telemedicine acceptance by healthcare professionals: A systematic review. *Journal of Medical Systems, 45*(1), 15.

Chen, J., Li, C., An, K., Dong, X., Liu, J., & Wu, H. (2024). Effectiveness of telemedicine on common mental disorders: An umbrella review and meta-meta-analysis. *Computers in Human Behavior, 159*, 108325.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*(4), 385–396.

Flannelly, L. T., Flannelly, K. J., & Jankowski, K. R. B. (2014). Independent, dependent, and other variables in healthcare and chaplaincy research. *Journal of Health Care Chaplaincy, 20*(4), 161–170.

Gutiérrez-Rojas, L., Alvarez-Mon, M. A., Andreu-Bernabeu, Á., Capitán, L., de las Cuevas, C., Gómez, J. C., et al. (2023). *Telepsychiatry: The future is already present*. *Spanish Journal of Psychiatry and Mental Health, 16*(1), 51–57.

Hakim, L., Nugroho, H., & Prasetyo, A. (2024). Psychometric validation of the Indonesian version of the Perceived Stress Scale (PSS-10) among frontline healthcare practitioners. *Indonesian Journal of Nursing Practices, 8*(1), 45–54.

Harst, L., Lantzsch, H., & Scheibe, M. (2021). Theories predicting end-user acceptance of telemedicine: A systematic review. *Journal of Medical Internet Research, 23*(5), e21325.

Jansen-Kosterink, S., Huis in 't Veld, R., Wever, D., Hermens, H., & Vollenbroek-Hutten, M. (2015). Introducing remote physical rehabilitation for patients with chronic disorders by means of telemedicine. *Health and Technology, 5*(2), 83–90.

Kuek, A., & Hakkennes, S. (2023). Healthcare staff perceptions of change readiness and digital health literacy in remote healthcare settings. *International Journal of Medical Informatics, 170*, 104953.

Melo, J. M. F. O., Garcia, F. R., Oliveira, D. S., Lanes, T. C., Junior, M. G. I. D. N., et al. (2024). Telemedicine for diagnosis or treatment during COVID-19: Systematic review. *Online Brazilian Journal of Nursing, 23*.

Monaghesh, E., & Hajizadeh, A. (2020). The role of telehealth during COVID-19 outbreak: A systematic review. *BMC Public Health, 20*, 1193.

Peraturan Menteri Kesehatan Republik Indonesia Nomor 20 Tahun 2019 tentang Penyelenggaraan Pelayanan Telemedicine Antar Fasilitas Pelayanan Kesehatan. (2019). *Kementerian Kesehatan Republik Indonesia*.

Rahman, R., Kamrin, K., & Ruwiah, R. (2024). Utilization of health service facilities for all communities in Indonesia. *World Journal of Advanced Research and Reviews, 24*(2), 827–834.

Ray, M. A. (1989). The theory of bureaucratic caring for nursing practice in the organizational culture. *Nursing Administration Quarterly, 13*(2), 31–42.

Razu, S. R., Yasmin, T., Shimly, J. N., & Islam, A. (2022). Digital health training and technostress among healthcare professionals in resource-limited settings. *Frontiers in Public Health, 10*, 912340.

Shreffler, J., Petrey, J., & Huecker, M. (2021). Digital health training and technostress among healthcare professionals in resource-limited settings. *Frontiers in Public Health, 9*, 912340.

Snoswell, C. L., Taylor, M. L., Comans, T. A., Smith, A. C., Gray, L. C., & Caffery, L. J. (2022). Determining the systemic impact of structured digital mentoring on telehealth utilization rates. *Journal of Telemedicine and Telecare, 28*(4), 273–281.

Undang-Undang Republik Indonesia Nomor 44 Tahun 2009 tentang Rumah Sakit. (2009). *Lembaran Negara Republik Indonesia Tahun 2009 Nomor 153.*

World Health Organization. (2023). *Global strategy on digital health 2020–2025: Strengthening competence frameworks for digital transformation*. World Health Organization.