

The Effect of Training Modality on Kenyan Health Care Providers' Clinical Decision- Making Using Obstetric Point-of-Care Ultrasound

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Abstract

Background

Obstetric point-of-care ultrasound (OPOCUS) is increasingly used to support antenatal care in low- and middle-income countries, yet evidence remains limited on how different OPOCUS training modalities influence clinical decision-making. This study examined the association of training modalities on the self-perception of OPOCUS informing clinical decision-making among Kenyan healthcare providers.

Methods

We conducted a cross-sectional provider survey embedded within a three-year implementation science study that examined OPOCUS introduction across public health facilities in eight Kenyan counties. Healthcare providers (HCPs) who had received either formal five-day Global Ultrasound Institute (GUSI) training or informal on-job training (OJT) were purposively selected. Trainees across both cohorts received regular mentorship that varied from daily to monthly. Data were collected using a structured questionnaire assessing trainees' self-perception of OPOCUS informing clinical decision-making in five targeted OPOCUS assessments. Multilevel multivariable linear regression models were used to examine associations between training modality and self-perception of OPOCUS informing clinical decision-making.

Results

A total of 344 healthcare providers participated (52% GUSI-trained; 48% OJT-trained), the majority of whom were midwives. The overall mean self-perception of OPOCUS informing clinical decision-making scores was 56 (95% CI: 53.0–59.0), which was significantly higher among those who received formal training compared to those who were OJT trained (66 vs. 45). Formal training was associated with an 18.4 point increase in self-perception of OPOCUS informing clinical decision-making (95% CI: 11.6–25.2; p -value < 0.001). Self-reported confidence in performing 5 OPOCUS assessments was also significantly higher among GUSI-trained (95.0% vs. 77.0%) and was independently associated with improved decision-making. In both training cohorts, weekly mentorship was associated with higher confidence and self-perception of OPOCUS informing clinical decision-making scores. Facility level, professional cadre, age, and years of experience were not associated with self-perception of OPOCUS informing clinical decision-making.

Conclusions

Formal OPOCUS training was associated with self-perception of OPOCUS informing clinical decision-making compared with informal OJT training. Confidence likely mediated this relationship, highlighting its importance as a mechanism linking training to clinical practice. These findings underscore the need for structured training models complemented by sustained mentorship to effectively scale OPOCUS in resource-limited settings.

Background

Point-of-care ultrasound (POCUS) has emerged as a promising tool in obstetric care, particularly in low- and middle-income countries where radiology services are scarce. Despite widespread adoption of diverse training modalities such as workshops, simulation, and peer-assisted learning, evidence remains limited on how these approaches influence healthcare providers' (HCP) clinical decision-making (1, 2).

In Kenya, midwives and frontline providers are often the first point of contact for pregnant women, yet persistent gaps in ultrasound knowledge and skills have been documented (3, 4). To bridge this gap, large-scale initiatives have expanded training in obstetric point of care ultrasound (OPOCUS). In one large-scale training program, over 500 rural HCPs were trained in OPOCUS (5). The HCPs received a five-day structured training conducted by Global Ultrasound Institute (GUSI) on five parameters of obstetric care, including fetal presentation, placental location, amniotic fluid volume, fetal heart activity, and number of fetuses. The trained HCPs were given Butterfly iQ+ probe with an iPad to facilitate OPOCUS use during routine antenatal and intrapartum care (6). In the initial study (5), HCPs had reported that OPOCUS influenced decision-making in the management of pregnant mothers. Following the deployment of OPOCUS devices, non-formally trained HCPs organically developed interest in using the devices, resulting into on-job training (OJT) that were not initially planned.

Despite these efforts, questions still remain about how formal, structured training versus informal, training approaches build decision-making capacity (7). Decision-making was defined as self-perception of OPOCUS informing clinical decision-making for the HCPs to modify patient care or refer a patient to a higher-level facility; to initiate referral for a comprehensive ultrasound; to schedule an earlier follow-up review; informed decision to proceed with birth.

This study therefore, examined the association of training modality with self-perception of OPOCUS informing clinical decision-making among HCPs. Two training modalities were used in this study: structured five-day formal training (conducted by GUSI) and informal OJT.

Methods

Study Design and Setting

We adopted a cross-sectional survey design, embedded in a large implementation science study (6). In the first phase of the implementation science study, over 500 HCPs were formally trained between September and December 2022 and given Butterfly iQ+ probe with an iPad (5). In the second phase, an additional 96 HCPs were trained in December 2023. The larger study was employed to evaluate the implementation of OPOCUS at varying levels of the healthcare system, while this study focused on self-reported perception among HCPs clinical decision-making ability.

Study Setting

This study and the parent study were conducted in health facilities across 8 counties in Kenya including Baringo, Kakamega, Kilifi, Kitui, Nakuru, Samburu, Taita Taveta and Turkana. About 15 counties account for 98.7% of the total maternal deaths in Kenya, which are attributed to poor access and low uptake of skilled care (5). The health facilities were mainly of dispensaries (level 2), health centres (level 3) and district/sub-county hospitals (level 4), and most were in rural settings.

Training Modalities

Two training modalities were compared in this study. The first modality was a formal five-day training conducted by GUSI and the second modality was informal On-Job-Training (OJT).

First, for formal GUSI training, the 500 HCPs from 224 health facilities who were nominated by the respective counties received a training between August and December 2022, as described by (5). The training covered the identification of five high-risk maternal and fetal parameters: fetal presentation, placental location, amniotic fluid volume, fetal heart activity, and number of fetuses. The second phase of GUSI training was conducted in December 2023 targeting 96 96 additional HCPs (6), for a total of 596 GUSI trained HCP.

Second, OJT was an informal hands-on in-service training that was provided spontaneously by any GUSI-trained providers to their peers. In this spontaneously occurring process, trained providers were able to informally teach their colleagues how to use the machine through hands on use with ANC clients. This exposure to OPOCUS aimed to transfer skills and knowledge to providers who did not receive the formal GUSI training but self-opted-in to learn about OPOCUS. OJT did not include any formalized curriculum, documentation or duration, though they could access existing online Butterfly learning modules. All OJT individuals were mainly working in ANC, postnatal and maternity units of the facility. GUSI-trained providers maintained control over the Butterfly devices and were encouraged to share Butterfly devices with their OJT peers.

A mentorship program was implemented to reinforce learning for both training modalities. Briefly, each sub-county had one mentor who provided support to facilities that had access to OPOCUS equipment. They visited at least one facility per week over a period of four months (February to July 2024) and used standardized guidelines and a record book (created by the study team) to document the facilities they visited, the number of mentees, and the activities/content covered during the visit. Mentorship activities depended on the number of available healthcare providers at each facility during the visit and was open to either GUSI-trained or OJT-trained HCPs.

Study Population and sampling

The participants for this study were HCPs who had undergone the GUSI training or OJT. The recruitment of participants in the study was done in two stages. In stage one, 115 (51%) health facilities were selected through a random process from the 224 health facilities. In the second stage, all the trained (GUSI or OJT) HCPs from the 115 facilities who were on duty during the five days of data collection were

purposely invited to participate in the study. By the end of the data collection period, a total of 344 HCPs participated in the study.

Data collection methods

A structured questionnaire was administered that collected socio-demographic information of the respondents, perceived level of confidence in performing OPOCUS assessments, self-perception of OPOCUS informing clinical decision-making, duration of mentorship received, and perceived confidence in using OPOCUS devices. The questionnaire was developed and pre-tested as reported previously (6). A total of 115 research assistants were recruited for data collection in the eight counties. The research assistants had knowledge of maternal care and were conversant with the culture and local languages for ease of communication and to encourage study participation. They underwent a two-day training to orient them to the data collection tools, ethical procedures around data collection, and standardized data collection guidelines. The training also introduced them to the Open Data Kit (ODK) mobile data collection software. During a 5-day period, research assistants collected data from each facility. All HCPs who consented in the sampled facilities completed the interviewer-administered questionnaires.

Data management and analysis

Outcome measures

Self-perception of POCUS informing clinical decision-making

Providers' self-perception of the influence of OPOCUS findings on clinical decision-making was the primary outcome of the study. It was measured using four items assessing the influence of OPOCUS on clinical decisions. Participants reported the extent to which OPOCUS: (i) led them to modify patient care or refer a patient to a higher-level facility; (ii) prompted referral for a comprehensive ultrasound; (iii) led them to schedule an earlier follow-up visit; and (iv) informed the decision to proceed with birth. Each item was rated on a five-point Likert Scale (rarely, sometimes, often, very often, and always).

Self-reported level of confidence in OPOCUS technology

Self-reported confidence in performing obstetric assessments using OPOCUS was the mediator variable used in this study. It was measured using five items assessing participants' confidence in identifying key high-risk maternal and fetal parameters: fetal heart rate, fetal position, number of fetuses, placental abnormalities, and abnormalities in amniotic fluid. Confidence in OPOCUS use was assessed using three items (Turning on the machine on and off, Adjusting gain and depth, Using the learning modules available in Butterfly App), each rated on a five-point Likert scale (not at all confident, not very confident, neutral, fairly confident, very confident).

Dosage of the mentorship program

The mentorship “dosage” was measured by the frequency of mentoring received. Participants were asked to indicate how often they participated in mentorship sessions over the 6 month period, categorized as “once or rarely,” “quarterly,” “monthly,” or “weekly.”

Statistical Analysis

The self-perception of OPOCUS informing clinical decision-making (outcome) was quantified by aggregating responses to the four questions listed above. The options “rarely” through “very often” were scored from 1 to 5, respectively, with ordered increments of 1 point. The scores of the four individual items were summed and then scaled by dividing the raw decision-making score by the maximum possible score (20). The rescaled decision-making score ranged from 0 to 100, where 0 indicated that the four decisions were rarely made by a provider and 100 indicated that all four decisions were always made. Confidence scores were generated using the same methodology, based on the six items listed in the previous section.

For descriptive analysis, categorical variables were summarized using proportions. Continuous variables (e.g., years of experience) were visually inspected using histograms and summarized using means and standard deviations if approximately normally distributed, or medians and interquartile ranges otherwise. Missing data were handled using complete-case analysis. To examine differences between proportions, we used chi-squared tests or Fisher’s exact tests when any cell count was smaller than five. Differences between means were examined using t-tests or one-way analysis of variance.

To examine the association between training modality (GUSI vs. OJT) and self-perception of OPOCUS informing clinical decision-making scores, we applied a multilevel multivariable linear regression model, given that the outcome was continuous and approximately normally distributed. To account for potential clustering of HCPs within facilities, we included a random intercept for county. A facility-level random intercept could not be used because several facilities had small numbers of HCPs, which prevented model convergence.

A parsimonious set of confounders was selected based on a Directed Acyclic Graph (DAG) shown in Supplemental Figure 1. The DAG also conceptualized two plausible pathways through which training modality could influence decision-making ability: (1) by providing the technical knowhow to identify pregnancy complications early, and (2) by increasing HCP’s confidence in the accuracy of their obstetric assessments. Therefore, in a subsequent model, we included confidence scores as a potential mediator to assess the extent to which the total effect of training modality on clinical decision making was through building confidence. We report the total effect, as well as the decomposed direct and indirect effects.

All statistical tests were two-sided and performed at a 5% significance level; p-values <0.05 were considered statistically significant. Point estimates were reported with 95% confidence intervals. Analyses were conducted using Stata version 17.

Results

Characteristics of the participants

Table 1 presents characteristics of participants. Of the 344 participants, 179 (52.0%) received formal GUSI training and 165 received OJT. Most of the participants were from Level IV facilities (n = 174; 50.6%). Majority of the participants were midwives (n = 301; 87.5%). The average age was 37.2 (SD-7.9) years old and had worked in the current facility for an average of 3.6 (SD-2.6) years.

Table 1
Characteristics of respondents

Item	GUSI		OJT		Total
	n	%	n	%	
Health Facility Level					
Dispensary (Level II)	18	10.1	13	7.9	31
Health Centre (Level III)	83	46.4	56	33.9	139
District/Sub-County Hospital (Level IV)	78	43.6	96	58.2	174
Total	179	100.0	165	100.0	344
Age					
Average age (in years) [mean (SD)]	38.5 (7.6)		35.7 (8.0)		37.2 (7.9)
Gender					
	n	%	n	%	
Female	123	68.7	125	75.8	248
Male	56	31.3	40	24.2	96
Total	179	100.0	165	100.0	344
Cadre					
	n	%	n	%	
Physician	5	2.8	1	0.61	6
Nurse/Midwife	148	82.7	153	92.7	301
Clinical officer	26	14.5	11	6.7	37
Total	179	100.0	165	100.0	
Years of Practice at the Current Facility					
Years worked in the current facility (mean[SD])	3.9 (2.7)		3.3 (2.5)		
Mentorship frequency					
Never	42	23.5	59	35.8	101 (29.4)
Once or rarely	18	10.1	33	20.0	51 (14.8)
Weekly	13	7.3	12	7.3	25 (7.3)

Item	GUSI		OJT		Total
	n	%	n	%	
Monthly	88	49.2	56	33.9	144 (41.9)
Quarterly	18	10.1	5	3.0	23 (6.7)

Healthcare providers' perceived influence of POCUS findings on clinical decision-making

Figure 1 shows the average scores on the individual influence of POCUS findings on clinical decision making on the dimensions that were assessed. Across the four questions, GUSI-trained HCPs reported higher scores than the OJT HCPs. The average rescaled combined scores was 56.0 (95% CI: 53.0–59.0). GUSI-trained HCPs had higher perceived influence of POCUS findings on clinical decision-making 66.0 (95% CI: 63.0–69.0), compared to the OJT 45.0 (95% CI: 40.0–, 50.0).

Healthcare providers' confidence in performing obstetric assessments

Figure 2a presents confidence scores in performing obstetric assessments. The average level of combined confidence in performing obstetric assessment was 87.0 (95%CI: 85.0–, 88.0). GUSI trained HCPs reported a higher mean confidence score (95.0 [95%CI: 94.0–96.0]) in performing each of the obstetrics assessments as compared to OJT trainees (77.0 [95%CI: 74.0–80.0]). A similar trend was with confidence in using the technology, such as turning it on and off, and accessing built-in modules (Fig. 2b).

Figure 2a: Confidence in obstetric assessments using OPOCUS GUSI. n = 179; OJT, n = 165

Effect of background characteristics on the self-perception of OPOCUS informing clinical decision-making

Table 2 presents the associations between background characteristics and self-perception of OPOCUS informing clinical decision-making. Receiving GUSI training increased self-perception of OPOCUS informing clinical decision-making scores by 18.4 (95%CI: 11.6–25.9; P-value < 0.001) points, compared to those who received OJT. Receiving mentorship weekly had the highest effect on the self-perception of OPOCUS informing clinical decision-making, significantly increasing it by 20.3 (CI: 12.4–28.1; P-value- 0.000) points, compared to those who never received mentorship.

Table 2
Effects of background characteristics on self-perception of OPOCUS informing clinical decision-making

Clinical Decision making score	Coefficient	p-value	[95% conf. interval]
Receiving GUSI Training	18.4	0.000	11.6 25.2
Frequency of Mentorship			
Weekly	20.2	0.000	12.4 28.1
Monthly	15.0	0.000	7.9 22.1
Quarterly	12.3	0.001	4.8 19.9
Once or rarely	18.59	0.001	8.0 29.1
Facility level			
Health Centre (Level III)	1.7	0.770	-9.3 12.8
District/Sub-County Hospital (Level IV)	4.0	0.585	-10.4 18.5
Profession			
Nurse/Midwife	-9.8	0.153	-23.2 3.6
Clinical officer	-7.3	0.444	-26.0 11.4
Age	0.1	0.499	-0.2 0.3
Gender			
Male	2.0	0.510	-4.0 8.1
Years in the current facility	0.3	0.649	-0.9 1.5
Intercept	36.6	0.001	14.8 58.7

Effect of background characteristics on confidence in performing obstetric assessments

Table 3 presents the association of various background factors on the confidence in performing obstetric assessments. Of the background characteristics, receiving GUSI training, frequency of receiving mentorship and being a male significantly influenced confidence in performing obstetric assessment. Receiving GUSI training significantly increased confidence in performing obstetric assessment by 15.7 (CI: 8.2–23.3; P-value = 0.000); receiving mentorship once or rarely significantly increased confidence by 12.7 (95%CI: 3.6–21.8; P-value = 0.006) points, and higher level of confidence was observed among males (2.9, 95%CI: 1.1–4.8; P-value = 0.002), compared to females.

Table 3

Effects of background characteristics on the confidence in performing obstetric assessments

Confidence in performing obstetric assessment	Coefficient	p-value	[95% conf. interval]
Receiving GUSI training	15.7	0.000	8.2 23.3
Frequency of mentorship			
Weekly	7.1	0.000	4.7 9.4
Monthly	7.6	0.001	3.3 12.0
Quarterly	3.3	0.197	-1.7 8.3
Once or rarely	12.7	0.006	3.6 21.8
Facility level			
Health Centre (Level III)	0.7	0.882	-8.5 9.9
District/Sub-County Hospital (Level IV)	-3.1	0.453	-11.3 5.0
Profession			
Nurse/Midwife	-2.1	0.457	-7.5 3.4
Clinical officer	-2.2	0.657	-12.0 7.5
Age	-0.1	0.379	-0.3 0.1
Gender			
Male	2.9	0.002	1.1 4.8
Years in current facility	-0.1	0.755	-0.5 0.4
Intercept	80.2	0.000	72.6 87.7

Effect of confidence in performing obstetric assessments on self-perception of OPOCUS informing clinical decision-making

Table 4 presents effect of confidence in performing obstetric assessment on self-perception of OPOCUS informing clinical decision-making while adjusting for other background factors. Receiving GUSI training significantly increased clinical decision making by 6.8 (CI: 0.2–13.4; P-value = 0.042); Confidence in performing obstetric assessments significantly increased self-perception of OPOCUS informing clinical decision-making scores by 0.7 (CI: 0.4–1.1; P-value = 0.000) points, and receiving mentorship weekly significantly increased the self-perception of OPOCUS informing clinical decision-making by 15.0 (95%CI: 5.1–24.8; P-value = 0.003) points as compared to OJT.

Table 4
Effects of confidence in performing obstetric assessments on the self-perceived self-perception of OPOCUS informing clinical decision-making

Decision making score	Coefficient	p-value	[95% conf. interval]
Receiving GUSI training	6.8	0.042	0.2 13.4
Confidence score	0.7	0.000	0.4 1.1
Frequency of mentorship			
Weekly	15.0	0.003	5.1 24.8
Monthly	9.1	0.014	1.8 16.4
Quarterly	9.5	0.015	1.8 17.2
Once or rarely	9.2	0.075	-0.9 19.3
Facility level			
Health Centre (Level III)	1.9	0.762	-10.1 13.8
District/Sub-County Hospital (Level IV)	6.8	0.313	-6.4 20.1
Profession			
Nurse/Midwife	-8.3	0.143	-19.3 2.8
Clinical officer	-6.1	0.400	-20.3 8.1
Age	0.1	0.377	-0.2 0.5
Gender			
Male	-0.2	0.958	-6.0 5.7
Years in current facility	0.4	0.561	-0.9 1.6
Intercept	-21.5	0.238	-57.3 14.2

Discussion

This study examined the association between OPOCUS training modality and HCPs' self-perceived influence of OPOCUS assessments on clinical decision-making in Kenya. Structured five-day GUSI training on OPOCUS significantly influenced self-perceived influence on clinical decision-making compared to OJT. The findings align with global evidence that standardized curricula provide not only clinical decision-making but also enhances confidence in OPOCUS assessments (8–10). Importantly, confidence in obstetric assessments partially mediated the relationship between training modality and decision-making ability, underscoring confidence as a key mechanism through which structured training influences clinical practice.

Overall, we show that HCPs reported higher self-perception on OPOCUS informing decision-making among those who received the 5-day formal training. Providers who underwent formal GUSI training reported decision-making influence scores that were, on average, more than 20 points higher than those who received OJT. These differences were consistent across all assessed decision-making domains: referral decisions, scheduling follow-up reviews, and decisions related to delivery. These findings align with prior evidence indicating that structured ultrasound training programs are more effective than informal learning approaches in supporting clinical reasoning and application of ultrasound findings in real-world care settings (11, 12) and in low-resource settings (13–15). While OJT may facilitate basic exposure and familiarity with OPOCUS, our results suggest that it may be insufficient, on its own, to support the level of decision-making confidence required for consistent and appropriate clinical use (16).

Confidence in performing obstetric ultrasound assessments emerged as a critical factor in this study. Participants who received formal GUSI training reported significantly higher confidence across all assessed obstetric parameters. This finding is consistent with previous studies demonstrating that structured, competency-based ultrasound training improves learner confidence and readiness to integrate ultrasound into bedside care (17, 18). Notably, although overall confidence levels were relatively high across the sample, the substantial gap between GUSI-trained and OJT-trained providers highlights the added value of standardized curricula, supervised hands-on practice, and clear learning objectives.

The mediation analysis provides important insight into how training modality influences clinical decision-making. After adjusting for confidence, the magnitude of the association between GUSI training and decision-making ability was attenuated but remained statistically significant, indicating both direct and indirect effects. This suggests that formal training not only enhances confidence but may also increase decision-making through additional pathways, such as deeper conceptual understanding, pattern recognition, and clearer mental models for interpreting ultrasound findings (19–21). These findings support theoretical frameworks in medical education that position confidence as a necessary, but not sufficient condition for competent clinical performance (22).

Findings suggest mentorship is a predictor of both confidence and self-perception of OPOCUS informing clinical decision-making. Providers who received weekly mentorship demonstrated the largest gains, even after adjusting for training modality and other background characteristics. This reinforces growing evidence that post-training mentorship and supportive supervision are essential components of effective OPOCUS implementation, particularly in resource-constrained settings (11, 23). The findings suggest that mentorship may help consolidate skills acquired during formal training, reinforce correct technique, and provide reassurance in complex or uncertain clinical scenarios (24, 25). Interestingly, even less frequent mentorship was associated with increased scores, highlighting the potential value (26) of scalable mentorship models, including periodic in-person visits supplemented by remote support.

Contrary to expectations, facility level, years of experience, and professional cadre were not significantly associated with clinical decision-making ability. This suggests that when formally trained and supported, midwives and other frontline providers at lower-level facilities can effectively use OPOCUS to inform

clinical decision-making (27). The lack of strong associations with age or experience further supports the feasibility of integrating OPOCUS into primary care through targeted training rather than relying on specific groups of providers.

These findings have important implications for the scale-up of OPOCUS within maternal health programs. First, structured training programs (such as GUSI) yield superior self-perception of OPOCUS informing clinical decision-making outcomes relative to informal, workplace-based learning. Second, mentorship should be considered a core component of all OPOCUS training initiatives, serving to reinforce learning, enhance confidence, and support long-term skill retention. Finally, since confidence mediates the relationship between training and decision-making, incorporating approaches that foster learner self-efficacy, such as simulation-based training, guided feedback, and peer-learning may further optimize training outcomes. While OJT did not greatly influence clinical decision making, it was however, positively related to perceived clinical decision making ability, demonstrating some beneficial effect.

This study has several strengths. It was conducted across a large and diverse sample of facilities in eight counties, enhancing the generalizability of findings across other counties in Kenya with similar population and health characteristics. The study was embedded within a real-world implementation science initiative, reflecting routine service delivery conditions rather than controlled training environments. Additionally, the use of a DAG-informed analytic approach provided some insights to the assessment of confounding and mediation pathways, strengthening the interpretability of the findings.

However, several limitations should be considered. First, the cross-sectional design precludes causal inference, and it is possible that providers who were more motivated or confident were more likely to participate in formal training or mentorship activities. Second, outcomes were based on self-reported perceptions rather than objective measures of competence or observed clinical behavior, which may introduce reporting bias. Third, OJT exposure was heterogeneous and self-selected, making it difficult to assess the intensity or quality of informal training received. Finally, while county-level clustering was accounted for, facility-level clustering could not be included due to small numbers, which may have influenced variance estimates and hence the significance level.

Despite these limitations, the findings have important implications for policy and practice. Scaling up OPOCUS in Kenya should prioritize structured, standardized training models complemented by sustained mentorship, rather than relying primarily on informal on-the-job learning. Hybrid models that combine formal training with ongoing mentorship may offer a pragmatic and effective approach for expanding ultrasound capacity at the primary care level. Future research should incorporate longitudinal designs to assess skill retention, objective competency assessments, and downstream effects on maternal and perinatal outcomes, as well as cost-effectiveness analyses to inform national scale-up strategies.

Conclusion

Structured five-day OPOCUS training significantly increases HCPs' self-perception of OPOCUS informing clinical decisions and confidence in performing OPOCUS assessments compared to informal OJT, with

confidence acting as a key mediator. Mentorship further strengthens these outcomes, highlighting the need for integrated training-mentorship models in scaling POCUS. For policy, this suggests that investments in standardized curricula may be strengthened with mentorship frameworks to ensure long-term impact. For clinical practice, it emphasizes the role of confidence-building in enabling providers to act decisively in obstetric care. Future research should explore longitudinal outcomes, patient-level impacts, and the potential of hybrid or digital learning models to expand access while maintaining quality.

Abbreviations

OJT
On–Job Training
OPOCUS
Obstetric Point–of–Care Ultrasound
HCP
Healthcare Provider
DAG
Direct Acrylic Graph
GUSI
Global Ultrasound Institute

Declarations

Ethics approval and consent to participate

This study received ethical approval from the Kenyatta University Ethical Review Committee (KUERC/PKU/2563/1689) and permission from all involved county research committees. The study was conducted in accordance with the Declaration of Helsinki and relevant local and international ethical regulations for research involving human participants. Informed consent was obtained from all participants. Research assistants ensured clients were appropriately consented and administered the questionnaire only once during the 5-day period. Confidentiality and privacy were ensured by collecting data anonymously and limiting data access strictly to the research team.

Consent for publication

No personal information or images have been included in this manuscript

Availability of data and materials

All data supporting the findings of this study are available within the paper and its Supplementary Information.

Competing interests

None

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Authors' contributions

The Kenyatta University (KU) team designed the study and the data collection tools together with the University of California San Francisco (UCSF) team. GG, AW, JM, LO, SB, SG, GG, GO collected quantitative data and participated in data analysis. GO and JM drafted the manuscript; NS and DW contributed study design, data interpretation and writing the manuscript. RG contributed to data synthesis and analysis. All authors reviewed the manuscript.

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Figures

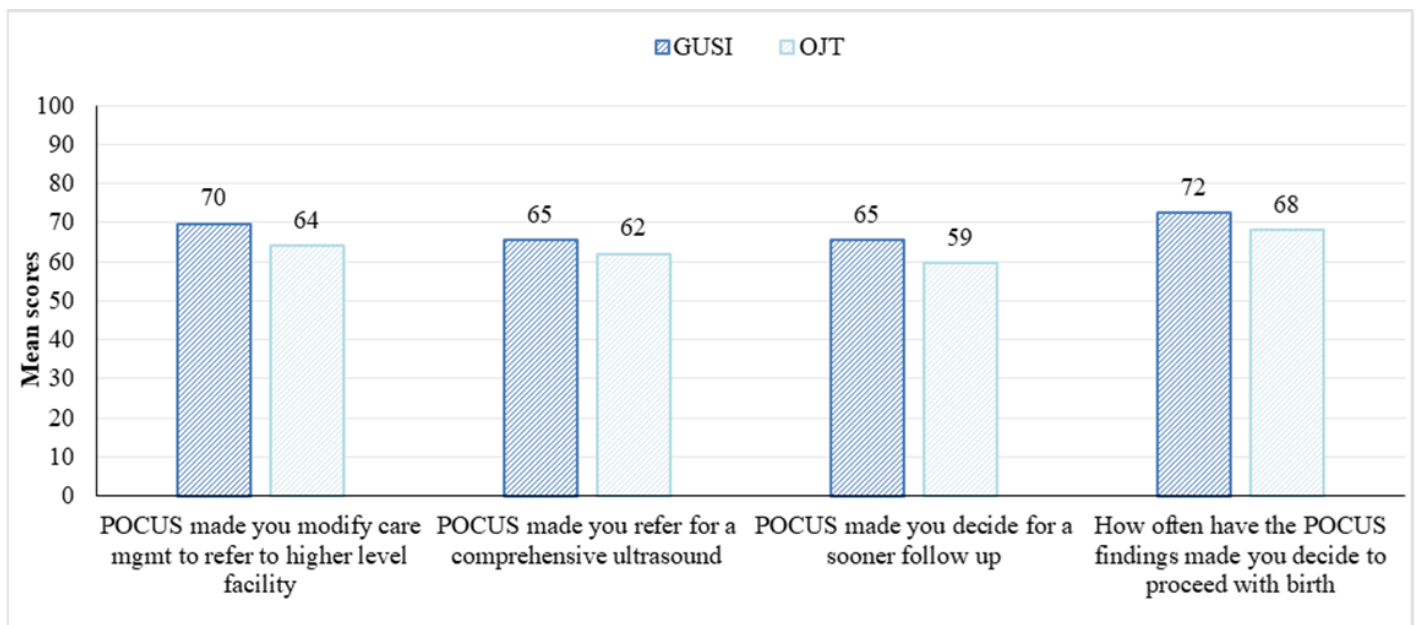


Figure 1

Scores for self-perception of OPOCUS informing clinical decision-making

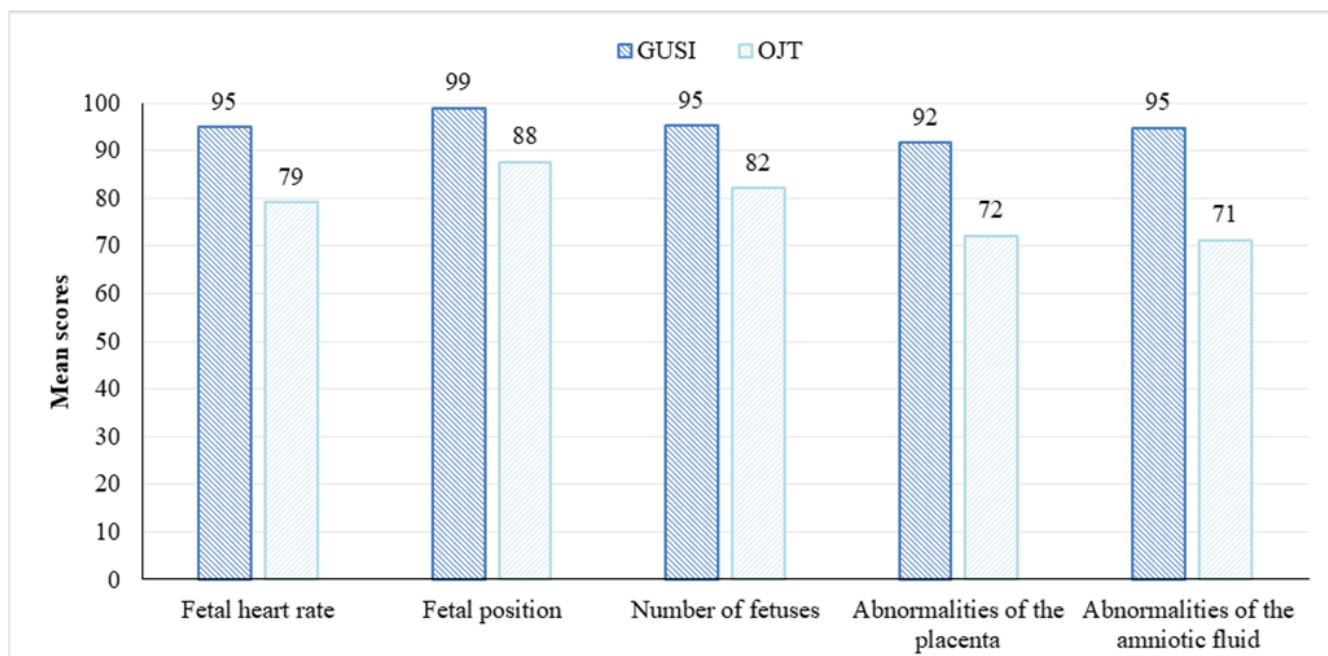


Figure 2a

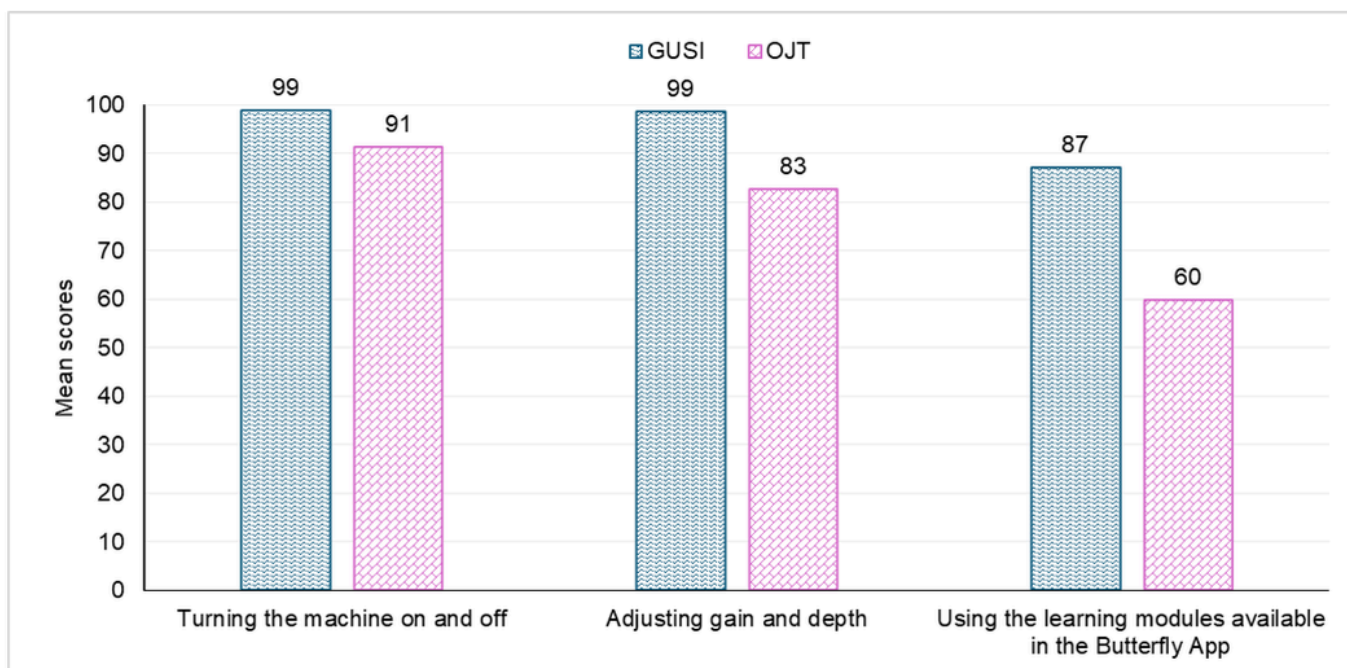


Figure 2b

Figure 2

a: Confidence in obstetric assessments using OPOCUS

GUSI, n=179; OJT, n=165

b: Confidence in the use of OPOCUS technology

Supplementary Files

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