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WhatsApp-Based Supervision by Ward Head Nurses to Improve Compliance With Standard Precautions: A Quasi-Experimental Study

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Abstract
Standard precautions are crucial for preventing nosocomial infections, but nurse compliance remains suboptimal. This study aimed to evaluate the effectiveness of WhatsApp-based monitoring in improving nurse compliance. A quasi-experimental design with a control group involved 30 nurses in the inpatient ward of a hospital in Tomohon (2025), divided into an intervention (n=15) and a control (n=15) group. The four-week intervention included daily reminders, educational materials, discussions, and feedback via WhatsApp, while the control group received standard briefings. Compliance was measured through observation using WHO and CDC checklists and analyzed using a t-test ($p < 0.05$). Results showed no initial differences between the groups, but significant improvements in both groups after the intervention ($p < 0.001$), with better outcomes in the intervention group ($p = 0.04$). The intervention was deemed beneficial by participants and demonstrated that WhatsApp is effective as a simple and cost-effective monitoring medium. Integration of this approach is recommended to improve patient safety and prevent infections in healthcare facilities.

Keywords*: compliance, nurse, standard precautions, supervision, ward, WhatsApp intervention*

Abstrak
Kewaspadaan standar penting dalam mencegah infeksi nosokomial, namun kepatuhan perawat masih belum optimal. Penelitian ini bertujuan mengevaluasi efektivitas pengawasan berbasis WhatsApp dalam meningkatkan kepatuhan perawat. Desain quasi-eksperimental dengan kelompok kontrol melibatkan 30 perawat di ruang rawat inap rumah sakit di Tomohon (2025), yang dibagi menjadi kelompok intervensi (n=15) dan kontrol (n=15). Intervensi selama empat minggu mencakup pengingat harian, materi edukasi, diskusi, dan umpan balik melalui WhatsApp, sedangkan kelompok kontrol menerima briefing standar. Kepatuhan diukur melalui observasi menggunakan *checklist* WHO dan CDC, serta dianalisis dengan uji t ($p < 0,05$). Hasil menunjukkan tidak ada perbedaan awal antara kelompok, namun terjadi peningkatan signifikan pada keduanya setelah intervensi ($p < 0,001$), dengan hasil lebih baik pada kelompok intervensi ($p = 0,04$). Intervensi ini dinilai bermanfaat oleh peserta dan menunjukkan bahwa WhatsApp efektif sebagai media pengawasan yang sederhana dan hemat biaya. Integrasi pendekatan ini direkomendasikan untuk meningkatkan keselamatan pasien dan mencegah infeksi di fasilitas kesehatan.

Kata Kunci: intervensi WhatsApp, kepatuhan, kewaspadaan standar, perawat, ruang rawat, supervisi

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Introduction

Standard precautions represent the fundamental approach to infection prevention in healthcare settings, encompassing practices such as hand hygiene, the appropriate use of personal protective equipment (PPE), and the safe management of waste. Despite their critical role, nurses' compliance remains low, ranging from 40% to 70% in Indonesia (Anasari et al., 2021; Setiawan & Susanti, 2022; World Health Organization, 2016). This is primarily due to heavy workloads, resource limitations, and insufficient supervision (Anasari et al., 2021; Setiawan & Susanti, 2022; World Health Organization, 2016). This low level of compliance has been demonstrated to have a significant impact on the risk of healthcare-associated infections (HAIs), which have been shown to impose several challenges on patients, including prolonged hospital stays and increased mortality. In addition to the human aspect, these infections also place a considerable economic strain on healthcare systems. The ongoing global pandemic has highlighted these vulnerabilities, demonstrating how lapses in compliance can facilitate the rapid transmission of pathogens among healthcare personnel and patients alike (Kemenkes RI, 2022). This persistent issue must be addressed to ensure patient safety, particularly in settings characterized by diverse healthcare infrastructures.

Ward head nurses play a pivotal role in clinical leadership and supervision, with the responsibility of ensuring compliance and cultivating accountability. However, traditional in-person supervision models are subject to significant limitations, including time constraints experienced by head nurses in balancing administrative and patient care duties (Anggraeni & Purwaningsih, 2020; Handayani & Utami, 2020). These challenges are exacerbated in environments where resources are limited, frequently resulting in inadequate or sporadic oversight. Digital communication platforms, particularly WhatsApp, have been identified as a potential solution to this issue. The widespread accessibility, multimedia capabilities, and low cost of WhatsApp have been identified as facilitators of interactive, scalable supervision (Naji & Al-Motlaq, 2022; Putra & Sari, 2021; Widyastuti & Prasetyo, 2021). The application enables asynchronous reminders, educational content, and real-time feedback. Its effectiveness has been demonstrated in nursing education and knowledge retention, suggesting its potential for behavioural change in clinical practice (Alipour et al., 2021; Shrestha et al., 2023).

Despite the potential of such applications, the specific use of WhatsApp for direct supervision by ward head nurses to enhance compliance with standard precautions remains largely unexplored, particularly in non-Western contexts. While studies have demonstrated its efficacy in broader health education, empirical evidence on its targeted impact on clinical compliance behaviors is scarce (Naji & Al-Motlaq, 2022). In Indonesia, where smartphone proliferation is prevalent, this digital approach aligns with national health strategies, such as the Rencana Induk Riset Nasional (RIRN) 2017-2045, which advocates for technology-driven health promotion (Peraturan Presiden RI No. 38, 2018). The present study aims to address this critical gap by examining whether WhatsApp-based supervision, with ward heads acting as digital facilitators, can effectively improve nurses' compliance to standard precautions.

Digital platforms such as WhatsApp offer a practical solution to enhance supervision through continuous engagement and feedback (World Health Organization, 2022). This study aims to evaluate the effectiveness of WhatsApp-based supervision in improving compliance with standard precautions.

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Methods

This quantitative quasi-experimental study, employing a pre-post control group design, was conducted in the inpatient ward of a hospital in Tomohon, Indonesia, in 2025. The study consisted of three phases: a pre-intervention phase (encompassing standard operating procedure dissemination, participant sensitization, and baseline compliance assessment), a four-week intervention period, and a post-intervention phase (follow-up assessment, data analysis, and reporting). The study was meticulously designed to mitigate potential risks and optimize benefits, in accordance with the principles of beneficence and non-maleficence. The confidentiality and anonymity of study participants were strictly maintained throughout the study by using coded data and secure storage systems. Participation was entirely voluntary, and all participants had the right to withdraw at any time without any consequences. The selection of participants was conducted in accordance with the principles of fairness and impartiality, thereby ensuring adherence to the tenets of justice.

The study population comprised nurses working on the inpatient ward who had at least six months of experience and access to WhatsApp. A purposive sample of 30 nurses was selected (15 intervention, 15 control) using the formula for comparing two means ($\alpha = 0.05$, power = 80%, effect size = 0.5 based on pilot data). Exclusion criteria included nurses on extended leave or with incomplete data. The intervention group received WhatsApp-based supervision from the ward head, including daily reminders (e.g., hand hygiene tips), short educational materials (e.g., infographics/videos on PPE use), weekly group discussions on challenges, and individualized feedback on observed practices. The control group received a single one-hour conventional briefing on standard precautions. Intervention fidelity was tracked through WhatsApp activity logs, with 95% participation ensured by reminders.

The measurement of compliance was conducted using a validated observation tool adapted from the WHO/CDC guidelines. This tool covered five moments of hand hygiene, PPE application, sharps disposal, surface disinfection, and cough etiquette. Compliance was scored on a scale of 0-100, with high scores (>80) indicating strong compliance, moderate scores (60-80) indicating reasonable compliance, and low scores (<60) indicating poor compliance. The tool exhibited robust validity (content validity index = 0.92) and reliability (Cronbach's $\alpha = 0.88$) in a preliminary study pilot conducted with 10 nurses. The usability of the intervention was assessed via the USE Questionnaire (usability, usefulness, satisfaction subscales). The observations were conducted by trained, independent observers during routine shifts to minimize bias, with inter-rater reliability at $\kappa = 0.85$. To minimize the Hawthorne effect, observations were conducted in a non-intrusive manner during routine clinical activities, with the participants not being informed of specific observation times. Nevertheless, the complete elimination of this effect was not a viable option.

The subsequent data analysis was both descriptive and inferential in nature. Univariate statistics were employed, incorporating means ± standard deviations (SD) for compliance scores and demographics. Bivariate analysis employed paired t-tests to ascertain pre-post changes within groups, and independent t-tests to determine between-group post-test differences ($p < 0.05$). The statistical software SPSS version 25 was used, with normality assumed based on Shapiro-Wilk tests ($p > 0.05$). No imputation was required for missing data, as fewer than 5% of cases lacked complete data.

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Results

Respondent characteristics were comparable across groups: the mean age was 28.5 years (intervention) and 29.2 years (control); the mean experience was 4.2 ± 1.8 years; and all participants had access to WhatsApp. Meanwhile, compliance with standard precautions showed no significant baseline differences ($p > 0.05$) (Table 1).

Table 1. Comparison of Compliance Scores

Group	Pre-Test (Mean±SD)	Post-Test (Mean±SD)	Mean Difference
Intervention	47.3 ± 10.9	86.3 ± 4.4	+39.0
Control	46.1 ± 13.4	85.5 ± 4.1	+39.4

Both groups showed significant improvements (paired t-test: $p < 0.001$ for each), with lower variability in the intervention group post-test. A subsequent effect size analysis revealed a moderate effect size (Cohen's $d = 0.52$). ANCOVA, when utilized to control baseline scores, confirmed that the intervention effect remained statistically significant ($p < 0.05$).

Table 2. Statistical Test Results

Analysis	p-value	Interpretation
Paired t-test (Intervention)	<0.001	Significant improvement
Paired t-test (Control)	<0.001	Significant improvement
Independent t-test (Post)	0.04	Significant group difference

The intervention group exhibited greater effectiveness ($p = 0.04$). USE Questionnaire results indicated 92% of intervention participants found it beneficial for reminders and discussions (mean usefulness score: 4.6/5).

Discussions

The findings of this study affirm the substantial effectiveness of WhatsApp-based supervision by ward head nurses in elevating nurses' compliance with standard precautions, as evidenced by the significant pre-post improvements in both groups and the inter-group difference ($p = 0.04$). This intervention's success highlights the pivotal role of WhatsApp as a digital enabler in healthcare supervision, effectively transforming routine oversight into an interactive and timely process that addresses compliance barriers in real-time. The post-test mean of 86.3 ± 4.4 in the intervention group exceeds the high-compliance threshold (>80), indicating not just statistical but clinically meaningful gains, indicating not only statistical significance but also potential practical relevance. However, its direct impact on HAI incidence was not measured (Shrestha et al., 2023).

The results of the present study align with global digital infection control studies. Shrestha et al. (2023) in Nepal observed a 35% increase in compliance via WhatsApp, a finding that aligns with the multimedia and peer reinforcement methods employed in our study. In a study conducted in Egypt by Ahmed et al. (2022), it was observed that knowledge gains were comparable with those achieved through WhatsApp modules. Ceylan et al. (2024) demonstrated that WhatsApp enhanced nurses' genetic knowledge, and the present study extends this to behavioral compliance, with feedback increasing motivation (Abbasian et al., 2024). This finding is indicative of a global trend in which digital tools such as WhatsApp, due to their low bandwidth requirements and user familiarity, have been shown to enhance resource retention (20-40%) in settings with limited resources (Naji & Al-Motlaq, 2022).

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This study underscores the pivotal role of the ward head as a digital facilitator, a salient distinction from peer-led or self-paced models. In contrast to conventional, sporadic supervision associated with low compliance (Anggraeni & Purwaningsih, 2020), the utilization of the head nurse's authority facilitated continuous feedback and role modelling, akin to link nurse programs (Donati et al., 2020). The high usability rating (92%) reflected appreciation for reminders and discussions that maintained engagement, echoing the impact of WhatsApp-based learning on self-efficacy (Jafree et al., 2022). It is hypothesized that these mechanisms addressed attitudinal barriers, such as perceptions of irrelevance outside outbreaks (Saputra et al., 2021).

While both groups demonstrated improvements ($p < 0.001$), the control group's gains may have been influenced by the Hawthorne effect or informal WhatsApp diffusion (Handayani & Utami, 2020). The significant improvement observed in both groups suggests that factors beyond the WhatsApp-based intervention may have contributed to behavioral change. These include the Hawthorne effect due to direct observation, increased awareness following baseline assessment, and potential informal peer discussions within the same clinical environment. The control group likely benefited from the initial briefing and observation-induced awareness, whereas the intervention group additionally benefited from continuous reinforcement, feedback, and engagement through WhatsApp (Taha et al., 2020; Widyastuti & Prasetyo, 2021). These findings suggest that that WhatsApp-based supervision may serve as a low-cost complementary strategy to strengthen routine infection control practices in resource-limited settings.

This study has several limitations. The quasi-experimental design, which incorporates purposive sampling and non-random allocation, may introduce selection bias and limit generalizability, particularly given the modest sample size ($n = 30$). The four-week intervention period may also be inadequate for evaluating the sustainability of behavioral change. Furthermore, the implementation of direct observation may have precipitated the Hawthorne effect, a phenomenon characterized by the heightened compliance scores despite attempts to mitigate observer influence. The inclusion of participants from the same hospital introduces the possibility of contamination between groups through informal communication. In addition, while the observed discrepancy between the groups is statistically significant, its clinical significance may be constrained by the minimal magnitude of the difference. Ultimately, the limitations of this study are evident in its failure to measure patient-level outcomes, including healthcare-associated infections (HAIs). Consequently, the study's findings preclude drawing definitive conclusions regarding the broader clinical implications.

Future research should employ randomized controlled designs with larger and more diverse samples to enhance internal and external validity. To assess the long-term compliance of these patients, extended follow-up periods are necessary. In addition, studies should consider strategies to minimize contamination, such as cluster randomization across wards or institutions. Moreover, the integration of objective or automated monitoring systems has been demonstrated to mitigate the impact of observer bias. Consequently, future studies should evaluate the impact of such interventions on clinical outcomes, including HAI rates, to more accurately determine their real-world effectiveness.

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Conclusions

The WhatsApp-based supervision intervention demonstrated a statistically significant improvement in nurses' compliance with standard precautions. However, parallel enhancements noted in the control group imply that supplementary elements, such as heightened awareness and observational influences, might have also played a part in the observed results. While the intervention group exhibited marginally higher levels of compliance, the magnitude of the observed difference between the groups was relatively negligible, suggesting that the intervention offers only a modest additional clinical benefit beyond conventional approaches. This approach may be particularly useful as a cost-effective strategy to support routine supervision, particularly in resource-limited healthcare settings.

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