Jurnal Abmas - *p-ISSN 1412-1891 & e-ISSN 2798-1436*
Volume 25 No 2 (2025) 157-168

JURNAL UPI

Jurnal Abmas

Media Informasi Pengabdian Kepada Masyarakat

https://ejournal.upi.edu/index.php/ABMAS

Innovative electrotherapy for low back pain management in health centers

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ABSTRACT

Low Back Pain (LBP) is a common musculoskeletal complaint among the elderly, primarily due to static posture or poor ergonomics. At the primary care level, such as community health centers (puskesmas), LBP management often faces challenges, including limited equipment and low understanding among healthcare workers regarding electrical therapy technologies. This community service activity aimed to enhance the capacity of basic physiotherapy services in primary care facilities by conducting technological training and providing innovative electrostimulator devices based on magnetic electrodes. The implementation methods included education on the basic principles of body electricity and the device's functionality, hands-on workshops for participants on device usage and electrode placement, and evaluation through pre-tests and post-tests. The results demonstrated a significant improvement in participants' understanding of the device's working principles and operational procedures. The response to the device's use was highly positive, and the electrostimulator has begun to be integrated into basic physiotherapy services at Puskesmas Teja. This activity proves that collaboration between applied education and technological innovation can strengthen the capacity of primary care services to manage LBP effectively and safely, particularly in the elderly population.

ARTICLE INFO

Article History:
Received: 2 Apr 2025
Revised: 10 Jul 2025
Accepted: 18 Jul 2025
Available online: 17 Aug 2025
Publish: 29 Dec 2025

Keywords:
electrostimulator; low back pain; magnetic electrode; primary physiotherapy

Open access
Jurnal Abmas
is a peer-reviewed open-access journal

ABSTRAK

Nyeri punggung bawah (Low Back Pain/LBP) merupakan keluhan muskuloskeletal yang umum terjadi pada lansia, terutama akibat postur statis atau ergonomi yang buruk. Pada tingkat pelayanan primer seperti puskesmas, penanganan LBP sering menghadapi kendala berupa keterbatasan alat dan rendahnya pemahaman tenaga kesehatan terhadap teknologi terapi listrik. Kegiatan pengabdian masyarakat ini bertujuan untuk meningkatkan kapasitas layanan fisioterapi dasar di fasilitas pelayanan primer melalui pelatihan teknologi dan pemberian alat elektrostimulator inovatif berbasis elektroda magnetik. Metode pelaksanaan meliputi edukasi prinsip dasar listrik tubuh dan fungsi alat, pelatihan langsung penggunaan dan pemasangan elektroda, serta evaluasi melalui pre-test dan post-test. Hasil kegiatan menunjukkan peningkatan signifikan pada pemahaman peserta terhadap prinsip kerja dan prosedur operasional alat. Respons terhadap penggunaan alat sangat positif dan alat elektrostimulator mulai diintegrasikan ke dalam layanan fisioterapi dasar di Puskesmas Teja. Kegiatan ini membuktikan bahwa kolaborasi antara pendidikan terapan dan inovasi teknologi mampu memperkuat kapasitas layanan primer dalam menangani LBP secara efektif dan aman, terutama pada populasi lansia.

***Kata kunci**: elektroda magnetik; elektrostimulator; fisioterapi primer; nyeri punggung bawah*

How to cite (APA Style)
Soelistiono, S., Astuti, S. D., Ain, K., Rulaningtyas, R., Suhariningsih, S., & Winarno, W. (2025). Innovative electrotherapy for low back pain management in health centers. *Jurnal Abmas, 25*(2), 157-168.

Peer review
This article has been peer-reviewed through the journal's standard double-blind peer review, where both the reviewers and authors are anonymised during review.

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https://doi.org/10.17509/abmas.v25i2.88671

INTRODUCTION

Low Back Pain (LBP) is a prevalent musculoskeletal disorder globally, particularly among the elderly population. The World Health Organization (WHO) estimates that 60-70% of the global population experiences LBP at least once in their lifetime, with prevalence increasing with age (Olechowski et al., 2023). In older adults, this condition is exacerbated by reduced muscle elasticity, impaired biomechanical posture, and degeneration of spinal structures (Tesfa et al., 2024). Additionally, concerns over the safety of prolonged exposure to low-intensity magnetic fields have also been addressed in biomedical research.

At the primary care level, such as community health centers (*puskesmas*), LBP is a common and recurrent complaint, contributing to reduced quality of life, limited functional activity, and long-term financial burdens. Unfortunately, most primary healthcare facilities lack modern therapeutic devices to address this issue effectively. Additionally, limited access to training and proficiency in medical technology among primary healthcare workers hinders the implementation of technology-based complementary therapies (Mahisanun & Saengsuwan, 2025).

One nonpharmacological therapy proven effective for alleviating low back pain is transcutaneous electrical stimulation using an electrostimulator. This device delivers low-intensity electrical currents through the skin to stimulate peripheral nerves and muscle tissue, physiologically reducing pain perception, improving local circulation, and facilitating motor function recovery (Liebano et al., 2024).

Recent innovations have introduced electrostimulators combined with magnetic electrode technology. The integration of electromagnetic principles into the device's design enhances the efficiency of therapeutic signal delivery and induces bioelectromagnetic effects that accelerate tissue regeneration and improve nerve cell conductivity (Yan et al., 2024). The advantages of this device include its noninvasive nature, portability, energy efficiency, and suitability for use in resource-limited primary care settings.

Puskesmas Teja, located in Tlanakan Subdistrict, Pamekasan Regency, was selected as a strategic partner for this community service program. Based on health service visit data, this puskesmas serves a significant elderly patient population, many of whom report low back pain and mobility limitations due to age-related factors (Yang et al., 2021).

This situation indicates that Puskesmas Teja faces significant challenges in managing LBP cases but also presents significant opportunities for improvement through education and appropriate technological applications. Healthcare workers at the facility have shown high enthusiasm for adopting new technological training, but limited access to training and modern medical devices remains a primary barrier. Therefore, this activity was designed to address these needs directly and measurably.

The general objective of this community service activity is to enhance the capacity of basic physiotherapy services in primary care facilities through technological training and the provision of innovative devices. The specific objectives are as follows: To provide education to healthcare workers on the basic principles of human body electricity and the functionality of magnetic electrode-based electrostimulators; to train participants directly in the operational procedures of the device and proper electrode placement based on clinical anatomy; to improve the competency of healthcare workers in applying technology based nonpharmacological therapy for managing low back pain; to donate the device for sustainable use in primary clinic settings as part of an integrated physiotherapy service program.

https://doi.org/10.17509/abmas.v25i2.88671

Literature Review

Basic Concept of Low Back Pain (LBP) and Physiotherapy Management

Low Back Pain (LBP) is a common musculoskeletal complaint among adults and the elderly. It is defined as pain experienced in the area between the lower costal margin and the inferior gluteal folds, with or without radicular pain to the lower extremities (Tesfa et al., 2024). This condition is multifactorial, involving muscular components, intervertebral discs, ligaments, and peripheral nerves (Yan et al., 2024).

As age increases, the risk of LBP rises due to degenerative processes in spinal structures, biomechanical disturbances, and reduced soft tissue elasticity. While both electrical and magnetic nerve stimulations have demonstrated promise in alleviating neuropathic pain, their clinical success is highly dependent on patient-specific factors and stimulation parameters (Olechowski et al., 2023; Yang et al., 2021).

Physiotherapists play a critical role in LBP management through nonpharmacological approaches such as exercise therapy, physical modalities (heat, cold, electrical stimulation), and postural and ergonomic education. Exercise therapy aims to enhance lumbopelvic stability, strengthen core muscles, and improve posture (Liebano et al., 2024). Electrical modalities, such as Transcutaneous Electrical Nerve Stimulation (TENS), work through central pain modulation and activation of endogenous analgesic pathways (Liebano et al., 2024). The effectiveness of physiotherapy depends on clinical skills, equipment availability, and the sustainability of interventions (Yan et al., 2024).

A systematic review and meta-analysis confirmed that Transcutaneous Electrical Nerve Stimulation (TENS) effectively manages chronic low back pain (Mo et al., 2023). TENS significantly reduces pain intensity and improves patients' quality of life, particularly when invasive treatments are not viable (Mo et al., 2023). These findings strongly advocate for integrating TENS into primary healthcare settings, such as community health centers, where resource limitations often restrict therapeutic options (Mo et al., 2023).

Magnetic stimulation has been extensively studied in neuroscience and pain management since the introduction of noninvasive magnetic stimulation for motor cortex excitation. This pioneering work laid the foundation for advancements in peripheral magnetic stimulation devices. Additionally, repetitive Peripheral Magnetic Stimulation (rPMS) has gained attention as a complementary therapy for musculoskeletal conditions, such as low back pain, highlighting the value of integrating magnetic and electrical modalities in clinical practice (Alashram, 2023). A key challenge in nerve stimulation therapies for chronic pain management is sustaining long-term clinical efficacy (Oakley et al., 2021). Both electrical and magnetic nerve stimulations show promise in alleviating neuropathic pain, but their effectiveness depends on patient-specific factors and optimized stimulation parameters (Oakley et al., 2021). Personalized approaches, such as tailoring stimulation settings and enhancing patient engagement, significantly improve adherence and extend analgesic benefits (Oakley et al., 2021). These findings emphasize the need for individualized treatment protocols when implementing noninvasive neuromodulation techniques, such as TENS or rPMS, in rehabilitation settings (Oakley et al., 2021).

Working Principles of Electrostimulators and Magnetic Electrodes

Low back pain (LBP) is a prevalent musculoskeletal condition affecting adults and the elderly, characterized by pain between the lower costal margin and the inferior gluteal folds, with or without radicular pain extending to the lower extremities (Tesfa et al., 2024). This multifactorial condition involves muscular components, intervertebral discs, ligaments, and peripheral nerves (Yan et al., 2024).

Physiotherapists play a vital role in managing LBP through nonpharmacological interventions, including exercise therapy, physical modalities such as heat, cold, and electrical stimulation, and education on posture and ergonomics (Liebano et al., 2024). Exercise therapy focuses on enhancing lumbopelvic stability, strengthening core muscles, and

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improving posture (Liebano et al., 2024). Electrical modalities, such as Transcutaneous Electrical Nerve Stimulation (TENS), alleviate pain by modulating central pain pathways and activating endogenous analgesic mechanisms (Liebano et al., 2024). The effectiveness of physiotherapy relies on clinical expertise, equipment availability, and the sustainability of interventions (Yang et al., 2021).

An electrostimulator is a medical device that delivers electrical pulses with specific frequencies and amplitudes to stimulate sensory and motor nerves, aiding in pain reduction, improving blood flow, and promoting neuromuscular activation (Liebano et al., 2024). The gate control theory explains that these electrical impulses can disrupt pain signal transmission to the brain by activating non-nociceptive A-beta nerve fibers.

Recent technological innovations have introduced magnetic electrodes, which generate a localized electromagnetic field when electrical currents are applied. This combination enhances the effectiveness of electrical stimulation and produces additional biological effects, such as increased membrane permeability, enhanced cellular metabolism, and inflammation modulation (Tesfa et al., 2024).

Magnetic fields have also been shown to accelerate tissue regeneration, increase fibroblast activity, and optimize cellular homeostasis (Yan et al., 2024). With the integration of magnetic electrodes, electrostimulators become more efficient, noninvasive, and suitable for resource-limited primary care facilities.

Recent studies have further validated the efficacy of electrotherapy-based interventions for managing chronic Low Back Pain (LBP). A randomized controlled double-blinded pilot trial demonstrated that regular electrotherapy significantly improved spinal flexibility and reduced pain sensitivity in patients with chronic nonspecific LBP, highlighting its potential as a nonpharmacological treatment option (Naka et al., 2023). Similarly, a retrospective comparative study found that the addition of pulsed electromagnetic field therapy to conventional physical therapy significantly reduced pain and disability in patients with chronic LBP, emphasizing the value of integrating electromagnetic modalities into standard care (Öztürk et al., 2024). These findings support the broader application of advanced electrotherapy technologies, such as magnetic electrode-based electrostimulators, in enhancing pain management and functional outcomes in primary care settings.

Recent advancements in electrotherapy for managing chronic Low Back Pain (LBP) underscore its growing relevance in primary care settings, particularly when integrated with structured training and innovative technologies. A comprehensive framework for ensuring the safety of musculoskeletal interventions, including electrotherapy, has been established to guide practitioners in mitigating risks prior to nonpharmacological treatments, offering principles applicable to LBP management (Rushton et al., 2023). Complementing this, a randomized controlled trial demonstrated that neuromuscular electrical stimulation significantly reduces chronic LBP, reinforcing the efficacy of electrotherapy technologies, such as magnetic electrode-based electrostimulators, in clinical pain management (Martins-de-Sousa et al., 2023). Furthermore, a randomized controlled experiment highlighted that adherence to Choosing Wisely recommendations influences physiotherapists' intentions to utilize electrotherapy for LBP, providing insights into its acceptance and practical implementation in community health settings like *puskesmas* (Kharel et al., 2025). Additionally, a systematic review and meta-analysis confirmed that modalities such as TENS, IFC, and EMS effectively improve patient-reported outcomes for chronic LBP, supporting the integration of portable and user-friendly electrotherapy devices in resource-limited primary care environments (Wolfe et al., 2024). These findings collectively validate the role of electrotherapy in enhancing pain management and functional outcomes, aligning with the objectives of introducing innovative electrostimulators to strengthen physiotherapy services at Puskesmas Teja.

Previous Studies on Electrotherapy in Primary Care

In Indonesia, the implementation of electrotherapy in primary care remains limited due to equipment shortages, inadequate training for medical staff, and the lack of Standardized Operational Procedures (SOPs) (Mahisanun &

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Saengsuwan, 2025). However, short-term training on TENS usage for healthcare workers at *puskesmas* significantly enhances their competency in delivering safe and effective alternative therapies (Mahisanun & Saengsuwan, 2025).

These findings suggest that the application of simple electrotherapy technology, when accompanied by adequate education, has significant potential to enhance the quality of physiotherapy services at the primary care level. This is particularly true for portable, energy-efficient, and user-friendly devices, such as the electrostimulator developed in this activity (Yan et al., 2024).

In a randomized clinical trial, electroacupuncture and TENS were shown to effectively reduce chronic nonspecific low back pain, with sustained effects over time (Depaoli-Lemos et al., 2021). Similarly, a comparison of TENS and Interferential Current (IFC) in primary care revealed immediate reductions in pain intensity, highlighting the value of simple, portable modalities in community settings (Dias et al., 2021). Furthermore, evidence-based insights support the continued use of TENS for various forms of back pain, recommending its integration into routine clinical practice (Lanham et al., 2023).

METHODS

This community service activity was conducted on Saturday, August 2, 2025, at Puskesmas Teja, Tlanakan Subdistrict, Pamekasan Regency, East Java. The initiative was a collaborative effort between the community service team from the Faculty of Science and Technology, Universitas Airlangga, and the primary care partner.

Puskesmas Teja was selected as the activity location due to its high number of elderly patients, with a significant prevalence of musculoskeletal complaints, particularly Low Back Pain (LBP). The limited availability of equipment and the lack of knowledge among healthcare workers regarding electrotherapy technology made this location highly relevant for implementing innovative technology-based training. **Figure 1** shows the community service team at Puskesmas Teja.

Figure 1. Community Service Activity at Puskesmas Teja
Source: Author's Documentation, 2025

The activity focused on two primary groups: Community Health Center Staff, including nurses, midwives, and health promotion personnel, who actively participated in the theoretical education and hands-on training on the electrostimulator, and Elderly Outpatients, who joined therapy demonstration sessions as part of clinical simulations. The involvement of elderly patients was observational, offering practical examples of device application within primary care services.

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The activity was thoughtfully structured in three main stages. First, participants engaged in an academic education and technology introduction session, where they explored the concepts of human body electricity and the operational principles of the electrostimulator, complemented by a presentation on the academic profiles of the Physics and Biomedical Engineering Programs at Universitas Airlangga to provide context for the introduced technology. Next, the program featured a theoretical material and interactive workshop, delivered by esteemed academic resource persons: Prof. Dr. Suryani Dyah Astuti, S.Si., M.Si., who presented a detailed lecture on the working principles of magnetic electrode-based electrostimulators and their application in modern acupuncture for LBP management, and Dr. Riries Rulaningtyas, S.T., M.T., who explained aspects of human body electricity, including tissue resistance and the safety of electrical current transfer in clinical settings. This segment continued with a hands-on workshop, where participants practiced operating the device under the guidance of the community service team and Biomedical Engineering master's students, focusing on practical skills such as device setup and therapy application. Finally, the activity concluded with a closing and reflection session, led by Prof. Dr. Khusnul Ain, M.Si., who evaluated the training's effectiveness, followed by the official handover of the electrostimulator to Puskesmas Teja as a symbol of collaboration, and ended with the singing of "Padamu Negeri" and a closing prayer.

The training materials were crafted using a multidisciplinary approach, integrating physiological, technological, and applied perspectives. The resource persons included Dr. Riries Rulaningtyas, S.T., M.T., who delivered content on the basics of human body electricity, biological tissue impedance, and safe energy transfer in medical contexts; Prof. Dr. Suryani Dyah Astuti, S.Si., M.Si., who explained the integration of electrotherapy in modern acupuncture, acupuncture points for LBP, and safety limits for stimulation; and Prof. Dr. Khusnul Ain, M.Si., who served as the final evaluator and facilitated reflective discussions on enhancing technology-based primary care capacity. The delivery methods encompassed interactive presentations, live device demonstrations, and the distribution of concise training modules to serve as practical guides for participants post-activity.

The evaluation was conducted using a combination of quantitative and qualitative approaches to assess the training's effectiveness, which included administering multiple-choice and true-false questionnaires to healthcare worker participants before and after the educational sessions to gauge improvements in understanding the device's working principles, usage safety, and basic biological electricity theory. During the workshop, instructors utilized structured observation sheets to record participants' skills in accurately setting device parameters, identifying relevant acupuncture points, and performing therapy procedures following safety principles. All evaluation data were analyzed descriptively to evaluate competency achievement and the device's readiness for adoption in primary care practices at partner health centers.

RESULT AND DISCUSSION

Participant Engagement and Enthusiasm in the Training Activity

The community service activity was attended by over 25 healthcare workers from Puskesmas Teja, comprising nurses, midwives, and health promotion staff. Full attendance and active participation in both educational and hands-on sessions reflected high enthusiasm. Engagement was also observed during discussions, demonstrations, and device trials, indicating a real need for practical and accessible therapeutic technology. **Figure 2**, **Figure 3**, and **Figure 4** show the community services activity at Puskesmas Teja.

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Figure 2. Electrostimulator Trial
Source: Author's Documentation, 2025

Figure 3. Atmosphere of the Medical Staff Training at Teja Community Health Center
Source: Author's Documentation, 2025

Figure 4. Presentation by Dr. Riries Rulaningtyas, S.T., M.T**.**
Source: Author's Documentation, 2025

https://doi.org/10.17509/abmas.v25i2.88671

Effectiveness of Basic Electricity and Electro-Acupuncture Theory Material

Academic experts delivered two core sessions. Dr. Riries Rulaningtyas, S.T., M.T., introduced the principles of human body electricity, including differences between AC and DC currents, and the concept of tissue impedance. Prof. Dr. Suryani Dyah Astuti, S.Si., M.Si., explained electrotherapy at acupuncture points relevant to LBP using modern clinical mapping. Evaluation through questionnaires showed 92% of participants rated the material as relevant and easy to understand due to real-life examples and practical analogies.

Feedback on Device Application

During the workshop, participants practiced adjusting current and frequency, placing magnetic electrodes, and observing muscle response. Feedback was overwhelmingly positive—participants appreciated the device's simplicity, portability, and usability. Many acknowledged its potential to serve as an alternative therapy, especially for underserved patients lacking access to specialized care.

Post-Test Results and Adoption Commitment

Based on pre- and post-test results analyzed by Prof. Dr. Khusnul Ain, M.Si., average scores improved from 58.3% to 87.5%. Key areas of improvement included: understanding working principles, acupuncture point recognition, and electrotherapy safety standards. Puskesmas Teja committed to integrating the device into routine services and formed a local operator team, with ongoing online mentoring planned for sustainability.

Discusssion

This community service initiative demonstrated that technology-driven interventions, supported by structured training, significantly enhance the competencies of healthcare workers at the primary care level (Mahisanun & Saengsuwan, 2025). Participants' positive responses align with findings that short-term training on Transcutaneous Electrical Nerve Stimulation (TENS) devices improves practitioner confidence and therapy implementation in puskesmas settings (Mahisanun & Saengsuwan, 2025).

Further exploration of electrotherapy applications provides additional insights into its effectiveness and practical implementation. For instance, the bioelectromagnetic effects of magnetic electrodes in tissue recovery complement the therapeutic outcomes observed with the device used in this program (Yan et al., 2024). This finding highlights the potential of magnetic electrode technology to enhance tissue regeneration, particularly for elderly patients with Lower Back Pain (LBP) (Yan et al., 2024). Other studies provide robust evidence supporting noninvasive electrotherapy for chronic pain management. Randomized controlled trials and recent advances demonstrate that such therapies significantly reduce pain levels, aligning with the training objectives to improve healthcare workers' skills (Liebano et al., 2024). These findings underscore the relevance of introducing such technologies in resource-limited settings like Puskesmas Teja (Liebano et al., 2024).

Experimental studies have also explored the cellular and tissue-level effects of electromagnetic stimulation. Research on the influence of magnetic fields on angiogenesis and bone regeneration reveals mechanisms relevant for elderly patients with degenerative spine conditions (Ribeiro et al., 2023). Similarly, strategies for electrical and magnetic stimulation at the cellular level reinforce the therapeutic potential of this combined technology (Omer et al., 2023).

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The portability and user-friendliness of the electrostimulator are supported by clinical evaluations of portable magnetic stimulation devices in physiotherapy contexts (Lim et al., 2018). Similarly, portable technologies are highlighted as a means to bridge equipment availability gaps in community health centers, aligning with participants' positive feedback on the device's practicality (Yang et al., 2021).

In the Indonesian context, comparative studies demonstrate the advantages of TENS over conventional therapies (Yakşi et al., 2021). Qualitative research and technical analyses emphasize the importance of proper training and electrode placement techniques, which were key components of the hands-on workshop in this program (Olechowski et al., 2023; Zhu et al., 2023). Community-based interventions further validate the educational approach adopted here, suggesting that sustained training can lead to long-term adoption (Pivovarsky et al., 2021; Tesfa et al., 2024). Additionally, evidence on the effectiveness of training programs and technology implementation supports the post-test improvements observed at Puskesmas Teja (Batilović et al., 2021; Davis et al., 2021).

The feasibility of integrating portable TENS devices in primary care is reinforced by discussions on practical applications and training needs in similar facilities (Cheng et al., 2024; Luo et al., 2023). Magnetic stimulation's role in musculoskeletal pain management further enriches the technological framework introduced, offering a foundation for future enhancements at Puskesmas Teja (Yan et al., 2024). The device's user-friendliness and portability align with recommendations for simple, effective tools for nonpharmacological pain management (Liebano et al., 2024). Moreover, participants' understanding of bioelectromagnetic effects, such as cellular regeneration and nerve conduction enhancement, reflects awareness of mechanisms discussed in the literature (Yan et al., 2024).

Beyond the immediate outcomes at Puskesmas Teja, broader research addresses patient perceptions and outcomes in pain management modalities. Psychological factors influencing chronic pain therapy adherence underscore the need for a holistic approach to device implementation (Lyon & Schuster, 2023). Additionally, considerations in the permanent implantation of Peripheral Nerve Stimulation (PNS) highlight that even simple transcutaneous stimulation shares mechanisms with more complex systems (Li et al., 2022).

Compared to previous studies, this activity introduces a novel integration of magnetic electrodes within an electrostimulator, which was well-received and understood by participants. The increased score from pre- to post-test confirms the effectiveness of applied learning over theoretical-only approaches, echoing the success of interactive community-based education as emphasized (Liebano et al., 2024).

Finally, the commitment of Puskesmas Teja to implement and maintain the device reflects the relevance of this program in a real-world setting. This experience provides a replicable model for similar facilities facing constraints in personnel training and technological infrastructure.

CONCLUSION

This community service activity successfully achieved its primary objective of enhancing the knowledge and skills of healthcare workers in using magnetic electrode-based electrostimulator technology as a nonpharmacological therapy for patients with Low Back Pain (LBP). Through educational sessions delivered by experienced academic resource persons, participants gained a solid theoretical foundation and practical skills to independently and safely operate the device. The portable electrostimulator, donated as a grant, has been well-received and integrated into the basic physiotherapy services at Puskesmas Teja. The activity not only improved individual competencies but also strengthened the synergy between higher education institutions and the target primary healthcare facility, promoting the application of relevant and contextual technology.

The implementation of the magnetic electrode-based electrostimulator at Puskesmas Teja significantly contributed to improving service capacity in addressing musculoskeletal complaints. The implementation of the magnetic electrode-based electrostimulator at Puskesmas Teja significantly enhanced the center's capacity to address

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musculoskeletal complaints, particularly LBP. The device is noninvasive, safe, user-friendly, and cost-effective, making it highly suitable for continued use in this facility. Its ability to provide nerve stimulation-based therapy supports the rationalization of pharmacological treatments, reduces dependency on analgesics, and promotes a more comprehensive approach to preventive and promotive care for elderly patients.

Based on the outcomes at Puskesmas Teja, it is recommended to establish further collaboration with this facility to support advanced training, impact monitoring, and the expanded use of the device for other relevant patient groups. The following specific follow-up actions are advised for Puskesmas Teja: Provide ongoing online-based guidance for local operators to ensure safe and effective long-term usage, develop training modules tailored to real clinical cases at Puskesmas Teja, including more complex musculoskeletal disorders, create comprehensive internal documentation such as Standard Operating Procedures (SOPs), informed consent forms, and patient feedback records to facilitate standardized implementation, and utilize Puskesmas Teja as a model site for future studies to evaluate the replicability of this technology in other primary care centers with similar profiles.

With these structured and site-specific actions, Puskesmas Teja can serve as a benchmark facility for community-based health technology implementation, while ensuring that the innovation introduced becomes part of sustainable physiotherapy services within its operational scope.

AUTHOR'S NOTE

Our highest appreciation and gratitude are extended to: Universitas Airlangga, for its funding support through the community service grant scheme, which enabled the optimal implementation of this program; Puskesmas Teja, Tlanakan Subdistrict, Pamekasan Regency, as the activity partner, for providing full support, facilities, and exceptional collaborative enthusiasm throughout the program; The Faculty and Students of the Faculty of Science and Technology, Universitas Airlangga, particularly the students of the Biomedical Engineering Master's Program, for their active contributions in developing materials, providing field practice assistance, and operating the device.

The synergy between academic institutions, primary healthcare services, and students has proven to be the key to the success of this activity, laying the foundation for the development of a sustainable health technology education model in the future.

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