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Telemedicine-Enabled Bedside Monitoring System for Low-Birth-Weight Infants: Strengthening Primary Healthcare Resilience and Family-Centered Neonatal Care in Indonesia

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ABSTRACT Low Birth Weight (LBW) remains a critical neonatal health problem due to its strong association with increased morbidity and mortality risks, requiring continuous and accurate physiological monitoring. This community service program aimed to implement a telemedicine-based bedside monitoring system at Gedangan Community Health Center, Sidoarjo Regency, to improve neonatal care services and strengthen health worker capacity in managing LBW infants. The intervention addressed key challenges, including limited access to real-time monitoring data, insufficient technological integration in primary care settings, and the need for improved technical competence among health workers. The method employed a structured community engagement approach consisting of counseling, training, demonstration, re-demonstration, and continuous mentoring. Thirty health workers, including nurses, midwives, and electromedical personnel, participated in the program conducted over two days. Evaluation was performed through direct oral questioning and structured practical observation during device operation and simulation activities. The results indicated a significant improvement in participants' knowledge and skills, with an increase in understanding of neonatal monitoring concepts and telemedicine application. Participants demonstrated improved ability to operate the bedside monitor, interpret vital sign parameters, and apply standard operating procedures. However, post-implementation evaluation revealed partial non-compliance with SOPs in device operation, maintenance, and repair, highlighting the need for continuous training and supervision. The telemedicine system successfully enabled real-time transmission of neonatal physiological data, improving accessibility for both health workers and families. In conclusion, the implementation of a telemedicine-based bedside monitoring system effectively enhanced the capacity of primary healthcare services for LBW infants. Continuous mentoring, infrastructure support, and periodic training are essential to ensure sustainability and optimal utilization of the technology in neonatal care.

INDEX TERMS Bedside Monitor, Telemedicine, BBLR, Community Service, Puskesmas Gedangan.

I. INTRODUCTION

Low Birth Weight (LBW) remains a major neonatal health problem because affected infants are highly vulnerable to respiratory disorders, body-temperature instability, infection, feeding difficulties, and other complications that require continuous clinical observation. Infants with LBW also face a substantially higher risk of neonatal morbidity and mortality than infants born with normal birth weight [1]–[4]. In 2020, Sidoarjo Regency recorded 295 LBW cases, demonstrating that neonatal complications related to low birth weight continue to require serious attention from healthcare providers [12], [13]. This condition highlights the importance of strengthening neonatal monitoring not only in referral hospitals but also in primary healthcare facilities, where early detection of physiological deterioration can determine the timeliness and effectiveness of clinical intervention.

Based on preliminary coordination with the Gedangan Community Health Center, several practical problems were identified in the monitoring of vulnerable infants. Continuous observation of vital signs was constrained by the limited availability and accessibility of monitoring

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technology. Physiological data displayed on conventional bedside devices could generally be accessed only by healthcare personnel who were physically present near the patient. Consequently, remote supervision was limited, and families could not obtain timely information regarding changes in their infant's condition. This limitation may increase parental anxiety, especially when infants require close monitoring over an extended period. In addition, health workers still required further technical strengthening to operate digital medical equipment correctly, interpret the displayed parameters, respond to alarms, conduct routine maintenance, and perform basic troubleshooting in accordance with established safety procedures.

These partner-specific problems indicate the need for appropriate technology that is clinically useful, practical, and suitable for the operational context of a community health center. A telemedicine-based bedside monitor offers a relevant solution because it can measure essential physiological parameters, including skin temperature, respiratory rate, oxygen saturation, heart rate, non-invasive blood pressure, and electrocardiographic activity. Through its telemedicine function, the recorded data can be transmitted to an authorized mobile application, allowing healthcare personnel and families to observe the infant's physiological condition more efficiently and in real time [23]–[26]. The use of this technology is expected to improve information accessibility, facilitate early recognition of abnormal changes, support communication between health workers and families, and strengthen family participation in neonatal care.

Nevertheless, the provision of medical equipment alone does not ensure effective, safe, and sustainable utilization. Technology adoption is strongly influenced by user knowledge, operational competence, adherence to standard operating procedures, and consistency in preventive maintenance. Without adequate training and continuing assistance, advanced equipment may be underused, operated incorrectly, or experience premature functional decline. Therefore, this community service activity aimed to implement a telemedicine-based bedside monitor while strengthening the capacity of health workers at the Gedangan Community Health Center through counseling, expert demonstration, hands-on practice, re-demonstration, and continuing mentoring. The activity was designed to improve participants' understanding and practical skills in device operation, monitoring, maintenance, and basic troubleshooting. Ultimately, the program was expected to enhance the safety, continuity, responsiveness, and sustainability of neonatal healthcare services, particularly for infants who require intensive physiological monitoring at the primary healthcare level.

II. METHOD AND IMPLEMENTATION

A. METHOD

The methods employed in this community service initiative are systematically designed to ensure effective knowledge transfer and sustainable skill acquisition, comprising counseling, training, demonstrations, and re-demonstrations. This multi-faceted pedagogical approach is rooted in experiential learning principles, which posit that active participation and hands-on practice are crucial for the retention of complex technical competencies. The overarching implementation design applies a framework of continuous mentoring and empowerment, specifically targeting both the health workers and the families of Low Birth Weight (LBW) patients at the Gedangan Health Center. By engaging both cohorts, the program ensures a holistic ecosystem of care where clinical efficacy and familial involvement are concurrently enhanced [29][30][31].

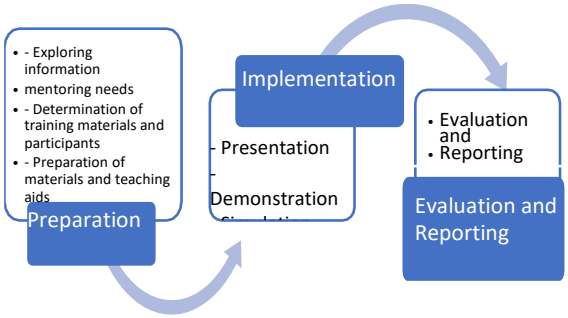

FIGURE 1. Flow of Activity Implementation

FIGURE 1 showed facilitate this intervention, a combination of instructional media and advanced medical technology was utilized. The theoretical components were delivered using standard audio-visual aids, including LCD projectors and structured PowerPoint (PPT) presentations, to provide a comprehensive conceptual foundation regarding neonatal monitoring and telemedicine infrastructure. However, the core of the training centered on the practical application of the Telemedicine-based Infant Bedside Monitor. This specialized apparatus is pivotal for neonatal surveillance, equipped with critical monitoring parameters essential for LBW infants, namely skin temperature, respiration rate, peripheral oxygen saturation (SPO2), heart rate (BPM), Non-Invasive Blood Pressure (NIBP), and electrocardiogram (ECG). The telemedicine feature integrates a secure cloud-based transmission system, allowing real-time physiological data to be accessed remotely via a dedicated mobile application on Android devices, thereby serving as the primary tool for bridging the informational gap between the clinical setting and the patients' homes [24][32].

The selection of the target audience was executed strategically to maximize the sustainability and institutional impact of the intervention. The primary participants consisted of 30 health workers and personnel responsible for medical equipment and health inventory at the Gedangan Health Center. This demographic includes nurses, midwives, and electromedical technicians who are directly involved in neonatal care and equipment maintenance. By focusing on these frontline personnel, the initiative ensures that the operational knowledge and maintenance protocols of the telemedicine system are deeply embedded within the institutional workforce, fostering long-term self-reliance rather than creating a dependency on external technical support [33][34].

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The implementation was led by a highly competent executing team comprising lecturers and certified electromedical technicians who possess extensive expertise in the field of medical instrumentation. This multidisciplinary proficiency is critical, as it bridges the gap between clinical application and technical troubleshooting. The team's competence ensured that the training was not merely procedural but also provided in-depth insights into the mechanistic principles of the equipment, enabling the health workers to understand the rationale behind each operational step and standard operating procedure (SOP).

The evaluation of this community service activity was conducted using a direct oral assessment method combined with structured questioning (expert questioning) involving the academic team and lecturers who developed the telemedicine-based bedside monitor. This approach was selected to ensure that participants' understanding and practical competence were assessed in real-time during the training process.

Knowledge assessment was carried out through interactive question-and-answer sessions delivered before and after the training activities. The questions were systematically designed by the expert team and focused on key aspects, including the basic concept of LBW monitoring, functions of each parameter in the bedside monitor, interpretation of vital signs, principles of telemedicine integration, and standard operating procedures for device use. Participants' responses were evaluated directly by the lecturers based on accuracy, clarity, and conceptual understanding. Improvement in knowledge was identified through comparison of participants' responses between the initial and final evaluation sessions.

Skill assessment was conducted during demonstration and re-demonstration activities. Participants were asked to perform operational tasks on the telemedicine-based bedside monitor, including device activation, sensor placement, parameter configuration, and use of the mobile application. The evaluation team, consisting of lecturers and electromedical experts, assessed participants' performance using a structured observation checklist. The checklist measured the ability to follow operational steps correctly, accuracy in executing procedures, responsiveness in handling simulated clinical scenarios, and adherence to standard operating procedures.

Each participant's performance was categorized into three levels: independent and correct performance, partially assisted performance, and incorrect or incomplete performance. Participants who were unable to perform certain procedures correctly received immediate corrective feedback and were required to repeat the procedure until acceptable competency was achieved.

The overall success of the training was determined based on qualitative and quantitative synthesis of the oral test results and practical demonstration outcomes. The activity was considered effective when participants demonstrated improved conceptual understanding during post-training questioning and were able to perform device operation independently with minimal or no assistance during re-demonstration.

The execution of the methodology was structured into sequential phases: theoretical counseling, guided expert demonstration, and independent re-demonstration. Initially, counseling sessions elucidated the clinical significance of the device. Subsequently, the team performed live demonstrations, showcasing correct sensor placement, interface navigation, and software pairing. Finally, a re-demonstration phase was mandated, wherein the participants were required to independently operate the device and simulate monitoring scenarios under expert supervision. This iterative cycle of practice and immediate constructive feedback was designed to solidify procedural memory, correct technical missteps in real-time, and cultivate the confidence necessary for the participants to manage the technology autonomously in actual clinical emergencies[35][36].

B. IMPLEMENTATION

Community service activities were systematically executed on a scheduled basis over two consecutive days, May 6-7, 2026, within the premises of the Gedangan Health Center meeting hall, Sidoarjo Regency. The implementation was meticulously structured into several sequential, pedagogical stages to ensure optimal knowledge transfer and skill acquisition: a formal opening, theoretical material provision, intensive operational training, high-fidelity simulation, and comprehensive evaluation. This structured approach was designed to transition the participants from theoretical understanding to practical competence seamlessly.

Opening

The activity commenced with a formal opening ceremony, establishing a collaborative and respectful tone between the academic institution and the primary healthcare facility. FIGURE 2 is the session was inaugurated with a comprehensive address by the Head of the Community Service Team, Prof. Dr. Ir. Bambang Guruh Irianto. In his

FIGURE 2. Opening Speech by the Head of the Gedangan Health Center, dr. Irawati

remarks, he articulated the core intent and purpose of the initiative, emphasizing the critical need to bridge the technological gap in neonatal care at the primary healthcare level. FIGURE 3 Prof. Irianto provided an extensive explanation regarding the origins of the equipment, detailing the rigorous research and development process that led to the

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creation of the Infant Bedside Monitor under the Applied Product Research (PPUPT) scheme.

This contextualization was vital, as it validated the scientific credibility of the device and reassured the health center staff of its efficacy and safety standards.

FIGURE 3. The team leader provided a clear and insightful explanation of the Community Service activities

The ceremonial segment concluded with an official speech by the Head of the Gedangan Health Center, dr. Irawati. On behalf of the institution, she expressed profound gratitude and formally welcomed the Community Service Team. Dr. Irawati underscored the strategic relevance of the telemedicine-based infant Bedside Monitor, acknowledging that its presentation and demonstration would significantly enhance the health center's capacity to manage vulnerable neonates and provide reassurance to anxious families.

Providing Learning Materials and Training

Following the formalities, the program transitioned into the core educational phase. FIGURE 4, the academic team provided an exhaustive explanation of the Telemedicine-based Infant Bedside Monitor, deconstructing its complex architecture into comprehensible modules. The instruction covered the physiological relevance of each monitoring parameter skin temperature, respiration rate, SPO2, BPM, NIBP, and ECG and how these metrics correlate with the clinical stability of LBW infants[37].

FIGURE 4. Explanation of the process of producing the Infant Bedside Monitor from the PPUPT research scheme by Bambang Guruh Irianto

A significant portion of the training was dedicated to the telemedicine infrastructure. FIGURE 6 the team demonstrated the procedural protocols for installing the device and subsequently configuring the dedicated application on the Android devices of the families assigned to care for the baby at home. This segment illuminated how the application establishes a secure, encrypted connection with the Bedside Monitor, thereby granting parents the unprecedented ability to access real-time, continuous data regarding their infant's health status remotely[23][26][37].

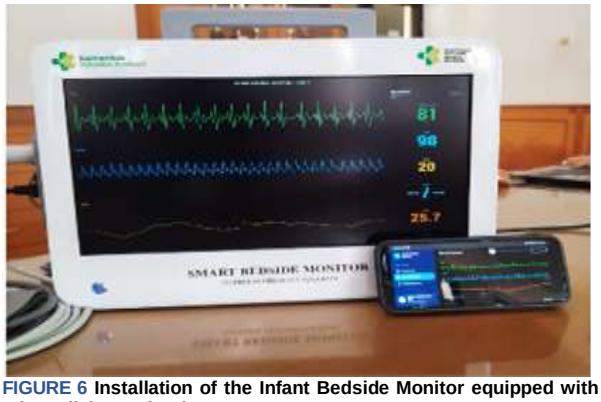

FIGURE 6 Installation of the Infant Bedside Monitor equipped with telemedicine technology

Intensive, hands-on training was then facilitated for the health workers. This practical session was meticulously designed to cover the entire operational lifecycle of the device, encompassing correct initialization, precise sensor placement on neonatal anatomy, alarm threshold configuration, and continuous monitoring of critical parameters. Furthermore, FIGURE 5, acknowledging that technological devices in clinical settings are prone to operational wear, the team incorporated modules on basic troubleshooting and preventive maintenance. Participants were trained to identify common technical anomalies, perform rudimentary software resets, and execute daily hardware maintenance routines to ensure the device's operational longevity[28][38][39].

FIGURE 5. Explanation of the Bedside Monitor device and its telemedicine parameters

Simulation and Monitoring Stage To solidify the theoretical and practical knowledge acquired during the training, a high-fidelity simulation stage was conducted. The meeting hall was transformed to accurately replicate the dynamic environment of a neonatal hospital ward. This immersive scenario was designed to test the participants' ability to operate the medical device under simulated clinical

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pressures while fostering interprofessional collaboration[40].

FIGURE 7, a dedicated team comprising electromedical personnel and nursing staff was assembled to focus on the comprehensive monitoring of the medical device's operation. The simulation required a symbiotic division of labor. The electromedical personnel assumed responsibility for the technological integrity of the apparatus. They meticulously checked each hardware component, verified sensor connectivity, and ensured that all functional parameters and alarm limits were configured strictly in accordance with established clinical standards (temperature, humidity, SPO2, BPM). Their primary objective was to guarantee that the data transmission to the telemedicine application was seamless and artifact-free[34][26].

FIGURE 7. Simulation of the Infant Bedside Monitor equipped with telemedicine technology

Concurrently, the nursing staff concentrated on the clinical interpretation of the generated data. They practiced continuously monitoring the displays, recording the infant's physiological trends, and documenting every activity and output of the device. This exercise emphasized the critical nature of accurate clinical documentation, which serves as the foundational legal and medical record for evaluating the infant's progress and planning subsequent care. The simulation successfully demonstrated the synergistic potential of the technology; the electromedical team ensured the precision of the data capture, while the nursing team ensured that the data was translated into actionable clinical insights, thereby embodying a holistic approach to technology-enabled neonatal care[13].

III. RESULTS

Monitoring and evaluation are carried out by a team consisting of health workers and medical equipment technicians through periodic reviews. The team monitors the use, maintenance, placement of equipment according to SOPs, and patient comfort every 3 months. Evaluation of monitoring results is carried out to ensure that medical devices are used in accordance with established procedures[28].

In one evaluation occasion, the evaluation team found several non-conformities: The evaluation team observed non-conformity in equipment operation according to SOP. Some health center staff did not fully follow the steps described in the SOP. The evaluation team also reviewed the implementation of the daily maintenance SOP. Some irregularities were found in the daily maintenance of medical equipment, which can reduce equipment life and increase the risk of operational failure[41]. FIGURE 8, The evaluation team found non-conformity in the equipment repair process according to established SOPs, which can affect equipment

FIGURE 8. Repair and calibration of medical equipment at the Gedangan Health Center

quality and patient safety[42].

FIGURE 9 The evaluation results were then used as the basis for providing appropriate follow-up. The team provided recommendations and suggestions to health center staff to improve compliance with equipment operation SOPs, daily maintenance, and repair. In addition, additional training was also organized to improve understanding and skills. In addition to the Bedside Monitor training, the team also contributed by calibrating and repairing health equipment at the Gedangan Health Center, such as digital sphygmomanometers, thermometers, and baby scales. The team also provided an in-cash contribution of Rp. 1,500,000 to the Mitra.

FIGURE 9. Repair and calibration of medical equipment at the Gedangan Health Center

IV. DISCUSSION

The results of the community service implementation regarding the application of the Telemedicine-based Bedside Monitor at the Gedangan Health Center, Sidoarjo Regency, demonstrate a significant impact on improving the quality of neonatal health services, particularly in the management of Low Birth Weight (LBW) infants. Based on the East Java Provincial Health Profile data, the number of LBW cases in Sidoarjo Regency was recorded at 295 in 2020[18]. This figure represents a serious epidemiological challenge

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considering that premature infants with LBW have a mortality risk up to 20 times higher compared to full-term infants, and are potentially susceptible to stunting and non-communicable diseases in adulthood [43]. It is within this context that telemedicine technology innovation serves as a crucial intervening variable, not only for medical personnel but also for the patients' families.

The most substantial impact of implementing the telemedicine-based Bedside Monitor is the fulfillment of real-time information demands for patients' families. In conventional care practices, families' limited access to continuously monitor their infants in the intensive care room often triggers prolonged psychological anxiety. This anxiety can ultimately disrupt the infant's recovery process and the quality of parent-infant attachment. With the specialized application on Android devices connected directly to the Bedside Monitor, parents now have the autonomy to monitor vital parameters such as SPO2, BPM, NIBP, skin temperature, and ECG in real-time from their homes. This concept aligns with the paradigm of Family-Centered Care in neonatology, where active family involvement is considered an integral component in improving neonatal health outcomes. The sense of relief and family engagement contributes to strengthening social support, which has been clinically proven to accelerate the patient's stabilization process[24][25].

Nevertheless, the post-implementation evaluation findings revealed a gap between technology adoption and compliance with Standard Operating Procedures (SOPs). The evaluation team identified three critical points of non-conformity: equipment operation not adhering to SOPs, neglected daily maintenance, and repair processes deviating from established procedures. An in-depth analysis of these findings indicates that the non-compliance behavior among healthcare workers at primary facilities like the Puskesmas is not solely caused by negligence, but rather influenced by several systemic factors. First, the high and multifunctional workload of healthcare workers at the Puskesmas often causes preventive maintenance procedures to be overlooked. Second, the complexity of the new technology's interface, particularly telemedicine systems requiring network integration and periodic sensor calibration, demands cognitive and psychomotor adaptation that cannot be achieved through a brief two-day training session. Third, the minimal presence of internal electromedical technicians at the Puskesmas level results in equipment repair processes often being improvised by personnel lacking technical competence, which leads to further damage and compromises patient safety[42].

Non-compliance with maintenance and repair SOPs carries destructive long-term implications. Substandard care cumulatively reduces the equipment's lifespan, degrades the accuracy of vital parameter measurements, and ultimately diminishes the quality of healthcare services. In the context of telemedicine, data accuracy on the transmitting side[27] (Bedside Monitor) is everything; if sensors are unmaintained and produce artifact data or inaccurate readings, the information received by the family via the Android application will be misleading. This could potentially trigger panic attacks or, conversely, provide a false sense of security. Therefore, the community service team's response in providing additional training (re-training) and establishing a periodic monitoring schedule every three months is a highly appropriate mitigation strategy. This regular assistance is not merely surveillance, but a nurturing process to form correct operational habits (habituation) until they are internalized into the work culture at the Gedangan Health Center.

Another aspect that warrants emphasis in this discussion is the relevance of the ancillary activities conducted by the team, namely the calibration and repair of other medical equipment such as digital sphygmomanometers, thermometers, and baby scales. This activity demonstrates that a holistic and contextual approach to community service is essential. The presence of new technology (Bedside Monitor) will not function optimally if it operates within an ecosystem where other health equipment is damaged or uncalibrated [24][23]. In many Puskesmas, medical devices suffering from minor damage often gather dust in inventory storage due to budget constraints for repairs and the absence of technicians. The team's action in restoring these devices directly enhances the overall service capacity of the Gedangan Health Center. Furthermore, the in-cash contribution of IDR 1,500,000, although nominal, represents a symbol of commitment and sustainability that supports the partner's independence in managing equipment maintenance in the future.

From a broader perspective, the implementation of telemedicine technology at the Gedangan Health Center serves as a microcosm of the digital health transformation in Indonesia. As the frontline of primary healthcare, Puskesmas often act as the benchmark for the success of national health programs. The integration of telemedicine systems enables Puskesmas to operate not in isolation, but rather connected to referral hospitals and patients' families, forming a synergistic information network. This aligns with Sustainable Development Goal (SDG) number 3, which aims to significantly reduce neonatal mortality rates. The utilization of innovations derived from the Applied Product Research (PPUPT) scheme, applied directly to the community, also proves the completeness of the innovation cycle: from laboratory research and field testing to community empowerment[44][45].

Future challenges lie in program sustainability and scalability. Limitations in internet network infrastructure in certain areas, telemedicine server stability, and the availability of routine budgets for maintaining Bedside Monitor sensors are variables that must be well-managed by the Puskesmas and the District Health Office after the community service team completes its final reporting phase. A policy at the Puskesmas management level is required to allocate preventive budgets and appoint dedicated personnel

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(focal points) specifically responsible for the maintenance of this telemedicine system, ensuring that the innovation does not cease to be a temporary project[28].

The implementation of the telemedicine-based bedside monitor at the Gedangan Community Health Center produced measurable improvements in participants' knowledge, skills, and operational compliance. Evaluation results from the pre-test and post-test assessments showed a significant increase in participants' understanding of neonatal monitoring and device operation. The mean pre-test score of participants was recorded at 62.4%, while the mean post-test score increased to 86.7%, indicating an average improvement of 24.3%. This improvement demonstrates that the structured combination of counseling, demonstration, and hands-on training effectively enhanced participants' cognitive understanding of telemedicine-based neonatal monitoring.

In terms of practical competency, the re-demonstration assessment revealed that 83% of participants were able to operate the bedside monitor independently without assistance, while 17% still required partial guidance during specific procedures such as sensor placement and application synchronization. Overall SOP compliance increased significantly after training, with adherence to correct operational procedures reaching 88%, compared to baseline observations during initial practice sessions where compliance was estimated at 54%. This indicates a substantial improvement in procedural discipline and standardization of device handling among health workers.

Operational outcomes also included technical support activities carried out during the program. FIGURE 8 a total of four medical devices at the health center, including digital sphygmomanometers, thermometers, and infant scales, were successfully repaired and calibrated to restore measurement accuracy and ensure service reliability. FIGURE 9. these improvements contributed to strengthening the overall quality of maternal and neonatal healthcare services at the facility.

Furthermore, monitoring outcomes of the telemedicine-based system showed that real-time physiological data transmission functioned effectively during simulation and initial field application. Vital sign parameters such as SpO_2, heart rate, respiratory rate, and temperature were successfully displayed on both bedside monitors and mobile applications without significant data delay or transmission error. Health workers reported improved confidence in monitoring LBW infants, while families experienced increased accessibility to infant condition updates, reducing uncertainty and anxiety.

Overall, the quantitative findings confirm that the integration of telemedicine-based monitoring systems, combined with structured training and continuous mentoring, significantly enhances both human resource capacity and healthcare service performance at the primary healthcare level.

Overall, the process and outcome evaluations affirm that the application of the Telemedicine-based Bedside Monitor has successfully enhanced the service capacity of the Gedangan Health Center and provided a sense of security for families of LBW infants[5][5]. The findings regarding SOP non-compliance actually serve as valuable insights that enrich the mentoring model, indicating that the transfer of technological knowledge must always be balanced with continuous asset management and patient safety coaching. With follow-up routine training and partner commitment, this innovation is expected to become a minimum service standard for LBW management in other primary healthcare facilities across Indonesia[46][17].

Although the implementation of the telemedicine-based bedside monitor demonstrated positive outcomes in improving knowledge, skills, and neonatal monitoring capacity, several limitations should be acknowledged to provide a balanced interpretation of the findings. First, the duration of the training was relatively short, which may limit the depth of skill internalization among participants, particularly for complex procedures such as device troubleshooting and system calibration. Longer training sessions or periodic refresher training may be required to ensure sustained competency.

Second, the effectiveness of the telemedicine system is highly dependent on internet connectivity. Inconsistent network stability in certain operational settings may affect real-time data transmission and potentially reduce the reliability of remote monitoring. This dependency highlights the need for robust infrastructure support to ensure optimal system performance.

Third, the sustainability of the program is influenced by the availability of maintenance resources and operational costs associated with the telemedicine-based device. Routine calibration, sensor replacement, and software maintenance require continuous budgeting, which may become a constraint if not formally integrated into the health center's financial planning.

Fourth, family involvement in utilizing the telemedicine application remains limited. Although the system is designed to support family-centered care, not all families demonstrated equal digital literacy or active engagement in monitoring infant conditions. This gap suggests the need for additional educational strategies targeting caregivers to maximize the benefits of remote monitoring.

To ensure long-term sustainability, a structured collaboration framework has been proposed between the Gedangan Community Health Center and the District Health Office. This includes the integration of telemedicine-based monitoring into routine neonatal services, the appointment of a dedicated focal person for device management, and the allocation of a preventive maintenance budget. In addition, periodic joint supervision and technical assistance from the academic institution are recommended to ensure continuous capacity building and system optimization. Future programs should also consider scaling up the training model to include family members and integrating simplified digital guides or video-based Standard Operating Procedure (SOP) modules. This approach is expected to strengthen user adoption,

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improve compliance, and ensure that the innovation can be sustained as part of routine primary healthcare services.

FIGURE 10, the Community Service activity was formally concluded with a commemorative group photograph involving the team leader, all members of the Community Service team at Gedangan Community Health Center, and participants of the Telemedicine-Based Bedside Monitors socialization program.

FIGURE 10. Group photo with the Head of the Health Center and

V. CONCLUSION

The primary objective of this community service initiative was to implement a Telemedicine-based Bedside Monitor at the Gedangan Health Center, Sidoarjo Regency, as a strategic intervention to support the sustainability and quality of healthcare services for Low Birth Weight (LBW) infants. The initiative successfully demonstrated that the integration of appropriate digital technology into primary healthcare settings can effectively bridge the informational gap between clinical personnel and patients' families, thereby fostering a more inclusive, family-centered care environment. The results obtained indicate a significant enhancement in the theoretical knowledge and practical skills of health workers regarding the operation, troubleshooting, and routine maintenance of the telemedicine device.

However, the evaluation phase also highlighted a critical insight: the mere introduction of advanced medical technology is insufficient without sustained human capacity building. To ensure unwavering compliance with the established Standard Operating Procedures (SOPs) and to mitigate the risk of operational deviations, continuous reinforcement is imperative. Consequently, supplementary training sessions and systematic monitoring conducted every three months remain essential to internalize correct operational habits and guarantee long-term patient safety.

For future community service activities, two strategic recommendations are proposed. First, it is highly recommended to expand the scope of telemedicine monitoring training directly to the patients' families at home. Empowering families with comprehensive guidance on utilizing the mobile application will maximize the technology's utility and alleviate parental anxiety. Second, the development of a more interactive and visually oriented SOP module is advised. Such a module would significantly accelerate the learning process for health workers, transcend potential technical literacy barriers, and serve as an accessible reference guide to ensure the consistent and correct operation of the equipment in the long term.

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DATA AVAILABILITY

The quantitative data used to support the findings of this study, including the results of the multiple linear regression and descriptive statistics, are included within the article. Raw data generated during the study are available from the corresponding author upon reasonable request.

AUTHOR CONTRIBUTION

Bambang Guruh Irianto contributed to the conceptualization of the program, led the implementation team, and provided expertise in medical instrumentation. Lusiana and Abdul Kholiq managed the field training modules and supervised the hands-on demonstration sessions. Syevana Dita Musvika and Much Faiz Nafi'u Pradana were responsible for data collection, simulation coordination, and technical support. Rifan Ramandani and Muhamad Muflih Ridwan performed the equipment calibration and repair activities. Sari Luthfiyah provided strategic supervision, managed academic coordination, and led the manuscript preparation and final review.

DECLARATIONS

ETHICAL APPROVAL

Not available.

CONSENT FOR PUBLICATION PARTICIPANTS.

Consent for publication was given by all participants

COMPETING INTERESTS

The authors declare no competing interests.

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