

Publications & Review Articles

Kariman, S.S., van den Heuvel, J.F.M., Adriaanse, B.M.E., Oepkes, D. and Bekker, M.N., (2024) The Potential of Tele-Ultrasound, Handheld and Self-Operated Ultrasound in Pregnancy Care: A Systematic Review. Prenatal Diagnosis. <https://doi.org/10.1002/pd.6679>

This systematic review examined the potential role of tele-ultrasound, handheld, and self-operated ultrasound devices in prenatal care. It assessed how this technology could have enhanced accessibility, accuracy, and convenience for pregnant individuals, especially in remote or underserved areas. The review highlighted Pulsenmore technology as the leading and sole innovation for patient-operated home ultrasound and underscored its feasibility and the high level of patient satisfaction.

Liat Mor, Eran Weiner, Or Marom, Daniel Tairy, Moran Nardi-Arad, Giulia Barda, Liliya Tamayev, Michal Levy. The effect of home ultrasound on maternal anxiety in patients with previous recurrent pregnancy loss: A randomized control trial, American Journal of Obstetrics & Gynecology MFM, Volume 6, Issue 10, 2024, 101447, ISSN 2589-9333, <https://doi.org/10.1016/j.ajogmf.2024.101447>

Interim publications:

- FMF 2023 (The 20th World Congress in Fetal Medicine)
- ACOG 2023 (The American College of Obstetricians & Gynecologists)
- FMF 2022 (The 19th World Congress in Fetal Medicine)

This randomized control trial investigated the impact of home ultrasound use on maternal anxiety among women with a history of recurrent pregnancy loss. Results remonstrated that anxiety score (STAI) was significantly lower in the device group (34.8 ± 12.9 vs. 45.0 ± 15.9 , $p = 0.016$), also found a significant increase in maternal attachment score (MAAS) in the device group (-13.6 ± 15.0 vs. -1.5 ± 11.3 , $p = 0.015$). The study demonstrated that integrating routine home-ultrasound telemedicine visits into the prenatal care of these women reduced maternal anxiety and contributed to greater maternal attachment.

Nir O, Dvir G, Galler E, et al. Integrating technologies to provide comprehensive remote fetal surveillance: A prospective pilot study. Int J Gynecol Obstet. 2024; 164: 662-667.

<https://doi.org/10.1002/ijgo.15018>

Interim publication:

FMF 2022 - the 19th World Congress in Fetal Medicine

The prospective pilot study investigated the integration of remote technologies to facilitate comprehensive fetal surveillance assessment. The study demonstrated the feasibility of a modified Biophysical Profile (mBPP) test for 10 women at term. 9 women (90%) successfully completed the remote mBPP assessment. The telemedicine visit was 63% shorter than the in-person visit. The findings suggested that incorporating these technologies could reduce hospital visits, save time and cost, and provide greater accessibility for expectant mothers.

Atkinson J., Hastie R., Walker S., Lindquist A., Tong S. Telehealth in antenatal care: recent insights and advances. BMC Med 21, 332 (2023). <https://doi.org/10.1186/s12916-023-03042-y>

The review covered recent developments in telehealth applications within antenatal care, highlighting its effectiveness in improving access to healthcare services for pregnant women. It discussed technological advancements, benefits such as reduced travel and increased convenience, and potential barriers to implementation. The study emphasized the importance of integrating telehealth into standard prenatal care to enhance maternal and fetal outcomes, particularly in underserved populations. The review dedicated a significant summary to the innovative Pulsenmore self-operated ultrasound technology, including descriptive illustrations. Overall, it advocated for further research and policy support to optimize telehealth practices in antenatal settings.

Pontones, C.A.; Titzmann, A.; Huebner, H.; Danzberger, N.; Ruebner, M.; Häberle, L.; Eskofier, B.M.; Nissen, M.; Kehl, S.; Faschingbauer, F.; et al. Feasibility and Acceptance of Self-Guided Mobile Ultrasound among Pregnant Women in Routine Prenatal Care. J. Clin. Med. 2023, 12, 4224. <https://doi.org/10.3390/jcm12134224>

The study evaluated the feasibility and acceptance of self-guided mobile ultrasound technology among pregnant women in routine prenatal care. Conducted with 46 expectant mothers, the research assessed user satisfaction, usability, and the technology's impact on patient engagement in their prenatal health. Results indicated a high level of acceptance and positive feedback regarding the self-guided ultrasound experience, suggesting its potential to enhance prenatal monitoring and empower patients in their care.

Mobile Self-Operated Home Ultrasound System for Remote Fetal Assessment During Pregnancy. Eran Hadar, Leor Wolff, Kinneret Tenenbaum-Gavish, Michal Eisner, Anat Shmueli, Shiri Barbash-Hazan, Riki Bergel, Elyasaf Shmuel, Ohad Houry, Sarah Dollinger, Noa A. Brzezinski-Sinai, Shay Sukenik, Anat Pardo, Inbal Navon, Yulia Wilk, Hadas Zafrir-Danieli, and Arnon Wiznitzer. Telemedicine and e-Health 2022 28:1, 93-101 <https://www.liebertpub.com/doi/10.1089/tmj.2020.0541>

The study investigated the feasibility of using a portable, self-operated ultrasound device, known as the INSTINCT (the former name of the Pulsenmore device). This observational study involved 100 pregnant women who used the device for up to 14 days. During the study, participants completed 1,360 self-scans, performing an average of 13.6 ± 6.2 scans each. The results showed high detection success rates for fetal heart activity (95.3%), amniotic fluid volume (92.2%), and fetal movement (88.3%). No device-related serious adverse events were found. The study demonstrated positive user feedback and high satisfaction, indicating that the Pulsenmore system is a promising tool for enhancing remote fetal monitoring in prenatal care.

POSTERS, ABSTRACTS AND PRESENTATIONS

Pardo A., Barbash-Hazan S., Nachum S., Shmueli A., Rak O., Klochender Frishman E, Zafrir Danieli H., Shtrichamn R., Azulay S., Hadar E. Quantitative Assessment of Fetal Heart Rate and Amniotic Fluid Volume in Self-Operated Home Ultrasound. Presented at the SMFM 2024 (The Society of Maternal-Fetal Medicine) [link to abstract](#)

The study validated the measurements of fetal heart rate (FHR) and Maximal Vertical Pocket (MVP) when using the self-operated Pulsenmore ultrasound technology for fetal well-being assessment. Findings suggested that self-operated ultrasound could provide high-quality and accurate evaluation of Amniotic Fluid Volume (AFV) and FHR, non-inferior to standard assessments. This research supported the utilization of innovative home ultrasound in improving prenatal care.

Njonou Noujjeep S., Henrich W. Mobile-based self-operated ultrasound for fetal assessment in patients at or past the estimated date of delivery. Presented at the ISOUG 2024 34th World Congress on Ultrasound in Obstetrics and Gynecology, 15–1, <https://doi.org/10.1002/uog.28018>

The study evaluated the feasibility of the Pulsenmore self-operated device for 50 women near term. 92% of the patients' scans were adequate. Women felt safe using the ultrasound device and indicated that they would use such a device during pregnancy. For 81.6%, home ultrasound utilization would lead to a reduction in doctor's consultations. Overall satisfaction with the device was high. The study concluded that the Pulsenmore ultrasound system is a viable solution for remote fetal assessment and could potentially lead to cost and time alleviation.

Axelrod M., Lahav Ezra H., Galler E., Nir O., Ofir K., Sivan E., Mazaki Tovi S. & Tsur A. Putting the "F" Back in Maternal-Fetal Telemedicine - A Prospective Pilot Study. Presented at the SMFM 2023 (The Society of Maternal-Fetal Medicine) [https://www.ajog.org/article/S0002-9378\(22\)01811-7](https://www.ajog.org/article/S0002-9378(22)01811-7)

The study investigated a novel approach in maternal-fetal telemedicine by alternating remote and in-clinic visits. 20 women with gestational diabetes at or beyond 32 weeks of gestation participated in a 4-week prospective study. Initial findings suggested that hybrid maternal-fetal care was feasible, saved time, improved patient satisfaction, and enhanced maternal compliance with glycemic control. This advancement highlighted a shift toward more inclusive, fetal-centered telemedicine solutions in maternal healthcare.

Hadar E., Pardo A., Barbash-Hazan S., Suarez-Easton S., Tenenbaum-Gavish K, Shmuel E., Bergel R., Tzadikévitch-Gefen K., Wiznitzer & A., Meizner, I. Self-Operated Home Ultrasound and Remote Experts Review - Real-life Data Results. Presented at the ISOUG 2022 (The International Society of Ultrasound in Obstetrics and Gynecology) <https://doi.org/10.1002/uog.25018>

Interim publications:

- ECPM 2022 (The XXVIII European Congress of Perinatal Medicine)
- FMF 2022 (The 19th World Congress in Fetal Medicine)

The study examined the real-world application of self-operated home ultrasound devices coupled with remote expert review. The real-world analysis demonstrated the effectiveness and reliability of the service, which provided comprehensive prenatal monitoring outside of clinical settings. The results indicated that this approach enables continuous and convenient fetal assessments, with experts remotely reviewing the data, thereby potentially transforming prenatal care accessibility and quality.

Altmark-Sofer M. The role of tele-ultrasound in crisis and war: A case for remote fetal assessment in resource-constrained regions . Presented at the WHII 2022 (The 2nd World Congress on Women's Health: Innovations & Inventions) [link to abstract](#)

The study discussed the use of tele-ultrasound for fetal assessment in regions affected by crisis and conflict. It highlighted how remote ultrasound technology could provide crucial prenatal care in resource-limited settings, where conventional healthcare access might be disrupted. By enabling remote fetal monitoring and expert guidance, tele-ultrasound offered a viable solution to maintain maternal-fetal health in challenging environments. This approach advocated for broader adoption of telemedicine to support vulnerable populations in times of crisis.

Ben Shitrit I., Kedmi A., El Haj K., Kosto A., Karni O., Poleg T., Bineth N., Gat T., Shnaider A., Fuchs L. Self-Scanning Of Lung Congestion By Dialysis Patients Using Novel Mobile-Phone Ultrasound - A Feasibility Pilot Study. Presented at the AIUM 2024 (The American Institute of Ultrasound in Medicine) J. Clin. Med. 2023, 12(11), 3829; [link to abstract](#)

The study examined the feasibility of dialysis patients using a mobile ultrasound device for self-scanning lung congestion. This pilot study assessed the feasibility and practicality of patients independently monitoring their lung health, which could aid in early detection and management of fluid overload—a common complication in dialysis. Findings indicated promising potential for mobile ultrasound to empower patients in managing cardiac heart failure disease from home.

Shufaro Y., Cohen M., Wertheimer A., Altman E., Sobol T., Shtrichman R., Levy R., Sapir O., Ben-Haroush A. Can patient self-scans using a home vaginal ultrasound device be used to monitor the ovarian stimulation in ART? Presented at the ESHRE 2024 (The European Society of Human Reproduction and Embryology). <https://doi.org/10.1093/humrep/deae108.1068>

Interim publication:

WCPM 2023 (The XVI World Congress of Prenatal Medicine)

The study explored whether patients undergoing assisted reproductive technology (ART) could reliably monitor ovarian stimulation using a self-operated home transvaginal ultrasound device. This research evaluated the device's accuracy and feasibility for patients to perform self-scans, potentially allowing for convenient, at-home tracking during ART cycles. The findings had significant implications for patient autonomy and accessibility in reproductive health monitoring.