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ULTRASAFE: ULTRASOUND LITERACY AND RADIOLOGY AWARENESS FOR SAFE EXAMINATIONS

ULTRASAFE: LITERASI ULTRASONOGRAFI DAN KESADARAN PEMERIKSAAN RADIOLOGI YANG AMAN

Scope:
Health

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ABSTRACT

Background: In many regions, including Surabaya, ultrasonography (USG) remains underutilized for the early detection of non-obstetric conditions due to limited public understanding of its diagnostic value. This lack of awareness poses a challenge to the optimal delivery of healthcare services. **Objective:** This community service program aimed to increase public knowledge about the role of ultrasonography in healthcare through the ULTRASAFE (Ultrasound Literacy and Radiology Awareness for Safe Examinations) initiative. **Method:** The activity consisted of two sessions. The first involved a presentation and discussion with 35 participants from Bronggalan, Surabaya. The second included a mobile outreach session through the distribution of brochures and posters, accompanied by a question-and-answer segment. Evaluation was conducted using pre-tests and post-tests to assess knowledge improvement. **Results:** Following the discussion and interactive presentations, participants demonstrated a clear understanding of the benefits of ultrasonography imaging. The program significantly improved participants' knowledge, as reflected in the increase of the mean score from 83.11% to 95.98%, with an N-gain value of 0.76. **Conclusion:** The ULTRASAFE activity effectively enhanced public literacy and attitudes toward ultrasonography as a diagnostic tool at Bronggalan, Surabaya.

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ABSTRAK

Latar belakang: Dalam berbagai wilayah di Indonesia, termasuk Surabaya, ultrasonografi (USG) kurang dimanfaatkan masyarakat umum sebagai deteksi dini penyakit non-kehamilan akibat kurangnya pengetahuan masyarakat terkait nilai diagnostik ultrasonografi. Sehingga hal tersebut menjadi hambatan pelayanan kesehatan yang optimal. **Tujuan:** Untuk mengenalkan peran ultrasonografi dalam sistem kesehatan melalui kegiatan ULTRASAFE. **Metode:** Kegiatan ini dibagi menjadi dua sesi. Pertama adalah sesi presentasi dan diskusi dengan 35 peserta masyarakat Bronggalan, Surabaya. Kedua adalah kegiatan pembagian brosur dan poster, termasuk tanya jawab dengan peserta. Evaluasi dilakukan melalui tes awal dan tes akhir. **Hasil:** Dari diskusi dan presentasi interaktif, peserta mampu menjelaskan dengan baik manfaat pemeriksaan ultrasonografi. Hasil tes awal dan akhir meningkat dari 83,11% menjadi 95,98%. Nilai N-gain yang diperoleh yaitu 0,76. **Kesimpulan:** Kegiatan ini secara efektif mampu meningkatkan pengetahuan terhadap pemeriksaan ultrasonografi pada masyarakat Bronggalan, Surabaya.

Kata kunci:
Ultrasonografi; Literasi;
Pemeriksaan; Diagnostik

BACKGROUND

According to the World Health Organization (WHO), diagnostic imaging services are essential components of healthcare at every level and should be accessible to all populations. However, accessibility alone is not sufficient—public awareness and understanding of the role of diagnostic tools, particularly ultrasonography (USG), remain limited in many regions (World Health Organization, 2025). Ultrasonography is widely used in modern medicine as a safe, non-invasive imaging technique that plays a crucial role in diagnosing various internal conditions. Unlike radiological modalities such as X-rays or CT scans, ultrasound does not emit ionizing radiation, making it a preferred option for both routine and specialized examinations (Whitworth et al., 2015). Globally, USG is often associated with obstetric care; however, its utility extends far beyond pregnancy monitoring. It is routinely used to assess organs such as the liver, kidneys, gallbladder, and blood vessels, as well as soft tissue structures.

In many communities—including urban and peri-urban areas like Surabaya—there remains a substantial knowledge gap regarding the broader applications of ultrasound. Preliminary observations and informal discussions in the target area revealed that many residents, particularly women, believed ultrasonography was useful only during pregnancy. This misconception highlights the need for greater education about the diagnostic value of ultrasound, particularly for preventive health screening. A limited understanding of this tool may result in missed opportunities for early detection and timely management of health conditions. Research by Uwizye et al. (2022) emphasizes that knowledge significantly influences an individual's ability and willingness to modify health-related behaviors. For behavior change to be sustainable, it is necessary to address both direct and indirect factors that affect people's capacity to adopt new health practices.

Previous community-based health education initiatives have shown success in improving public knowledge and influencing health-seeking behaviors (Muscat et al., 2017). According to a narrative review by Larasati (2020) several factors shape health-seeking behavior among the Indonesian population, including sociodemographic characteristics, the influence of significant others, sociocultural beliefs, perceptions about diseases and their causes, and perceptions of medical services—particularly accessibility, availability, and cost, especially in rural areas. Despite this, there remains limited

documentation of programs specifically aimed at promoting radiological awareness and literacy regarding ultrasound among general communities in Indonesia. The lack of accessible and relevant information about medical imaging may contribute to unnecessary fear, misconceptions, or underutilization of diagnostic services. Therefore, the ULTRASAFE initiative was developed to provide the public with accurate, accessible, and practical information about the benefits and proper use of ultrasonography.

METHOD

This community service activity was implemented through a structured health education program titled ULTRASAFE (Ultrasound Literacy and Radiology Awareness for Safe Examinations). The event took place on May 4, 2025, in RW VIII Bronggalan, Surabaya, and was conducted by fourth-semester students from the Radiology Imaging Technology Program, Universitas Airlangga, as part of a Project-Based Learning (PBL) initiative integrated into the Ultrasound (Ultrasonography) course. The program targeted members of the general public, particularly women, with a total of 35 participants aged between 40 and 60 years. The activity began with a pre-test consisting of nine questions (Table 1). The primary approach used was direct health counseling, delivered through short lectures and interactive discussions, supported by printed educational materials such as posters and brochures. During implementation, educational sessions were conducted in two formats: Centralized sessions, held in a communal public space, and Mobile sessions, conducted door-to-door to ensure broader community reach. All materials were designed to be simple, culturally appropriate, and easily comprehensible to participants. The educational content covered the basic principles of ultrasound, its safety aspects, and applications beyond pregnancy, particularly its role in the early detection of non-obstetric medical conditions. At the end of the activity, a post-test was administered to measure participants' knowledge improvement. This evaluation included interviews with several participants regarding the educational materials and their satisfaction with the activity. The effectiveness of the intervention was assessed by comparing participants' scores on the pre-test and post-test to determine changes in ultrasound literacy.

Table 1. The Pre-test and Post-test Questions

Question Code	Item Questions
Q1	What is the main purpose of an ultrasound examination?
Q2	What is the primary principle behind ultrasound imaging?
Q3	What substance is applied to the skin before an ultrasound scan?
Q4	What type of energy is used in ultrasound imaging?
Q5	What are the other uses of ultrasound besides pregnancy?
Q6	Can ultrasonography be used to examine abnormalities in the thyroid gland?
Q7	Can ultrasonography be used to detect abnormalities causing shoulder pain?
Q8	Who is primarily responsible for interpreting ultrasound results in a clinical setting?
Q9	Which of the following is a major advantage of ultrasound compared to other imaging modalities?

RESULT AND DISCUSSION

The ULTRASAFE program (Ultrasound Literacy and Radiology Awareness for Safe Examinations) was developed to enhance public understanding of ultrasonography (USG) as a diagnostic tool that extends beyond its common association with pregnancy (Whitworth et al., 2015). The educational activity was attended by 35 participants, primarily women from the

local community (Table 2). The program was conducted by fourth-semester students from the D4 Radiological Imaging Technology Program at Universitas Airlangga, as part of the Ultrasound Basics course within a Project-Based Learning (PBL) framework. To ensure effective learning and broader engagement, the activity was implemented in two formats: a centralized session (Figure 1) and a mobile outreach session.

Table 2. The Characteristics of The Respondents

Characteristics	N	Percentage (%)
Gender		
Man	0	0.00
Woman	35	100.00
Age		
40-45	7	20.00
46-50	8	22.86
51-55	14	40.00
56-60	6	17.14

At the beginning of the session, nearly all participants demonstrated limited awareness of the various applications of ultrasound. Many believed that ultrasound was used exclusively for pregnancy check-ups (Putri et al., 2023). This perception was addressed through an interactive

presentation led by students, who utilized simple language, visual aids, and real-life examples. Emphasis was placed on the safety and non-invasive nature of ultrasonography, correcting misconceptions that it emits harmful radiation similar to X-rays (Kitson, 2024).



Figure 1. (a) Students Delivering Ultrasound Literacy Presentations to Participants (b) Photo Session of Participants and Students

Throughout the session, participants remained highly engaged, asking questions about whether ultrasound could detect symptoms they had personally experienced—such as abdominal pain or fatigue. These questions reflected a growing interest in ultrasound's broader role as a diagnostic tool for early detection, particularly in identifying conditions such as gallstones and kidney disorders. Several participants shared personal or family health experiences and expressed surprise that ultrasound could be used to investigate these conditions without radiation exposure.

Evaluation of the activity was conducted through Q&A sessions and interviews to assess participants' understanding of ultrasonography. During the discussion, participants actively asked questions and repeated key concepts in their own words, demonstrating that they had effectively absorbed the information. This interaction indicated that participants' understanding had significantly improved, even without relying solely on written assessments.

The educational material was delivered by students from the Faculty of Vocational Studies, Universitas Airlangga (FV UNAIR), using PowerPoint presentations and brochures highlighting ultrasound principles and the importance of early detection. Observations revealed high levels of enthusiasm among participants, as evidenced by their attentive behavior and active participation in the Q&A sessions. Several participants who had previously undergone ultrasound examinations also shared their experiences, which further motivated others to seek similar screenings.

To maintain engagement, facilitators

incorporated a short quiz game and distributed small prizes. This simple activity successfully sustained participants' attention and encouraged active involvement, especially among adult learners who may feel less comfortable in formal educational settings. The game created a relaxed and enjoyable atmosphere while still reinforcing learning objectives (Alsawaier, 2018).

After the main presentation and Q&A session, the team presented a token of appreciation to the community representative, and the event concluded with a group photo. This closing moment symbolized collaboration and reinforced a sense of togetherness, appreciation, and shared responsibility among community service team.



Figure 2. Informal Interview with A Community Representative

During an informal interview, several community members shared their impressions of the activity. One participant mentioned that most mothers in the neighborhood had never been informed that ultrasound could be used to detect general health conditions—they believed it was

only for pregnancy. Her comment underscored the persistence of limited knowledge about ultrasound and the need for community-based educational programs. Feedback of this kind highlights the importance of localized health literacy initiatives in correcting misconceptions and improving diagnostic awareness, especially in under-informed populations (Manzoor et al., 2025).

In addition to the centralized session, the student team conducted mobile outreach activities by visiting nearby households and engaging individuals along pedestrian paths who

were open to receiving information. Using leaflets and posters designed with simple language and familiar visuals, the team conveyed key messages in short, 7–15-minute interactions. These informal encounters yielded positive responses—many participants felt more comfortable asking questions in this setting and expressed gratitude for receiving direct and accessible health information. This finding reinforces that voluntary participation and informal engagement play vital roles in the success of community-based health education (Kweku et al., 2020).



Figure 3. Poster and Leaflet used During the Mobile Outreach Session

Although the mobile outreach reached fewer participants than the centralized session, it played a complementary role in extending the program's impact. This strategy ensured that individuals unable to attend the group session still received equivalent information in an approachable format. Participant feedback from both sessions indicated improved comprehension of ultrasound's broader applications—not only in obstetric care but also in the early detection of internal organ pathologies. Furthermore, several participants expressed an intention to undergo ultrasound examinations in the future as part of preventive health screening. These outcomes demonstrate that the activity

successfully achieved its primary objectives and made the educational content relatable to participants' daily lives, thereby improving retention and encouraging long-term behavioral change (Rohimi et al., 2024).

Quantitative assessment was conducted through pre-test and post-test evaluations. The comparison of results is shown in Figure 4. Post-test results revealed a significant improvement in participants' knowledge, indicating a substantial increase in their conceptual understanding of basic ultrasound principles and applications. This improvement also reflects the effectiveness of the instructional design and delivery strategy.

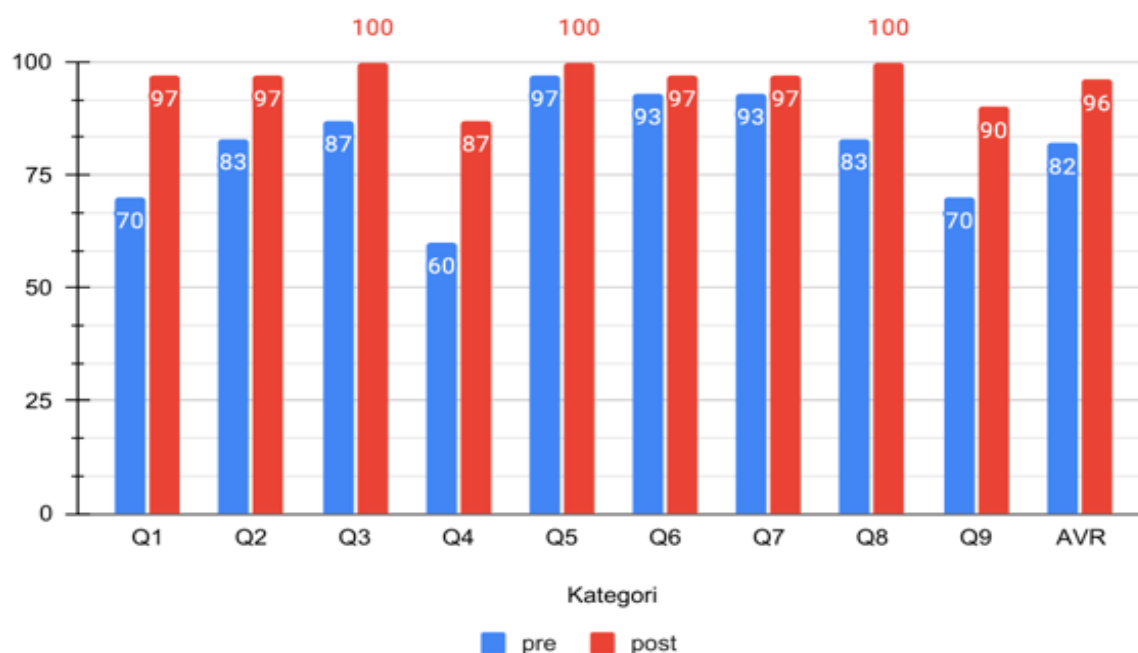


Figure 4. Comparison Graph of Pre-test and Post-test Results (Q = Question Number, AVR = Average)

Based on the comparative graph of pre-test and post-test results, the average pre-test score of 83.11% reflects participants' initial level of understanding before the instructional intervention. Following the learning intervention, the average post-test score increased significantly to 95.98%, indicating that the material was well comprehended by the participants.

This improvement is further supported by the combined score ratio between the pre-test and post-test averages, analyzed using the N-gain method. This method measures instructional effectiveness while minimizing bias associated with high baseline scores. According to Sukarelawa et al. (2024) the N-gain test is a widely used tool for evaluating the effectiveness of learning interventions. It provides a strong basis for assessing the extent to which an educational program contributes to participants' understanding. Based on the N-gain calculation results—with a pre-test score of 83.11% and a post-test score of 95.98%—an N-gain value of 0.76 was obtained, which is classified as high. This indicates that the learning intervention was highly effective in improving participants' understanding of the material presented.

CONCLUSION AND SUGGESTION

The ULTRASAFE program effectively improved participants' diagnostic literacy and attitudes toward ultrasonography. During

interactive discussions, participants' engagement and responses increased significantly. Before the ULTRASAFE activity, most participants believed that ultrasonography was used only for obstetric and gynecological examinations. By the end of the program, they demonstrated an understanding that ultrasonography can also be used to examine internal organs such as the liver, kidneys, and gallbladder. The emergence of new health-seeking intentions, particularly participants' expressed willingness to undergo ultrasonography for preventive screening, indicates a positive shift toward proactive healthcare practices.

To strengthen future community service initiatives, it is recommended that the program be expanded to include larger and more diverse community groups, thereby increasing its reach and representativeness. Bringing an actual ultrasound device during educational sessions, rather than relying solely on videos, is also recommended to enhance participants' understanding through live demonstrations. Such hands-on exposure would allow participants to directly observe the imaging process, gain a clearer visualization of internal structures, and strengthen the connection between the educational content and its practical application. Additionally, periodic follow-up sessions should be implemented to reinforce learning outcomes and monitor behavioral changes over time. Incorporating digital platforms, such as social media campaigns or short educational videos, may further improve accessibility and support the

sustainability of health literacy initiatives within the community.

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