2026, Volume 58, Issue 0, 1-5, e-ISSN 1938-3800

Family Medicine

BRIEF REPORT

Ultrasound-Guided IUD Placement During Family Medicine Residency Training

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HOW TO CITE: Henderson R, Bryce R, Johnson K, et al. Ultrasound-Guided IUD Placement During Family Medicine Residency Training. *Fam Med.* 2026;58(0):1-5.
doi: 10.22454/FamMed.2026.669937

FIRST PUBLISHED: August 20, 2026

KEYWORDS: family practice, intrauterine devices, physicians, family, residency, ultrasonography, interventional

ABSTRACT

Background and Objectives: Intrauterine device (IUD) placement is common in primary care and is a required training objective of family medicine postgraduate programs. Ultrasound guidance is available to assist medical trainees with determining the correct uterine position and proper IUD placement, providing immediate confirmation for both the clinician and the patient. In the present study, we sought to determine whether ultrasound-guided versus nonultrasound-guided IUD placement within a family medicine training environment improves resident confidence, as well as patient pain scores and procedural time.

Methods: We conducted a prospective, randomized controlled trial of IUD placement by ultrasound guidance versus no ultrasound at the family medicine resident training clinic in Saskatoon, Saskatchewan, Canada. We compared resident confidence pre- and postprocedure, patient-reported pain scores at three time points, and total procedure time between the ultrasound-guided and control groups using marginal models. Confidence levels and pain scores were reported using 0- to 10-point box scales.

Results: A total of 49 patients and 30 residents were enrolled. The average increase in resident-reported confidence was greater in the ultrasound-guided group (mean difference = 1.2 points, *P*=.01). Patient pain scores were similar between the ultrasound and control groups at all time points (mean difference=–0.2 points, *P*=.45). Procedural time in the ultrasound-guided group was longer (mean difference = 10.9 minutes, *P*=.03).

Conclusions: Ultrasound-guided IUD placement results in improved family medicine resident-reported confidence without compromising patient comfort.

INTRODUCTION

Point-of-care ultrasound (POCUS) in primary care is being encouraged across many outpatient conditions.[1,2] POCUS has now been introduced into undergraduate and postgraduate medical training programs.[3-9] As such, ultrasound use during family medicine training requires evaluation across multiple presentations.

POCUS has been studied to optimize intrauterine device (IUD) placement. The potential benefits to patients and medical trainees of ultrasound-guided IUD insertion are not known. Postprocedural pain and procedure duration reductions have been reported with ultrasound-guided versus nonultrasound-guided IUD placement among practicing physicians,[10] albeit with limitations.[11] However, the utility of ultrasound-guided IUD insertions during training requires further study.

Our primary objective was to determine whether ultrasound-guided IUD placement increases resident procedural confidence within a family medicine training environment. The secondary objective was to determine whether patient comfort and procedural time differed with ultrasound guidance. We hypothesized that ultrasound-guided IUD insertion would provide visual cues

for placement before, during, and after the procedure that would improve resident confidence, while reducing patient discomfort and procedural time.

METHODS

Patients scheduled for IUD insertion at West Winds Primary Health Centre in Saskatoon, Saskatchewan, Canada from May 2020 through May 2024 who provided consent were randomized to either an ultrasound-guided procedure or routine non-imaged placement. Study inclusion criteria included biological female sex at birth and age 18 to 45 years. Exclusion criteria included contraindications to ibuprofen, moderate to severe fibroids, congenital uterine malformations, postpartum less than 6 weeks, or planned IUD replacement. All family medicine residents training in the 2 year Saskatoon program were invited to participate. Ethics and operational approvals were obtained from the University of Saskatchewan Biomedical Research Ethics Board and the Saskatchewan Health Authority.

Written consent was obtained from patient and resident participants. All patients were instructed to use standardized preprocedure analgesia of 200 mg ibuprofen 1 hour preprocedure. Patients randomized to the control group underwent standardized nonultrasound-guided IUD placement performed by residents with faculty supervision. Standard IUD placement involved a bimanual exam, tenaculum placement, and uterine length measurement via sound, and then IUD insertion to the measured uterine depth. A community ultrasound was performed 1 to 2 months following the procedure to confirm proper placement. Patients randomized to the experimental group underwent standardized ultrasound-guided IUD placement by residents, under the supervision of a single physician with certification in diagnostic ultrasonography (A.R.B.) who conducted and interpreted all ultrasound examinations. In this group, participants underwent transvaginal ultrasound examination immediately prior to the procedure (confirming uterine position on bimanual exam), transabdominal ultrasography during placement (to guide passage of the sound, IUD insertion through the cervix, and IUD placement at the fundal endometrium in real time), and transvaginal ultrasound (using GE Healthcare Voluson E8 ultrasound machine) immediately postprocedure (to confirm correct final placement). Both transabdominal and transvaginal ultrasound examinations were chosen, because transvaginal ultrasonography provides far superior resolution and is the standard of care for female reproductive anatomic assessments.[12,13] Participants in the experimental group had a partially filled bladder to optimize ultrasound imaging.

Resident procedural confidence was self-reported on an 11-point box scale from 0 (no confidence) to 10 (absolute confidence) before and after the procedure.[14] Patient pain scores were recorded on an 11-point box scale (0 = no pain, 10 = worst pain) at three time points: (a) following speculum placement, (b) immediately after IUD insertion, and (c) 5 minutes postprocedure. Procedural duration, and resident and patient characteristics, were documented.

Descriptive statistics compared characteristics of the groups. Due to multiple pain evaluations per patient and multiple procedures (sometimes both techniques) by some residents, marginal linear regression models were used to compare group outcomes (SPSS version 29.0, IBM Corp). We targeted 16 participants per group at 80% power and 95% confidence level, reflecting a two-point difference comparing average pre–post confidence change between groups and an assumed two-point standard deviation within each group.

RESULTS

We enrolled 49 patients and 30 residents; some residents participated more than once. Data from six patients and five resident observations were excluded for inadequate documentation. We included 43 patient datasets and 44 resident observations in our analyses. Placement was successful for all ultrasound-guided insertions. Only one patient randomized to ultrasound-guidance was converted to the standard approach and analyzed as originally assigned. Participant demographics are shown in Table 1.

The average resident confidence score increased by 1.2 points with ultrasound-guided than nonultrasound-guided placement (95% CI 0.3–2.1, P=.01; Table 2), potentially benefiting first-year residents more. Change frequencies are shown in Figure 1. Four of 43 placements (one ultrasound-guided, three standard) required supervisor assistance; among these four residents, only one undertaking standard placement did not report improved confidence.

Mean patient pain scores at each time point are compared between groups (Table 2). We found no difference in pain scores between groups. Model estimates of procedural duration in our teaching clinic suggested that ultrasound guidance was prolonged by 10.9 minutes compared to standard placements (95% CI 1.4–20.4, P=.03). Including resident experience as a possible confounder in the model reduced the duration difference to 9.7 minutes (95% CI −0.13–19.6, P=.053). No effect was seen by inclusion of resident experience in other models to evaluate patient pain or resident confidence. Residents had similar numbers of study experiences between the groups (Table 1).

DISCUSSION

In this prospective, randomized controlled trial, we report that ultrasound-guided IUD placement was associated with greater resident confidence compared to nonultrasound-guided placement. We also found that ultrasound-guided placement required an average of 11 additional minutes, with no substantial impact on patient discomfort. The latter finding is inconsistent with previous research demonstrating reduced pain scores with ultrasound-guided placement;[10] however, these studies were not within an educational context. Procedure time also has been shown previously to be reduced with ultrasound guidance,[10] differing from our study.

TABLE 1. Patient and Resident Participant Characteristics Within Ultrasound-Guided and Nonultrasound-Guided IUD Insertion Groups

Patients[a]	Ultrasound-guided (N = 19)	Standard approach (N = 24)
Age, mean (SD)	32.1 (7.0)	33.1 (10.9)
Gravidity, median (IQR)	1.5 (0, 2)	1 (0, 3)
Parity, median (IQR)	1 (0, 2)	1 (0, 3)
Nulliparity, n (%)	6 (37.5)	7 (43.8)
BMI, median (IQR)	24.9 (23.0, 29.8)	25.2 (22.7, 31.7)
Analgesia prior to procedure, n (%)		
Yes[b]	17 (94.4)	20 (87.0)
No	1 (5.6)	3 (13.0)
Residents	**Ultrasound-guided (N = 21)**	**Standard approach (N = 23)**
Year of program, n (%)		
First	15 (71.4)	12 (52.2)
Second	6 (28.6)	11 (47.8)
Number of previous IUD procedures ever for resident assigned to procedure, median (IQR)	2 (0, 11)	5 (2, 15)
Number of previous study experiences for resident assigned to procedure, n (%)		
First study procedure	12 (57.1)	14 (60.9)
Second	5 (23.8)	5 (21.7)
Third	1 (4.8)	3 (13.0)
Fourth	3 (14.3)	0
Fifth	0	1 (4.3)
Confidence (scale 0 to 10) prior to procedure, mean (SD)	5.0 (1.6)	5.4 (2.0)

[a]Age, gravidity, parity, and BMI were missing for three participants in the ultrasound group and eight patients in the standard group.
[b]Three of these patients took analgesia outside a 55–65 minute preprocedural window: one at 90 minutes, substituting 1g acetaminophen for ibuprofen (ultrasound); one at 30 minutes (ultrasound); and one at 5 minutes (standard). Analgesia status missing for two participants.
Abbreviations: BMI, body mass index; IQR, interquartile range; IUD, intrauterine device; SD, standard deviation

We evaluated whether residents required supervisor assistance during IUD insertion to include challenges that trainees experience in a learning environment. Reassuringly, occurrences were few, with resident confidence typically still increasing even when support was required. Our research suggests that ultrasound-guided placement might reduce the need for learner assistance.

TABLE 2. Outcome Values Within Ultrasound-Guided and Nonultrasound-Guided IUD Insertion Groups

Outcomes	Ultrasound-guided	Standard approach	*P* value[a]
Change in resident confidence level after procedure, mean (SD)[b]	2.2 (1.4)	1.0 (1.6)	.01
Program year			
1	2.7 (1.5)	1.0 (1.4)	
2	1.3 (0.5)	1.0 (1.9)	
Procedural time, minutes, mean (SD)	23.6 (20.2)	13.0 (8.4)	.03
Patient pain scores, mean (SD)			
Preprocedure	0.8 (0.9)	1.0 (1.1)	.45
Midprocedure	3.8 (2.7)	4.6 (1.8)	
Postprocedure	1.9 (1.8)	2.2 (1.7)	

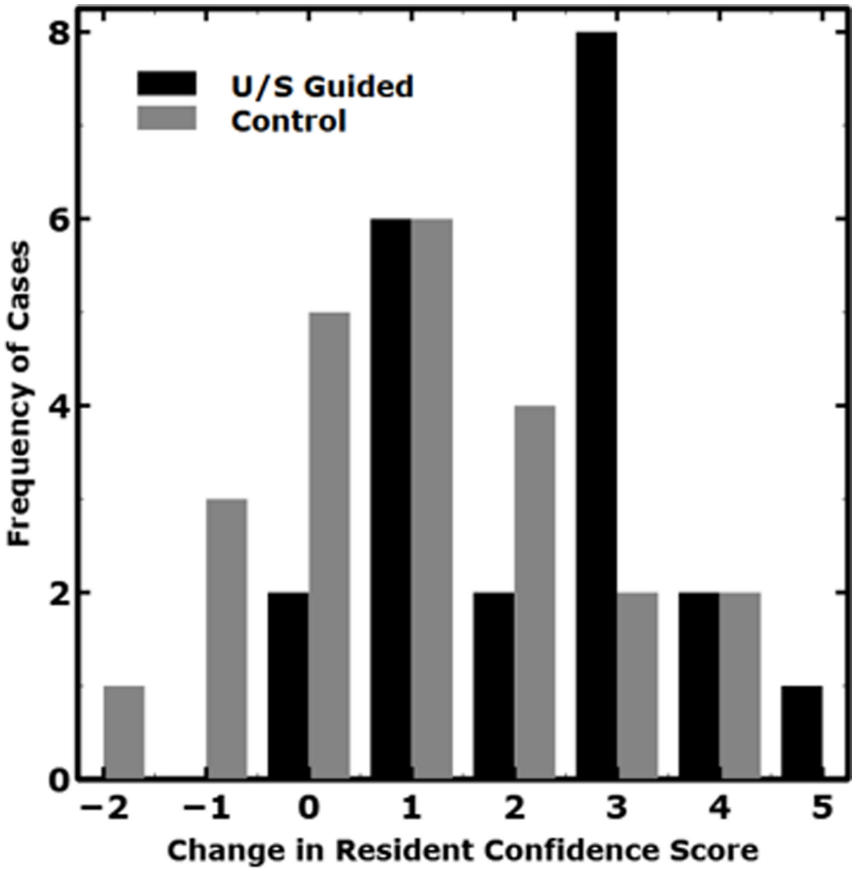
[a]*P* values taken from marginal models for correlated outcomes. Models for confidence change and time included group as the only independent variable; model for pain scores included both group and time point. *P* value for pain scores compares pain preprocedurally between the groups; subsequent nonsignificant testing of interaction between group and time point (not shown) provided no evidence of subsequent group pain differences.
[b]Postprocedure confidence minus preprocedure confidence. Interaction between group and program year nonsignificant (*P*=.12).
Abbreviations: IUD, intrauterine device; SD, standard deviation

Study strengths included a randomized controlled trial design and real-world context that evaluated broad patient and resident samples. Although some residents participated multiple times, only four residents performed three or more study procedures; the consistency of our results as learners practice their skills over time, and across program years, requires additional evaluation. Malposition rates up to 16% have been reported with standard IUD placement.[15] Unfortunately, we could not obtain data to confirm proper placement from community-performed ultrasound exams for control-group participants. We were reassured that none were malpositioned following ultrasound-guided procedures in our study, lower than previously reported.[16] We anticipate that widespread adoption of ultrasound-guided IUD placement in a postgraduate educational setting would provide educational feedback, limit the number of patient visits, and reduce strain on outpatient-ultrasound resources. This approach also may help prevent complications (eg, pain, bleeding, uterine perforation, infection, pregnancy), optimizing patient care. Transvaginal ultrasonography provides greater resolution than transabdominal for visualizing female reproductive anatomy and confirming IUD placement; however, transvaginal imaging is not possible to conduct during IUD insertion because probe placement interferes. Future research could explore the use of transabdominal ultrasonography alone.

CONCLUSIONS

In conclusion, ultrasound-guided IUD placement provides a practical means for family medicine residents to improve

FIGURE 1. **Frequency Distribution of the Change (Postprocedure Minus Preprocedure) in Resident-Reported Confidence in Ultrasound-Guided Versus Nonultrasound-Guided Groups**



confidence in IUD insertion while maintaining patient comfort. Our findings support the adoption of ultrasound-guided IUD insertion in postgraduate family medicine training programs because it provides a visual cue for identifying anatomic landmarks and proper placement. This training has the potential to reduce postprocedural complications and health care burden; however, further research is required to confirm these notions.

PRESENTATIONS

Results from this study were presented locally at the 31st annual scholarship day in the Department of Academic Family Medicine, College of Medicine, University of Saskatchewan, May, 2021.

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