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Community-Based Tele-Mentored Ultrasound for Urological Screening in Rural Primary Care

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Abstract: This community service activity aims to assess the feasibility and impact of the community-based HHUS tele-mentoring program for urological screening in rural primary healthcare centers in Indonesia. A prospective quasi-experimental study was conducted from August to October 2025 at Pangkalan Baru Primary Health Center, Riau, Indonesia. Four general practitioners (GPs) underwent a one-day HHUS training session, followed by one month of tele-mentoring using the UroSono Mentor app, a telemedicine platform that supports both real-time video consultation and asynchronous image review, and one additional month of independent practice. Confidence, usability, feasibility, mentor responsiveness, patient satisfaction, and behavioral intention were assessed using structured questionnaires. Data were analyzed using the Friedman test ($p < 0.05$). Confidence scores improved significantly across all phases ($p = 0.018$), increasing from 2.06 (pre-training) to 4.37 (tele-mentoring) and 3.81 (independent practice). Training satisfaction was high (3.81 ± 0.19), with positive ratings for mentor responsiveness (4.44 ± 0.24) and usability (4.13 ± 0.14). Patient satisfaction averaged 4.49 ± 0.54. Of the 26 patients examined, 69.2% had normal findings, while 30.8% required referral. Community-based tele-mentored HHUS effectively enhanced GPs' competence and confidence, achieving strong acceptance among both healthcare providers and patients. The UroSono Mentor model shows promise for scalable integration into rural urological screening programs.

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Introduction

Access to specialist urological services in rural areas is frequently limited by geographic isolation, leading to delayed diagnosis, unnecessary referrals, and suboptimal patient outcomes. Telemedicine has emerged as a transformative tool in overcoming these barriers, especially in urology, a discipline grappling with provider shortages in underserved regions (Bisset et al., 2025). Studies in the United States of America found that 62.2% of U.S. counties have no practicing urologist, a disparity identified as a major barrier to timely care, and telemedicine enables urologists to extend their reach across larger geographic areas, directly improving access for rural populations who would otherwise be unable to obtain specialist evaluation (Kirshenbaum, Rhee, Gettman, & Spitz, 2021).

Ultrasonography (US) is a non-invasive imaging technique that is portable, highly sensitive, free from ionizing radiation, and accessible in settings where conventional imaging modalities are either costly or unavailable (Moore & Copel, 2011; Robertson et al., 2017;

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Smith et al., 2018). Achieving advanced proficiency in US is challenging, as the only reference for determining the location and orientation of the imaging plane is the visualized organ displayed on the monitor. There is no positional feedback to inform the operator how far the imaging plane deviates from the true axial or anatomical cross-section of the target organ. Consequently, even experienced operators may commit errors in imaging plane positioning (Duarte, Dos Santos, Iared, & Peccin, 2022).

Recent advancements in ultrasound (US) technology have enabled the creation of portable handheld devices that integrate with smart mobile platforms, allowing real-time image sharing via commercial messaging services or specialized digital applications. Although this represents a significant technological leap, studies exploring the use of tele-mentored handheld ultrasound (tele-HHUS) remain scarce (Baribeau et al., 2020; Swanson et al., 2019). Studies in several developing countries have shown that live tele-ultrasound can produce satisfactory image quality and diagnostic accuracy when clinicians receive real-time remote guidance (Britton et al., 2019). Despite these promising results, most implementations are not tailored to specific specialties and lack structured integration into clinical decision-making. Among telehealth modalities, tele-HHUS offers the potential to help less-experienced operators perform point-of-care imaging under expert supervision, even in resource-limited, real-world settings. However, its effectiveness in supporting rural general practitioners (GPs) across diverse clinical scenarios remains uncertain (Zhou et al., 2023).

Tele-urology studies conclude that remote encounters can safely replace in-person visits for a variety of urologic concerns. Results from a major tele-urology evaluation revealed that most patients felt their symptoms—including hematuria, stone follow-up, urinary complaints, and postoperative issues—were adequately managed through remote consultation, with consistently high satisfaction scores (Naik et al., 2022). Similarly, review conclusions show that telehealth effectively supports clinical decision-making across multiple urologic conditions (Novara et al., 2020). These findings indicate that remote specialist guidance is both feasible and clinically reliable, supporting its integration with diagnostic imaging pathways in rural settings where access to urology specialists is limited.

Evidence from telementored ultrasound trials shows that high-quality imaging can be generated even by inexperienced personnel. Smith et al. found no significant differences in image quality or performance among three telemedicine mentoring setups—multiple cameras, smartphone, and audio-plus-ultrasound stream—and concluded that low-cost platforms, including smartphones, are effective for remote ultrasound instruction (Smith et al., 2018). Likewise, Robertson et al. reported that non-physician learners produced 90% high-quality images and 89% clinically usable images under remote mentoring, with experts feeling comfortable making clinical decisions based on the transmitted scans (Robertson et al., 2017). These findings confirm that tele-mentored ultrasound can reliably support image acquisition for diagnostic purposes, even in communities with minimal on-site training resources. The general practitioners at Pangkalan Baru Primary Health Center faced a dual challenge: a skill gap arising from the absence of formal ultrasound training in their professional background, and a confidence gap stemming from uncertainty in interpreting sonographic findings without specialist oversight. These two interrelated barriers inability to perform the procedure and reluctance to act on its results together contributed to underutilization of available diagnostic resources and a high rate of unnecessary referrals to the nearest regional hospital. Tele-mentoring was therefore selected as the community service solution precisely because it simultaneously addresses both gaps: providing structured skill-

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building through supervised practice while offering real-time expert reassurance that builds interpretive confidence over time.

Tele-mentored handheld ultrasound (tele-HHUS) has demonstrated strong feasibility and clinical utility in rural and low-resource settings. In a multi-clinic rural program, Zhou et al. reported that tele-HHUS produced clinically impactful findings—identifying kidney stones, renal cysts, hydronephrosis, and other abdominal pathologies—and directly changed clinical management, including increased referrals from 5.9% to 8.3%. Their conclusion emphasized that real-time remote mentoring allowed novice rural clinicians to generate diagnostically adequate images that suppofrted safe clinical decisions (Zhou et al., 2023). Telementoring enables rural providers to perform ultrasound examinations with meaningful diagnostic yield, forming a foundation for community-based urological screening.

Pangkalan Baru Primary Health Center is located in Siak Hulu District, Kampar Regency, Riau Province, approximately 35 kilometers from the nearest regional hospital (RSUD Arifin Achmad, Pekanbaru) where urology specialist services are available. On average, the health center manages 15–20 patients per month presenting with urinary tract complaints, including flank pain, hematuria, urinary retention, and lower urinary tract symptoms. Despite this patient volume, the facility had no established ultrasound examination protocol for urological indications, and general practitioners lacked formal training in point-of-care ultrasonography. A handheld ultrasound (HHUS) device was available at the facility but remained largely unused due to the absence of trained operators and the unavailability of on-site specialist supervision. These conditions—geographic isolation, unmet clinical need, and underutilized equipment—created a clear imperative for a structured community service intervention. Telemedicine in Indonesia's urological services remains underdeveloped, as many urologists continue to face insufficient infrastructure and uncertainties regarding system readiness and user acceptance. While these barriers persist, the adoption of telehealth is steadily expanding and has gained broad acceptance among healthcare professionals, although challenges in platform functionality and infrastructure remain unresolved. To address these gaps, we propose an innovative community-based model that integrates tele-mentored ultrasound with online consultation specifically for urological disorder screening in rural primary care settings in Indonesia. This model leverages existing tele-HHUS technology and mobile health platforms to enable real-time imaging, bidirectional consultation, tele-mentoring, and structured referral decisions. The aim of this community service program is to improve the independence of primary healthcare doctors in performing urological ultrasonography, optimize the diagnostic capacity of rural primary care facilities, and equalize access to urological services for underserved communities through a scalable tele-mentored model.

Method

This community service employed a prospective quasi-experimental (one-group pretest–posttest) design aimed at evaluating the effectiveness of training and implementing a tele-mentored handheld ultrasound (HHUS) system for urological screening in rural primary care facilities. The community service was conducted between August and October 2025 at Pangkalan Baru Community Health Center, Siak Hulu District, Kampar Regency, Riau Province, Indonesia, as part of a Community Health Development (Desa Binaan) program designed to strengthen urological services in resource-limited areas. This design was chosen because it allows assessment of learning outcomes and technology implementation within a single group of participants without a control group.

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This community service program was implemented through a collaborative partnership between the service team comprising urology specialists and academic staff from Universitas Riau and Arifin Achmad General Hospital and the Pangkalan Baru Primary Health Center as the partner institution. Prior to implementation, coordination meetings were conducted with the Head of the Health Center and the Kampar Regency Health Office to obtain institutional approval, align program objectives with local health priorities, and confirm logistical readiness. The Health Center contributed by providing clinic space for training and examination activities, facilitating patient recruitment, and ensuring the availability of the existing HHUS device. The service team was responsible for developing the training curriculum, deploying the UroSono Mentor application, providing specialist mentors throughout the tele-mentoring phase, and conducting all evaluations. This division of roles ensured that the Health Center was an active participant in program delivery rather than a passive recipient, supporting the long-term sustainability of skills and services beyond the program period.

Two groups of participants were included. The first group comprised four general practitioners working at Pangkalan Baru Health Center who were enrolled using total sampling, meaning all eligible doctors at the facility participated. Inclusion criteria were willingness to complete all study phases, involvement in urological patient care, and availability during the study period. The second group consisted of patients who underwent HHUS examinations during the tele-mentored phases. Patients were recruited consecutively, but only those with clinical indications for urinary tract ultrasonography were included such as flank pain, urinary retention, hematuria, or other urinary tract symptoms. All patients provided written informed consent prior to participation.

This community service activities were implemented into four sequential phases: pre-training (T0), intensive training (T1), tele-mentoring (T2), and independent practice (T3). The timeline encompassed T0 (day 0, baseline), T1 (day 1, post-training), T2 (month 1, tele-mentoring phase), and T3 (month 2, independent phase). This phased structure aligns with previously established tele-ultrasound training models, where learners first undergo preparatory instruction, followed by intensive hands-on training, progress into remotely supervised scanning, and ultimately demonstrate independent image acquisition, an approach similar to that employed in structured competency programs, phased tele-mentoring protocols, and longitudinal ultrasound training frameworks described in prior studies (Elshehry, Ghafri, & Jufaili, 2025; Grubic et al., 2025; Kirkpatrick, McKee, Ball, Ma, & Melniker, 2022).

At T0, participants completed a structured questionnaire to assess baseline knowledge and self-confidence in performing HHUS for urological screening. The T1 phase comprised a one-day intensive training program conducted by urology specialists from Arifin Achmad General Hospital, including didactic sessions on urological ultrasonography principles and image interpretation, followed by supervised hands-on practice with real patients. Upon completion, participants filled out post-training questionnaires evaluating improvements in knowledge and self-confidence, along with a satisfaction survey assessing training effectiveness and acceptability.

During T2, which lasted one month, participants performed HHUS examinations at their respective primary care facilities under real-time remote supervision from urology specialists using the UroSono Mentor mobile application. Developed by the research team, this platform functioned as an educational and consultative telemedicine tool incorporating live video communication, image sharing, a urological ultrasound atlas, and direct mentor

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feedback. At the end of this phase, participants completed questionnaires evaluating self-confidence, usability, feasibility, mentor responsiveness, and perceived clinical impact. Concurrently, patient satisfaction surveys were administered to assess comfort, communication clarity, and trust in the tele-mentored HHUS service.

During T3, general practitioners independently performed HHUS for one month without direct supervision and subsequently completed a final questionnaire assessing self-confidence, behavioral intention, and sustainability of HHUS use in routine clinical practice.

Data collection was conducted using a structured questionnaire specifically developed for this study. The instrument captured information across the four study phases. At T0, data included participants' demographics and baseline confidence levels. At T1, responses assessed training satisfaction. At T2, the questionnaire evaluated self-confidence, usability, feasibility, mentor responsiveness, perceived clinical impact, and patient satisfaction. Finally, at T3, assessments focused on self-confidence, behavioral intention, and sustainability of HHUS practice. All questionnaire items were rated on a five-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Content validity was reviewed by two urology specialists, while reliability testing demonstrated Cronbach's α values indicating a high level of internal consistency of the instrument. Data were analyzed using IBM SPSS Statistics version 25.0 Descriptive statistics including means and standard deviations were used to summarize scores for training satisfaction, tele-mentoring evaluation, behavioral intention, and patient satisfaction. To assess changes in knowledge and self-confidence across the three time points (T0, T2 and T3), the Friedman test was applied as a non-parametric alternative to repeated-measures ANOVA, appropriate given the small sample size (n = 4) and ordinal Likert-scale data. A p-value of <0.05 was considered statistically significant. Post-hoc pairwise comparisons using Wilcoxon signed-rank tests with Bonferroni correction were performed where the Friedman test indicated a significant overall difference. Patient satisfaction data from tele-mentoring phase were summarized descriptively.

Result and Discussion

Participant Characteristics

All four general practitioners completed the study. The mean age was 32.75 years (range 29–37) with an average of 7.5 years of clinical experience; three (75%) had no prior ultrasound experience, and one (25%) had previous exposure. Participant characteristics are summarized in Table 1.

Table 1. Characteristics of Participating General Practitioners

ID	Age (years)	Gender	Years in Practice	Prior Ultrasound Experience
D1	29	Male	3	No
D2	34	Female	9	No
D3	31	Male	6	Yes
D4	37	Female	12	No

During the tele-mentoring phase (T2), 26 patients with clinical indications for HHUS underwent the procedure. The mean patient age was 54.8 ± 12.1 years, comprising 15 males (57.7%) and 11 females (42.3%). The distribution of HHUS findings and referral outcomes is summarized in Table 2.

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Table 2. Distribution of HHUS with Tele-Mentored Diagnoses and Management Among Patients

HHUS Diagnosis	n	%	Referral Status
Normal	18	69.2	Referred to hospital: 8 (30.8%)
Hydronephrosis	3	11.5	Managed at primary care: 18 (69.2%)
Nephrolithiasis	2	7.7	
Vesicolithiasis	2	7.7	
Prostatic enlargement	1	3.9	
Total	**26**	**100**	Total: 26 (100%)

Training Satisfaction (T1)

Participant satisfaction with the one-day training was high (Table 3). The highest ratings were given to the clarity and effectiveness of instruction (5.00 ± 0.00) and the value of hands-on practice (4.25 ± 0.50). Lower scores were observed for the adequacy of training duration and variety of patient cases (3.00 ± 0.00). Overall mean satisfaction was 3.81 ± 0.19, indicating that the training was well-received but could benefit from extended practical sessions.

Table 3. Satisfaction with Training Scores among General Practitioners

Item	Statement	Mean ± SD
1	The instructors presented materials clearly and effectively.	5.00 ± 0.00
2	Hands-on sessions improved my understanding of ultrasound.	4.25 ± 0.50
3	The number and variety of patients during hands-on practice were sufficient.	3.00 ± 0.00
4	The training duration was adequate to enhance practical skills.	3.00 ± 0.00
	Overall satisfaction	**3.81 ± 0.12**

Evaluation of the Tele-Mentoring Program (T2)

Participants rated the tele-mentoring system positively, with usability averaging 4.13 ± 0.14, mentor responsiveness 4.43 ± 0.24, feasibility 4.18 ± 0.13, and perceived clinical impact 4.13 ± 0.14, as summarized in Table 4. These results indicate that both the platform and the mentoring process were practical and beneficial for clinical learning.

Table 4. Evaluation of the Tele-Mentoring Program Using the UroSono Mentor Application

Evaluation Domain	Mean ± SD
Usability	4.13 ± 0.14
Feasibility of implementation	4.18 ± 0.13
Mentor responsiveness	4.43 ± 0.24
Perceived clinical impact	4.13 ± 0.14
Overall mean	**4.21 ± 0.16**

Evaluation of the One-Month Independent Phase (T3)

At the one-month independent phase (T3), participants demonstrated high behavioral intention and perceived sustainability toward HHUS use (Table 5). The overall mean score across four items was 4.56 ± 0.52, indicating consistently positive responses. All doctors expressed strong agreement that they intended to continue using HHUS routinely (4.75 ± 0.50) and to further improve their ultrasound skills (4.75 ± 0.50). Slightly lower—but still positive—scores were observed for willingness to train colleagues (4.25 ± 0.50) and perceived sustainability within their facilities (4.50 ± 0.58).

Table 5. Assessment of GP Behavioral Intentions and Program Sustainability

Statement	Mean ± SD
I intend to continue using tele-mentored HHUS routinely.	4.75 ± 0.50
I plan to share or train colleagues about tele-mentored HHUS use.	4.25 ± 0.50
I will continue to improve my ultrasound skills.	4.75 ± 0.50

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I believe tele-mentored HHUS sustainability is possible in my facility.	4.50 ± 0.58
Overall mean	**4.56 ± 0.52**

Knowledge and Confidence

The mean knowledge and confidence score increased significantly from 2.06 ± 0.31 at baseline (T0) to 4.37 ± 0.32 during the tele-mentoring phase (T2), as shown in Table 6. After one month of independent practice (T3), the score slightly declined to 3.85 ± 0.30 but remained significantly higher than baseline (p = 0.018, Friedman test).

Table 6. Changes in Doctors' Knowledge and Confidence Scores Across Study Phases

Time Point	Mean ± SD	p-value
T0 (Pre-training)	2.06 ± 0.31	0.018*
T2 (Tele-mentoring phase)	4.37 ± 0.32	
T3 (One-month independent)	3.81 ± 0.31	

**Friedman Test*

Patient Satisfaction

Overall patient satisfaction with tele-mentored HHUS was very high, with a mean total score of 4.49 ± 0.53, as summarized in Table 7. Patients reported receiving clear explanations, experiencing comfort during the examination, and expressing trust in the results.

Table 7. Patient Evaluation of the Tele-Mentoring Program Utilizing the UroSono Mentor Application

Item	Mean ± SD
The doctor clearly explained the procedure	4.31 ± 0.73
I felt comfortable during the examination	4.46 ± 0.50
I trusted the ultrasound results	4.40 ± 0.49
I was satisfied with the overall service	4.63 ± 0.48
I would recommend this service to others	4.67 ± 0.47
Overall mean	**4.49 ± 0.53**

This pilot study demonstrates that the implementation of a community-based tele-mentored HHUS model for urological screening in rural primary care successfully enhanced general practitioners' competence, expanded service accessibility, and achieved high satisfaction levels among both participants and patients. These findings reinforce prior evidence indicating that tele-ultrasound can be effectively utilized in resource-limited settings when accompanied by structured training and remote supervision.

During the tele-mentoring phase (T2), 26 patients underwent HHUS examinations. Most findings were normal (69.2%), while the remainder included hydronephrosis (11.5%), nephrolithiasis (7.7%), vesicolithiasis (7.7%), and prostate enlargement (3.9%). Approximately 30.8% of patients were referred to hospitals for further evaluation, whereas 69.2% were managed within the primary care setting. These results highlight the role of HHUS in enabling GPs to triage patients effectively, reserving hospital referrals for those with significant abnormalities. This aligns with the objective of strengthening diagnostic capacity at the primary care level and minimizing unnecessary referrals, as similarly observed in tele-HHUS implementation studies (Eadie et al., 2018). Evidence from general-practice POCUS shows a comparable effect, with ultrasound use reducing intended referrals from 49.2% to 25.6%, demonstrating a substantial 23.6% absolute reduction that further supports the role of tele-mentored HHUS in decreasing unnecessary escalation to secondary care (Aakjær Andersen, Brodersen, Davidsen, Graumann, & Jensen, 2020).

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Figure 1. Atmosphere of the one-day intensive HHUS training session (T1) at Pangkalan Baru Primary Health Center, showing urology specialists from Arifin Achmad General Hospital conducting hands-on instruction with general practitioner participants

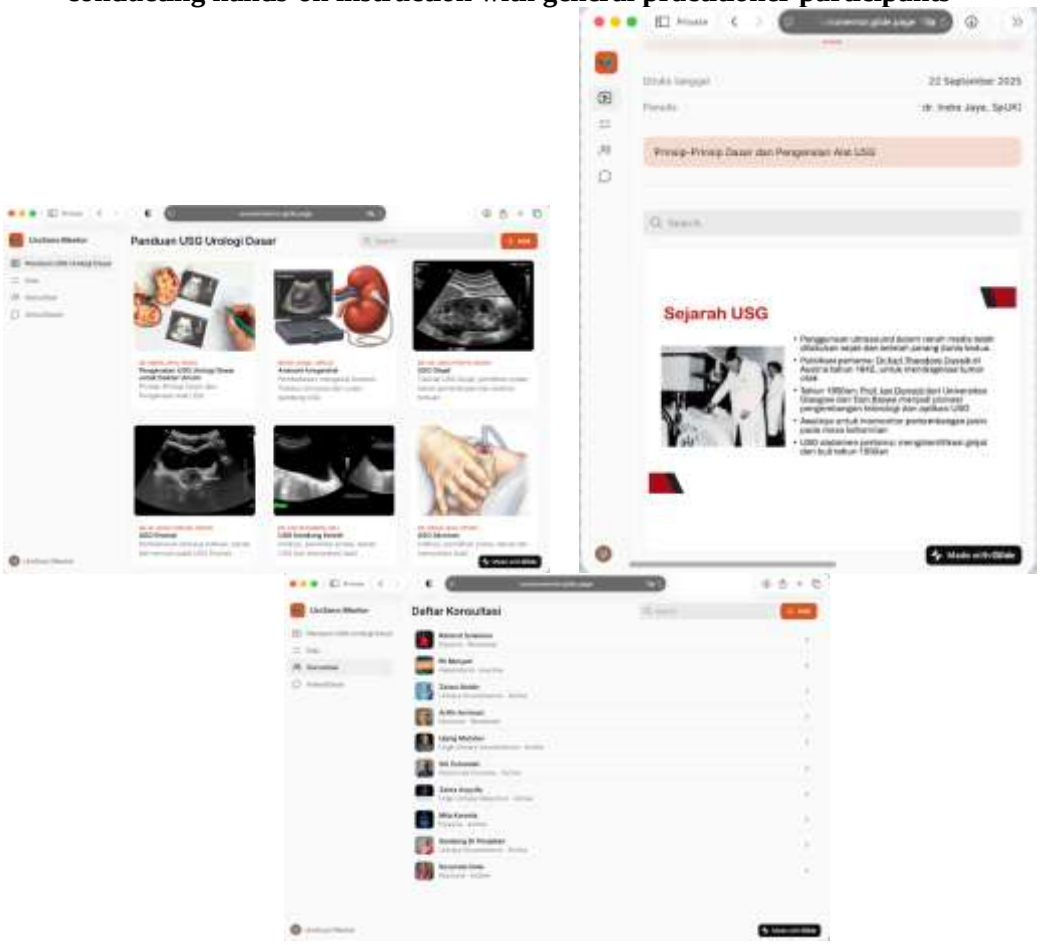

Figure 2. Screenshot of the UroSono Mentor application interface during active tele-mentoring, displaying the live video consultation feature and image-sharing panel used by urology specialists to provide real-time remote guidance.

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Figure 3. General practitioner performing a tele-mentored HHUS examination on a patient at the primary care facility during the T2 phase, with the UroSono Mentor application open on a mobile device for simultaneous specialist consultation.

After one month of independent practice (T3), all physicians demonstrated a strong intention to continue using HHUS, with an overall mean score of 4.56 ± 0.52. The highest ratings were for items relating to planning continued regular HHUS use and desire to improve ultrasound skills (both = 4.75 ± 0.50). These findings reflect high technology acceptance and a strong motivation to sustain HHUS practice independently in primary care. They also support the concept of community-based capacity building by emphasizing local ownership, autonomy, and continuity of healthcare innovation. This is further reinforced by evidence showing that participants consistently described POCUS as a valued tool and were already integrating it into routine assessments, while strengthened training, supportive governance, and other key facilitators were identified as enablers of community-driven capacity building and the development of autonomous, sustainable ultrasound services in primary care (Akanuwe et al., 2023).

The Friedman test revealed a significant improvement in participants' knowledge and self-confidence scores across the pre-training (T0), tele-mentoring (T2), and independent (T3) phases ($p = 0.018$). Mean confidence increased from 2.06 at baseline to 4.37 during the tele-mentoring phase and slightly declined to 3.81 during the independent phase, yet remained well above the pre-training level. This indicates that a one-day intensive training combined with continuous remote mentoring effectively strengthened the physicians' capability to perform HHUS for urological screening. The mild decline during the independent phase warrants deeper consideration. A plausible explanation is the loss of the "safety net" effect—the psychological sense of security that comes from knowing a specialist mentor is immediately available for real-time guidance and validation. When this supervisory buffer was removed during the independent phase, participants may have experienced heightened uncertainty when encountering ambiguous or complex findings, leading to a reduction in reported confidence even when their technical skills remained intact. This phenomenon is well recognized in competency-based education, where the transition from supervised to autonomous practice often produces a temporary dip in self-efficacy before consolidation occurs. These findings underscore the importance of a structured transition period between the tele-mentored and fully independent phases of the community service program. Future implementations should consider incorporating periodic booster sessions—monthly or quarterly—during which GPs can review challenging cases with mentors, share scanning experiences, and receive targeted feedback to prevent skill decay and maintain confidence. A structured case library within the UroSono Mentor platform could further

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support this transition by allowing asynchronous review of annotated cases during the independent phase. These results align with Zhou et al. (2023), who reported that tele-mentored HHUS significantly improved physicians' diagnostic accuracy and confidence in remote community practice (Zhou et al., 2023). This is supported by evidence showing that across 23 studies, remote ultrasound learners consistently demonstrated equivalent improvements in knowledge and hands-on skills compared with in-person instruction, and reported feeling comfortable performing ultrasound under real-time remote guidance (Bui, Parange, Bezak, & Bidner, 2024). Furthermore, follow-up evaluations in rural clinicians showed that 93% reported increased scanning confidence and 62% performed scans that directly contributed to clinical diagnosis, demonstrating substantial gains in both diagnostic confidence and accuracy after receiving remote ultrasound mentoring (Bidner, Bezak, & Parange, 2022).

Participant satisfaction with the training was high, with an overall mean of 3.81 ± 0.19. Theoretical delivery and hands-on sessions were rated highly effective, although participants noted that training duration and patient case variety could be improved. This highlights the importance of incorporating sufficient clinical exposure to reinforce practical skills beyond didactic sessions. Similarly, Jemal et al. (2024) reported that extending training duration and diversifying patient cases substantially improved tele-ultrasound operator competence in Ethiopia (Jemal et al., 2024).

The tele-mentoring phase yielded excellent results, with an overall mean score of 4.21 ± 0.16. Mentor responsiveness achieved the highest rating (4.43 ± 0.24), followed by implementation feasibility (4.18 ± 0.13). These outcomes indicate that the UroSono Mentor system was both effective and user-friendly for participants. The presence of responsive mentors provided crucial technical and emotional support, enhancing learners' confidence and autonomy. Similar findings have been reported in prior systematic reviews finding that tele-ultrasound generally produced satisfactory image quality and influenced clinical management despite infrastructural limitations (Britton et al., 2019). Similarly, a pilot program in several developing countries demonstrated high concordance (79–100%) between local providers and supervising clinicians, with participants highly satisfied and reductions in travel burden (Jemal et al., 2024).

System-level findings from virtual-care evaluations further reinforce the practicality of remote diagnostic supervision. Neves et al. reported that virtual primary-care tools improved perceived efficiency (55.7%), timeliness (60.2%), effectiveness (46.5%), and safety (45.5%), and emphasized that public willingness for continued use of remote technology was high across telephone, messaging, and video platforms (Neves et al., 2024). Complementing this, Wherton et al. reported a rapid and sustained escalation in remote clinical activities—from an average of 8 to 171 video-supported consultations per week within one month—and concluded that virtual care is sustainable when supported by stable infrastructure and adaptable workflows (Wherton, Greenhalgh, Hughes, & Shaw, 2022). These findings confirm that primary care environments can reliably adopt remote supervision systems, laying the groundwork for more specialized tele-mentored diagnostic approaches.

Patient satisfaction with the tele-mentored HHUS service was notably high, with an overall mean of 4.49 ± 0.53. Patients reported comfort during examinations, clear explanations, and confidence in the accuracy of ultrasound findings. This suggests that tele-mentoring-based ultrasound services are well accepted not only by healthcare providers but also by patients as reliable and patient-friendly diagnostic tools. High patient trust may also enhance adherence to clinical recommendations and expedite clinical decision-making. This

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is further supported by findings from tele-mentored ultrasound assessments showing that remotely guided scans consistently achieved high diagnostic quality, with 96.4% of cardiac cineloops and 79.1% of thoraco-abdominal cineloops rated as suitable for clinical interpretation (Vatsvåg et al., 2020).

Conclusion

The community-based tele-mentored HHUS model demonstrates strong feasibility, acceptability, and educational impact, with the ability to enhance diagnostic confidence while strengthening referral systems within primary care. Confidence scores improved significantly from 2.06 at baseline to 4.37 during the tele-mentoring phase ($p = 0.018$, Friedman test), and remained elevated at 3.81 after one month of independent practice. Patient satisfaction was high (4.49 ± 0.53), and 30.8% of examined patients were appropriately referred for specialist care, supporting the model's clinical utility. This program holds substantial potential for broader adoption in national health systems, particularly in rural areas with limited specialist access, by empowering general practitioners to conduct basic urological screenings safely and effectively under remote specialist supervision.

Further multicenter studies with larger cohorts, extended training durations, and the inclusion of reference imaging are recommended to validate diagnostic accuracy, assess long-term competency, and evaluate the cost-effectiveness and scalability of this approach. Integration of tele-mentoring platforms such as UroSono Mentor may provide a sustainable and replicable framework for the future development of multidisciplinary tele-ultrasound programs within community healthcare systems.

Recommendation

Based on the findings of this community-based tele-mentored HHUS program, the following evidence-informed recommendations are addressed to specific stakeholders for practical and applicable action.

For the Health Center/Partners: The Pangkalan Baru Primary Health Center and similar rural facilities are encouraged to develop internal standard operating procedures (SOPs) for HHUS-based urological screening, ensuring that the skills acquired through this program are institutionalized rather than dependent on individual practitioners. Regular equipment maintenance schedules for the HHUS device should be established, and at least one trained GP should be designated as an internal HHUS coordinator to sustain service continuity. Periodic booster sessions conducted quarterly via the UroSono Mentor platform are recommended to prevent skill decay during the post-program independent phase and to address complex cases collaboratively with specialist mentors.

For the Health Office/Government: The Kampar Regency Health Office and the Riau Provincial Health Office are encouraged to consider the UroSono Mentor model as a replicable framework for scaling tele-mentored HHUS programs across other rural primary health centers in the region. Regulatory support is needed to formally recognize community-based tele-mentoring as a component of continuing professional development for general practitioners, aligned with national telemedicine policies. Budget allocation for HHUS device procurement, connectivity infrastructure, and specialist mentoring fees should be considered as part of rural health service improvement programs. A formal policy endorsement by the Ministry of Health would enable broader adoption and institutional sustainability of this approach at the national level.

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For Future Community Service Teams: Academic and hospital-based community service teams planning similar interventions are recommended to extend the training curriculum to a minimum of two to three days of supervised hands-on practice, incorporating a wider variety of pathological cases to accelerate skill consolidation, as evidenced by participant feedback on training duration (mean score 3.00 ± 0.00). Future programs should also incorporate a structured transition phase between tele-mentored and independent practice, including scheduled asynchronous case reviews and regular mentor check-ins. Multicenter designs with standardized outcome measures, reference imaging comparison, long-term competency follow-up, and cost-effectiveness analyses are recommended to generate the robust evidence necessary for national policy adoption and to advance the scalability of multidisciplinary tele-ultrasound community service programs across Indonesia and the broader Asia-Pacific region.

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References

Aakjær Andersen, C., Brodersen, J., Davidsen, A. S., Graumann, O., & Jensen, M. B. B. (2020). Use and impact of point-of-care ultrasonography in general practice: A prospective observational study. *BMJ Open*, *10*(9), 1–9. https://doi.org/10.1136/bmjopen-2020-037664

Akanuwe, J. N. A., Siriwardena, A. N., Bidaut, L., Mitchell, P., Bird, P., Lasserson, D., … Lilford, R. (2023). Practitioners' views on community implementation of point-of-care ultrasound (POCUS) in the UK: a qualitative interview study. *BMC Health Services Research*, *23*(1), 1–10. https://doi.org/10.1186/s12913-023-09069-4

Baribeau, Y., Sharkey, A., Chaudhary, O., Krumm, S., Fatima, H., Mahmood, F., & Matyal, R. (2020). Handheld Point-of-Care Ultrasound Probes: The New Generation of POCUS. *Journal of Cardiothoracic and Vascular Anesthesia*, *34*(11), 3139–3145. https://doi.org/10.1053/j.jvca.2020.07.004

Bidner, A., Bezak, E., & Parange, N. (2022). Evaluation of antenatal point-of-care ultrasound training workshops for rural/remote healthcare clinicians: a prospective single cohort study. *BMC Medical Education*, 22(1), 1–16. https://doi.org/10.1186/s12909-022-03888-5

Bisset, B., Shriram, T., Davuluri, M., Azar, H., Beilan, J., Amin, R., & Houman, J. (2025). Applications and Outcomes of Telehealth and Integrated Care in Men's Health Urology. *Journal of Medical Internet Research*, *27*, 1–10. https://doi.org/10.2196/69095

Britton, N., Miller, M. A., Safadi, S., Siegel, A., Levine, A. R., & McCurdy, M. T. (2019). Tele-ultrasound in resource-limited settings: A systematic review. *Frontiers in Public Health*, 7(SEP). https://doi.org/10.3389/fpubh.2019.00244

Bui, C., Parange, N., Bezak, E., & Bidner, A. (2024). The Role of Telehealth in Ultrasound Training for Remote Learners: A Systematic Review. *Telemedicine and E-Health*, 30(4), 963–975. https://doi.org/10.1089/tmj.2023.0396

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E-ISSN : 2722-5097
Pg : 444-457

Duarte, M. L., Dos Santos, L. R., Iared, W., & Peccin, M. S. (2022). Telementored ultrasonography: A narrative review. *Sao Paulo Medical Journal*, 140(2), 310–319. https://doi.org/10.1590/1516-3180.2020.0607.R2.15092021

Eadie, L., Mulhern, J., Regan, L., Mort, A., Shannon, H., Macaden, A., & Wilson, P. (2018). Remotely supported prehospital ultrasound: A feasibility study of real-time image transmission and expert guidance to aid diagnosis in remote and rural communities. *Journal of Telemedicine and Telecare*, 24(9), 616–622. https://doi.org/10.1177/1357633X17731444

Elshehry, A., Ghafri, S. Al, & Jufaili, M. Al. (2025). Longitudinal point-of-care ultrasound training program for emergency medicine faculty in Oman: a Kirkpatrick model approach. *BMC Medical Education*, 25(1). https://doi.org/10.1186/s12909-025-07954-6

Grubic, N., Nihal, S., Herr, J. E., Jelic, T., Montague, S. J., Aleksova, N., … Johri, A. M. (2025). Training Nonexpert Users in Cardiopulmonary Point-of-Care Ultrasound Using a Virtual Curriculum and a Teleconsultation Model: A Multicentre Study. *CJC Open*. https://doi.org/10.1016/j.cjco.2025.06.009

Jemal, K., Ayana, D., Tadesse, F., Adefris, M., Awol, M., Tesema, M., … Mendez, I. (2024). Implementation and evaluation of a pilot antenatal ultrasound imaging programme using tele-ultrasound in Ethiopia. *Journal of Telemedicine and Telecare*, 30(6), 1005–1016. https://doi.org/10.1177/1357633X221115746

Kirkpatrick, A. W., McKee, J. L., Ball, C. G., Ma, I. W. Y., & Melniker, L. A. (2022). Empowering the willing: the feasibility of tele-mentored self-performed pleural ultrasound assessment for the surveillance of lung health. *Ultrasound Journal*, 14(1). https://doi.org/10.1186/s13089-021-00250-6

Kirshenbaum, E., Rhee, E. Y., Gettman, M., & Spitz, A. (2021). Telemedicine in Urology: The Socioeconomic Impact. *Urologic Clinics of North America*, 48(2), 215–222. https://doi.org/10.1016/j.ucl.2021.01.006

Moore, C. L., & Copel, J. A. (2011). Point-of-care ultrasonography. *New England Journal of Medicine*, 364(8), 749–757. https://doi.org/10.1056/NEJMra0909487

Naik, N., Hameed, B. M. Z., Nayak, S. G., Gera, A., Nandyal, S. R., Shetty, D. K., … Somani, B. K. (2022). Telemedicine and Telehealth in Urology—What Do the 'Patients'' Think About It?' *Frontiers in Surgery*, 9(April), 1–11. https://doi.org/10.3389/fsurg.2022.863576

Neves, A. L., van Dael, J., O'Brien, N., Flott, K., Ghafur, S., Darzi, A., & Mayer, E. (2024). Use and impact of virtual primary care on quality and safety: The public's perspectives during the COVID-19 pandemic. *Journal of Telemedicine and Telecare*, 30(2), 393–401. https://doi.org/10.1177/1357633X211066235

Novara, G., Checcucci, E., Crestani, A., Abrate, A., Esperto, F., Pavan, N., … Ficarra, V. (2020). Telehealth in Urology: A Systematic Review of the Literature. How Much Can Telemedicine Be Useful During and After the COVID-19 Pandemic? *European Urology*, 78(6), 786–811. https://doi.org/10.1016/j.eururo.2020.06.025

Robertson, T. E., Levine, A. R., Verceles, A. C., Buchner, J. A., Lantry, J. H., Papali, A., … McCurdy, M. T. (2017). Remote tele-mentored ultrasound for non-physician learners using FaceTime: A feasibility study in a low-income country. *Journal of Critical Care*, 40, 145–148. https://doi.org/10.1016/j.jcrc.2017.03.028

Smith, A., Addison, R., Rogers, P., McLean, J. S., Boyd, S., Hoover, K., … Parsons, M. (2018). Remote mentoring of point-of-care ultrasound skills to inexperienced

Vol. 7, No. 2 (May 2026)
E-ISSN : 2722-5097
Pg : 444-457

operators using multiple telemedicine platforms: Is a cell phone good enough? *Journal of Ultrasound in Medicine*, 37(11), 2517–2525. https://doi.org/10.1002/jum.14609

Swanson, J. O., Nathan, R. O., Swanson, D. L., Perez, K. M., Bresnahan, B. W., Mirza, W., & Goldenberg, R. L. (2019). Use of ultrasound and mHealth to improve perinatal outcomes in low and middle income countries. *Seminars in Perinatology*, 43(5), 267–272. https://doi.org/10.1053/j.semperi.2019.03.016

Vatsvåg, V., Todnem, K., Næsheim, T., Cathcart, J., Kerr, D., & Oveland, N. P. (2020). Offshore telementored ultrasound: a quality assessment study. *Ultrasound Journal*, 12(1). https://doi.org/10.1186/s13089-020-00180-9

Wherton, J., Greenhalgh, T., Hughes, G., & Shaw, S. E. (2022). The Role of Information Infrastructures in Scaling up Video Consultations During COVID-19: Mixed Methods Case Study Into Opportunity, Disruption, and Exposure. *Journal of Medical Internet Research*, 24(11), 1–16. https://doi.org/10.2196/42431

Zhou, Y. J., Guo, L. H., Bo, X. W., Sun, L. P., Zhang, Y. F., Chai, H. H., … Xu, H. X. (2023). Tele-Mentored Handheld Ultrasound System for General Practitioners: A Prospective, Descriptive Study in Remote and Rural Communities. *Diagnostics*, 13(18), 1–12. https://doi.org/10.3390/diagnostics13182932