

Telemedicine for medical abortion: a systematic review

M Endler,^{a,b} A Lavelanet,^c A Cleeve,^a B Ganatra,^c R Gomperts,^d K Gemzell-Danielsson^a

^a Department of Women's and Children's Health, Division of Obstetrics and Gynecology, Karolinska Institutet, Stockholm, Sweden

^b Department of Public Health, Women's Health Research Unit, University of Cape Town, Cape Town, South Africa ^c Department of Reproductive Health and Research, UNDP-UNFPA-UNICEF-WHO-World Bank Special Programme of Research, Development and Research Training in Human Reproduction, World Health Organization, Geneva, Switzerland ^d Women on Web, Amsterdam, the Netherlands

*Correspondence: M Endler, Department of Women's and Children's Health, Division of Obstetrics and Gynecology, Karolinska Institutet, Tomtebodavägen 18b 171 77 Stockholm, Stockholm, Sweden. Email: margit.endler@ki.se

Accepted 4 March 2019. Published Online 17 April 2019.

Background Telemedicine is increasingly being used to access abortion services.

Objective To assess the success rate, safety, and acceptability for women and providers of medical abortion using telemedicine.

Search strategy We searched PubMed, EMBASE, ClinicalTrials.gov, and Web of Science up until 10 November 2017.

Study criteria We selected studies where telemedicine was used for comprehensive medical abortion services, i.e. assessment/counselling, treatment, and follow up, reporting on success rate (continuing pregnancy, complete abortion, and surgical evacuation), safety (rate of blood transfusion and hospitalisation) or acceptability (satisfaction, dissatisfaction, and recommendation of the service).

Data collection and analysis Quantitative outcomes were summarised as a range of median rates. Qualitative data were summarised in a narrative synthesis.

Main results Rates relevant to success rate, safety, and acceptability outcomes for women $\leq 10^{+0}$ weeks' gestation (GW) ranged from 0 to 1.9% for continuing pregnancy, 93.8 to 96.4%

for complete abortion, 0.9 to 19.3% for surgical evacuation, 0 to 0.7% for blood transfusion, 0.07 to 2.8% for hospitalisation, 64 to 100% for satisfaction, 0.2 to 2.3% for dissatisfaction, and 90 to 98% for recommendation of the service. Rates in studies also including women $>10^{+0}$ GW ranged from 1.3 to 2.3% for continuing pregnancy, 8.5 to 20.9% for surgical evacuation, and 90 to 100% for satisfaction. Qualitative studies on acceptability showed no negative impacts for women or providers.

Conclusion Based on a synthesis of mainly self-reported data, medical abortion through telemedicine seems to be highly acceptable to women and providers, success rate and safety outcomes are similar to those reported in literature for in-person abortion care, and surgical evacuation rates are higher.

Keywords Medical abortion, telemedicine.

Tweetable abstract A systematic review of medical abortion through telemedicine shows outcome rates similar to in-person care.

Linked article This article is commented on by D Grossman, p. 1103 in this issue. To view this mini commentary visit <https://doi.org/10.1111/1471-0528.15802>.

Please cite this paper as: Endler M, Lavelanet A, Cleeve A, Ganatra B, Gomperts R, Gemzell-Danielsson K. Telemedicine for medical abortion: a systematic review. BJOG 2019;126:1094–1102.

Introduction

The barriers to access safe abortion present a serious health risk for women globally.^{1–4} Between 2010 and 2014, 25.1 million abortions, corresponding to 45.1%, were unsafe, provided by unskilled practitioners or using outdated or harmful methods.⁵ Whereas mortality after safe abortion is negligible and serious adverse events rare,^{6,7} unsafe abortion is estimated to cause 23 000 deaths globally each year.⁸

According to WHO recommendations, many components of abortion care in the first trimester can be provided on an outpatient basis and by mid-level providers, and

women can self-administer the abortion medication and self-assess the abortion completeness at home.⁹ Investigating the accuracy of self-assessment of gestational age (GA) and eligibility for medical abortion, as well as the feasibility of task-shifting to health workers outside of healthcare facilities are, however, areas requiring further research.^{9–13}

Telemedicine (TM) is the remote assessment and treatment of patients by means of telecommunications technology, and is an expanding health sector that has the potential to increase access to safe abortion. In the context of abortion care, TM services may be used for counselling and assessment, the acquisition of abortion medication,

and clinical guidance through the abortion process.¹⁴ These services sometimes form part of local healthcare facilities, and are performed alongside care offered in-person, and sometimes operate independently of these to overcome geographical or legal barriers to abortion access.^{15,16}

The purpose of this review is to assess the evidence for the success rate, safety, and acceptability for women and providers of comprehensive medical abortion through TM, i.e. pre-abortion assessment, medication, and post-abortion follow up.

Methods

Search strategy

The GRADE approach was used to define the intervention of interest and outcomes relevant to the study question. We performed a systematic review of published records in PubMed, EMBASE, ClinicalTrials.gov, and Web of Science up until 10 November 2017, using a search-construct adapted for each database (Supporting Information Appendix S1). No other limitations were made in regard to language, setting, time period or study design. Identified citations were uploaded into an EndNote database (EndNote X6) and duplicates removed. All researchers developed the search criteria. One researcher (M.E.) screened citations by title or abstract and performed a full-text analysis on abstracts seeming to fulfil inclusion criteria. If there was uncertainty regarding inclusion, the article was reviewed by four researchers (A.L., A.C., B.G., K.G.D.) and a consensus decision made. A PRISMA flowchart of study selection is shown in Supporting Information Figure S1.

Study selection

We defined medical abortion through TM as the provision of all of the following services: pre-abortion assessment and counselling, abortion medication, instructions for medication and follow up, through any form of verbal or written exchange of information occurring between the woman and the person who takes medical responsibility for the assessment or content of the information given. We discuss TM abortion with reference to medical abortion performed in-person, performed in or partly in-clinic without making use of TM.

We included articles or abstracts that reported on outcomes relating to success rate, safety or acceptability for women and/or providers, of medical abortion through TM at any GA, using any national or internationally recommended regimen for medical abortion.⁷ We excluded studies that investigated the use of TM for a limited component of abortion care such as pre-abortion counselling or post-abortion follow up, or the use of unidirectional information during the abortion process, as the effectiveness of these interventions has been shown.^{17–23}

Our primary outcomes were success rate and safety for women, and acceptability for women or providers. We thereby adhered to the core outcome sets for medical abortion that are being formulated.²⁴ We defined success rate as any measure of complete abortion, safety as any measure of abortion-related complications severely affecting the physical health of the woman, and quantitative acceptability for women or providers as any categorical measure of the emotional experience of performing or providing medical abortion through TM. We defined qualitative acceptability for women or providers as any description of experiences or emotions related to the acceptability of the abortion. Our secondary outcomes were clinical symptoms or outcomes affecting the physical experience of the abortion but not affecting safety, such as unscheduled clinical visits, outpatient medical treatment or symptoms of heavy bleeding or pain.

There was no patient or public involvement (PPI) in the study.

Statistical analysis and adjustments of data

We screened selected articles and extracted data on outcomes compatible to our pre-defined primary and secondary outcomes. We separately studied outcomes for women $\leq 10^{+0}$ weeks' gestation (GW), the current recommended limit for home abortion according to the FDA, and outcomes for women up to and above 12 GW.²⁵ We categorised GA at abortion according to the best available estimate at intake of abortion medication. In studies where only GA at consultation was recorded, and the time required for delivery of the abortion medication was estimated at 1 week, GA at abortion was assumed to be GA at consultation plus 7 days. We defined women who were reported as having received abortion medication but not confirmed intake, or not responded to follow up, as lost to follow up (LTFU). We used the GRADE approach to assess the quality of evidence for each quantitative outcome and assessed the methodology, relevance, coherence, and data adequacy in qualitative studies in relation to TM for medical abortion.^{26,27}

Synthesised quantitative data were summarised as a range of median rates. Statistical analysis was done using IBM SPSS Statistics, Version 25.0 (IBM Corp., Armonk, New York, NY). Qualitative data were summarised in a narrative summary.

Results

Selected studies and outcomes

We identified 1426 studies in the search. Two studies which were at the time unpublished were accessed through direct communication with the authors and included. We excluded 1413 studies because they did not meet inclusion criteria. Thirteen studies in total were selected for

inclusion. Two of these presented outcomes from two separate study groups, resulting in a total of 15 study groups.

Among 13 studies, there were three retrospective cohort-, one prospective cohort-, seven descriptive, and two qualitative studies. Data came from self-reported online emails or questionnaires, patient records or direct communication with hospitals. The sample size ranged from 19 to 17 956 in studies reporting quantitative data and from 8 to 40 in studies presenting qualitative data. Ten studies reported on outcomes after abortion through TM up to 10⁺⁰ GW, and three also included women at higher gestational ages.

In selected studies, we extracted data for three outcomes measuring success rate: rate of continuing pregnancy, self-assessed complete abortion, and surgical evacuation post-abortion; two outcomes measuring safety: rate of hospitalisation and blood transfusion; and three measures of acceptability: rate of satisfaction, dissatisfaction, and willingness to recommend the TM service.

An overview of study setting, design, and outcomes is presented in Supporting Information Table S1.

Study characteristics

Selected studies represented data from four TM abortion services. For all services, misoprostol is self-administered at home.

Seven studies with a total of 11 024 study participants were based on data from Women on Web (WoW), Amsterdam, which has offered abortion through TM since 2004, mostly to women in settings where access to abortion is legally restricted.^{28–34} Pre-abortion assessment and post-abortion follow up take place via on-line questionnaires or per email, and a 24-hour help-desk is available. Abortion medication is sent by post. WoW operates outside of the formal healthcare system and provides no auxiliary clinical exams.

Four studies with a total of 19 170 participants and eight providers were based on data from Planned Parenthood clinics in Iowa and Alaska, which have had a TM abortion option integrated into clinical facilities since 2008. Pre- and post-abortion ultrasound are done in-clinic by a medical technician, but ultrasound assessment, informed consent, and witnessed intake of mifepristone 200 mg (in accordance with Iowa State legal requirements)³⁵ is performed off-site by a physician through an encrypted digital video-conference system.^{36,39–41} One study with 19 participants was based on data from Willow's Women's Clinic in Vancouver, which has had a TM abortion care option for women in British Columbia since 2012.³⁸ Pre-abortion assessment is performed by Skype Videoconference. Ultrasound GA dating is done by a physician if s-HCG, taken at a local lab, is >5000. Abortion medication is picked up at a local pharmacy. Follow-up videoconference and s-HCG take place 1 week post-abortion.

One study with 1010 participants was based on data from the Tabbot Foundation in Sydney, which has provided medical abortion through TM to women in Australia since 2015.³⁷ Women are screened by telephone for eligibility and referred for ultrasound, haemoglobin, blood-typing and s-HCG at a local facility. Pre-abortion assessment after these exams takes place on the telephone with a physician. Abortion medication is sent by post through a central pharmacy. Telephone contact with a nurse occurs on the day of intake of the medication. The s-HCG is taken 7 days after abortion at a local laboratory. Follow-up assessment is done over the telephone by a staff member. A summary of TM interventions for medical abortion for each service is presented in Supporting Information Table S2.

Synthesis of results

Nine studies reported on one or more aspects of success rate of medical abortion using TM ≤10⁺⁰ GW.^{29–34,36–38} Rates of continuing pregnancy ranged from 0 to 1.9%.^{29,31–33,36,37} Rates of self-assessed complete abortion ranged from 93.8 to 96.4%.^{29,33,37} Rates of surgical evacuation post-abortion ranged from 0.9 to 19.3%.^{29–34,36–38} In one study investigating rates of and reasons for surgical evacuation, 15.6% of patients had an evacuation because of excessive bleeding or signs of infection, which represented 3.3% of the total study group.³¹ Three studies which included women also >10⁺⁰ GW, reported on measures of success rate.^{31,33,34} Rates of continuing pregnancy ranged from 1.4 to 2.3%.^{31,33} In one of these studies, the rate of continuing pregnancy specifically among women ≥13⁺⁰ GW was 6.9%.³¹ The rate of complete abortion in one study was 93.2% overall and 87.2% for women ≥12⁺⁰ GW.³³ Rates of surgical evacuation ranged from 8.5 to 20.9%.^{31,33,34} One study reported a 23.1% rate of surgical evacuation among women ≥12⁺⁰ GW³³, and another study found rates of 44.8% among women ≥13 GW.³¹

Four studies reported on one more outcome related to safety of medical abortion through TM ≤10⁺⁰ GW.^{29,30,37,39} Rates of blood transfusion ranged from 0 to 0.7%.^{29,30,37,39} Rates of hospital admission ranged from 0.07 to 2.8%.^{37,39} One of these studies compared safety-related outcomes between women choosing abortion through TM and in-person abortion care.³⁹ The incidence of hospitalisation in this study was 0.07% in the TM group and 0.12% in the in-person care group ($P = 0.22$). The rate of blood transfusion was 0.07% in both groups. ($P = 0.98$). There were no reports of maternal death in any study. A summary of outcomes relating to safety and success rate is shown in Table 1.

Eight studies reported on one or more quantitative measures of acceptability for patients using TM abortion services at ≤10⁺⁰ GW.^{28,30–34,36,37} Acceptability in these studies referred to an assessment of the abortion service as a whole. Satisfaction rates ranged from 64 to 100%.^{36,37}

Dissatisfaction rates ranged from 0.2 to 2.3%.^{28,30,32} The percentage of women willing to recommend the TM abortion service ranged from 90 to 98%.^{28,36} One of these studies compared acceptability-related outcomes between women choosing abortion through TM and in-person abortion care.³⁶ There was no statistical difference between groups either in the rate of high satisfaction or in the rate of low satisfaction. Three studies which included women >0⁺ GW reported on quantitative measures of acceptability. The satisfaction rate ranged from 90 to 100%.^{31,33,34} A summary of these results is found in Table 2.

One study qualitatively compared acceptability between women who chose abortion through TM ($n = 20$) and those who received care in-person ($n = 5$) at Planned Parenthood clinics in Iowa.⁴⁰ For both TM and in-person participants, limiting travel time to the abortion clinic and

waiting time for the abortion treatment was the most important factor in their choice of method. Most TM patients felt indifferent to the remote aspect of abortion counselling, some preferred it, one would have preferred face-to-face. All said they would recommend medical abortion through TM to a friend.

Two studies qualitatively investigated acceptability among providers of medical abortion through TM at Planned Parenthood clinics in Iowa ($n = 15$) and Alaska ($n = 8$).^{40,41} Positive consequences of TM abortion services that emerged in interviews with providers were: greater flexibility, greater access to physicians, increased efficiency of resources, fewer cancellations and delays, being able to ensure access to medical abortion due to earlier access to services and shorter GA at abortion, and reduced travel times for patients. Minimal impact on clinic flow and

Table 1. Rates of safety and effectiveness outcomes among studies and study groups selected for a systematic review of abortion through telemedicine

Study	GA Weeks	Sample size n	Safety		Effectiveness			Secondary outcomes
			Blood transfusion n (%)	Hospital admission n (%)	Continuing pregnancy n (%)	Surgical intervention n (%)	Complete abortion n (%)	Antibiotic use n (%)
Gomperts et al. ³²	≤10	249	–	–	4 (1.6)	34 (13.6)	–	2 (0.8)
	≤10	118	–	–	0 (0)	8 (6.8)	–	3 (2.5)
Gomperts et al. ³⁰	≤10	2323	0 (0)	–	–	289 (12.4)	–	–
Gomperts et al. ³¹	All	307	–	–	7 (2.3)	64 (20.9)	–	–
	≤9	207	–	–	4 (1.9)	40 (19.3)	–	–
	10–12	71	–	–	1 (1.4)	11 (15.5)	–	–
	≥13	29	–	–	2 (6.9)	13 (44.8)	–	–
Larrea & Palencia ³³	All	872	–	–	1.4	95 (10.9)	813 (93.2)	(9.3)
	≤9	650	–	–	–	68 (7.8)	40 (95.4)	–
	10–11	132	–	–	–	23 (10.6)	10 (92.4)	–
	≥12	39	–	–	–	9 (23.1)	5 (87.2)	–
Aiken et al. ²⁸	≤10	1000	7 (0.7)	–	8 (0.8)	45 (4.5)	947 (94.7)	26 (2.6)
Les et al. ³⁴	All	59	–	–	–	5 (8.5)	–	–
Grossman et al. ³⁶	≤9	TM ($n = 223$)	–	–	2 (0.9)	2 (0.9)	–	–
		Ref ($n = 226$)	–	–	2 (1.0)	7 (3.1)	–	–
	≤9	TM ($n = 1172$)	–	–	nns (0.9)	–	–	–
		Ref ($n = 2384$)	–	–	nns (1.0)	–	–	–
Grossman et al. ³⁹	≤9	TM ($n = 8765$)	6 (0.07)	6 (0.07)	–	–	–	–
		Ref ($n = 10405$)	7 (0.07)	13 (0.12)	–	–	–	–
Wiebe et al. ³⁸	≤10	18	–	–	–	1 (5.6)	–	–
Hyland et al. ³⁷	≤10	754	1 (0.1)	21 (2.8)	1 (0.1)	26 (3.4)	727 (96.4)	–
Incidence	<10 GW*		0–0.7	0.07–2.8	0–1.9	0.9–19.3	93.8–96.4	0.8–2.6
Range	All GW**				1.4–2.3	8.5–20.9	93.2	9.3

–, no data on this variable; CI, confidence interval; GA, gestational age; GW, weeks' gestation; nns, number not specified; Ref, reference, i.e. in-person abortion care; TM, telemedicine.

Unless specified numbers represent data on outcomes after abortion through telemedicine.

*Based on studies including women up to an estimated 10 GW at abortion treatment.

**Based on studies including women up to any gestational age.

Table 2. Rate of measures of acceptability of the experience of abortion through telemedicine among eight studies reporting on these outcomes included in the systematic review

	GW	Categorical measures of the acceptability of medical abortion through telemedicine			
		Satisfied ^a n (%)	Dissatisfied ^b n (%)	Would recommend ^c n (%)	
Gomperts et al. ³²	194	≤10	–	2 (1.0%)	–
Gomperts et al. ³⁰	1894	≤10	1214 (64) ^d	43 (2.3)	–
Gomperts et al. ³¹	307	All	307 (100)	–	–
Larrea and Palencia ³³	872	All	nns (98)	–	–
Aiken et al. ²⁸	1023	≤10	–	nns (0.2);	nns (98.2%)
Grossman et al. ³⁶	TM:214 Ref: 217	≤9	TM: 201 (94) Ref: 191 (88)	TM: 1 (0.5) Ref: 1 (0.5)	TM: 192 (90%) Ref: (180 (83%))
Les et al. ³⁴	49	All	49 (100)	–	48 (98%)
Hyland et al. ³⁷	754	≤10	781 (97.4)	–	–
Incidence Range (%)		≤10 ^e	64.0–100%	0.2–2.3	90.0–98.0
TM patients		All ^f	98.0–100%	–	–

–, no data on this variable; CI, confidence interval; GW, weeks' gestation; GW, gestational weeks; nns, number not specified; n, number; PP, Planned Parenthood; Ref, Reference, i.e. in-person abortion care, TM, telemedicine.

^aChoosing the terms 'acceptable', 'satisfied', 'highly satisfied' or 'very satisfied' to rate the abortion experience.

^bChoosing the terms 'dissatisfied', 'very dissatisfied', 'not acceptable', 'extremely stressful' or 'unacceptably stressful' to rate the abortion experience.

^cAnswer yes to question of whether she would recommend the abortion service to a friend.

^dOther response options: 'acceptable stress' (22.5%), 'no specific feelings' (3.1%), 'do not want to share my feelings' (8.0%).

^eBased on studies including women up to an estimated 10 GW at abortion treatment.

^fBased on studies including women up to any gestational age (GA). Maximum GA categories: Gomperts et al.³¹ ≥13 GW (*n* = 29); Larrea & Palencia³³ ≥12 GW (*n* = 39); Les et al.³⁴ confirmation from author that some women will have been ≥12 GW (number unknown).

minimal impact on the provider–patient interaction was reported. No negative aspects emerged. A summary of these findings is found in Table 3.

Antibiotic use after medical abortion through TM was the most common secondary outcome reported. Two studies, which included women ≤10⁺⁰ GW, reported use between 0.8 and 2.6%; one study which also included women >10⁺⁰ GW, reported antibiotic use at 9.3% (Table 1).^{29,32,33} Other reported secondary outcomes were rate of clinical visits for complications after abortion (range 14.6–24.9%),^{32,33} rate of heavy bleeding (range 3.4–5.2%),^{29,34} and emergency visits with treatment (0.15% among TM patients and 0.21% for in-person patients, *P* = 0.31).³⁹

Quality of the evidence

We rated the quality of evidence for all selected outcomes as low, on the premise that all studies were observational and most lacked a comparison group for the effect measured. Based on the high LTFU among quantitative studies (5–57%), overall, the risk of selection bias was assessed as high. Three studies presented a sensitivity analysis of the

women who were LTFU. Two found no significant differences between the study sample and the LTFU group^{28,29} and one found that women ≤7 GW and >12⁺⁰ GW were overrepresented in the LTFU group.³³ One study lowered LTFU to 23% in a study group by adding telephone follow up, compared with 45% in a demographically similar study group without such follow up, and found that rates of continuing pregnancy and surgical evacuation in the telephone group were lower.³² Sample sizes ranged from 19 to 19 170.

Discussion

Main findings

Based on a synthesis of limited and mainly self-reported data, this review found that rates of complete abortion, continuing pregnancy, hospitalization, and blood transfusion after abortion through TM ≤10⁺⁰ GW were at similar levels to those reported after in-person abortion care in the published literature.^{6,42,43} Surgical evacuation rates were higher than expected. Acceptability for women and providers was high.

Table 3. Summary of two qualitative studies investigating the experience of providing or receiving counselling for medical abortion by telemedicine

Study	Sample size	GA and source	Qualitative studies based on inductive coding using grounded-theory
			Summary of women and provider perspectives on telemedicine and standard care abortion counselling
Grindlay et al. ⁴⁰	TM: 20 Ref: 5 Provi-der:15	PP Iowa ≤ 9 GW*	<i>Women:</i> For both TM and reference patients proximity/lower waiting time took precedence in choice of counselling. TM patients: indifferent to TM aspect of counselling, some preferred it, one would have preferred in-person counselling. All would recommend their chosen method to a friend. <i>Providers:</i> Greater access to physicians, efficiency of resources, fewer cancellations/delays. Ability to ensure access to MA because of greater flexibility and earlier access
Grindlay et al. ⁴¹	8	PP Alaska ≤ 9 GW	<i>Providers:</i> Increased availability, flexibility, fewer clinicians needed, ability to see patients in multiple clinics each day, physicians scheduled as needed. Shorter gestational age at abortion resulting in higher proportion of MA. Reduction in travel times. Minimal impact clinic flow. Minimal impact provider–patient interaction

GA, gestational age; GW, weeks' gestation; PP, Planned Parenthood.

*Weeks' gestation at abortion treatment.

Strengths and limitations

The heterogeneity of setting, service provision, and even abortion medication regimen in this review is high, which means that the evidence must be interpreted with caution. There were no randomised clinical trials, and most of the data came from descriptive studies and were based on self-reported outcomes. Two observational studies assessed the safety and success rate of TM in direct comparison with in-person care which adds to the reliability of these results.^{36,39} Seven of nine of the remaining studies represented study populations for whom abortion is legally restricted, meaning that no comparison group would have been accessible. However, the lack of a comparison group limits what can be said about the relative risks and acceptability of abortion through TM. All study groups represented high- to middle-income settings. Findings can therefore reliably be generalised only to similar socio-economic contexts. In studies reporting on success rate or safety outcomes, LTFU ranged from five to 57%, and only three articles presented a sensitivity analysis based on background characteristics in the LTFU group. The high loss to follow up means that the risk of selection bias is theoretically high. It is plausible, however, that women LTFU in these studies represent women with a lower rate of complications. However, LTFU in studies largely relying on self-reported outcomes and representing patient populations outside the formal health care sector, will inevitably be high, and controlled trials in these contexts difficult to achieve. Policy recommendations in this area may therefore have to allow for incomplete data and rely on the best

available evidence in order not to delay access to this alternative abortion care option.

Interpretation

The mean rate of complete abortion after in-person medical abortion is estimated at 96.7% at ≤ 9 GW and 93.1% at $\leq 10^{+0}$ GW, which is similar to the range found in our review (93.8–96.4%).⁶ The mean rate of continuing pregnancy is estimated at 0.8% at ≤ 9 GW and 2.9% at $\leq 10^{+0}$ GW, which compares to mean rates between 0 and 1.9% found in our review. This suggests that abortion through TM is comparable to in-person abortion care with respect to the clinically most relevant measures of abortion completeness. The mean rate of surgical evacuation after in-person abortion care at $\leq 10^{+0}$ GW is estimated at below 5% (1.8–4.2%),⁶ whereas surgical evacuation rates in our review ranged from 0.9 to 19.3%. One study from WoW showed that surgical evacuation rates vary depending on the women's country of residence, and another that a minority of women report that evacuation was performed for excessive bleeding or infection.^{30,31} It is therefore possible that the differing rates of surgical evacuation reflect varying local practices in the treatment of incomplete abortion or miscarriage. Rates of continuing pregnancy and surgical evacuation for women using TM for medical abortion were significantly higher at $>12^{+0}$ GW compared with $\leq 12^{+0}$ GW, and higher than those reported in the literature for abortion at $>12^{+0}$ GW after in-person abortion care.^{31,33,34} Women performing abortion in hospital at $>12^{+0}$ GW receive misoprostol at regular intervals until

abortion occurs.⁴⁴ However, women performing abortion through TM may not have access to repeat doses of misoprostol, which would lower their rate of complete abortion. The total sample size representing women at $>12^{+0}$ GW was small, which limits interpretation, but these results require further investigation.

Systematic reviews on complication rates after medical abortion at $\leq 10^{+0}$ GW estimate the incidence of severe haemorrhage at below 0.6% (0.03–0.6%) and hospitalisation at below 1% (0.04–0.9%).^{6,42,43} Rates of blood transfusion (range 0–0.7%) and hospitalisation (range 0.07–2.8%) in selected studies were therefore similar to rates reported in the literature, but the available evidence was relatively small. Maternal mortality after safe abortion is extremely low.⁴⁵ No maternal deaths would therefore be expected in selected studies. The interpretation of risks associated with medical abortion through TM, particularly for services without affiliation to local healthcare facilities, is complicated by the high rate of LTFU among these studies. Based on the limited LTFU analysis performed, there are no indications that these women have more complications than those who are followed up. This review indicates that medical abortion through TM is highly acceptable to women. Women in selected studies were satisfied both in settings where the option of in-person abortion care was available and in settings where few alternatives existed. The mean rates of satisfaction were similar to those in studies on medical abortion provided in-person, of which several also show a preference for self-administration of misoprostol at home.^{46–48} There were only two studies evaluating acceptability of medical abortion through TM for providers, but they indicated that it is highly acceptable for providers and is associated with greater flexibility and efficiency.^{40,41}

Abortion through TM may at the least be a highly autonomous option and at most a life-saving alternative for women seeking abortion.^{49–52} Several areas, however, remain to be investigated in order to substantiate policy recommendations on abortion care through TM. In addition to the physician-supervised TM models described in this review, there are less comprehensive services which make use of TM to some degree, from which outcome data have not been published. Some of these services operate according to established medical guidelines, whereas others provide a lower quality of advice.^{15,16,53,54} These services should, when data are available, be evaluated. To do this, a consensus is required around a definition of the minimum requirements for a TM service to qualify as an abortion care provider. There are furthermore no studies specifically on abortion through TM in low-resource countries. Securing safe alternatives for women in low-resource settings who are most likely to suffer the consequences of unsafe abortion, is a priority.⁵⁵

Conclusions

Medical abortion through telemedicine seems to be highly acceptable to women. Rates of continuing pregnancy, complete abortion, haemorrhage and hospitalisation are similar to those reported in the literature for in-person abortion care. Surgical evacuation rates are higher. The compiled results in this review are based mostly on self-reported data and come with several methodological limitations. To inform future policy recommendations, abortion care through telemedicine needs to be defined and research is needed on the feasibility of using TM for abortion in low-resource settings.

Disclosure of interests

RG is founder and director of Women on Web; she otherwise reports no conflict of interest. ME, AL, BG, AC, and KGD have no conflicts of interest to report. Completed disclosure of interests forms are available to view online as Supporting information.

Contribution to authorship

RG and KGD had the original idea for the study. ME, AC, AL, BG, and KGD designed the study. ME performed the systematic search and main analysis, and wrote the first and final draft of the manuscript. ME, AC, AL, BG, RG, and KGD contributed to the interpretation of results. ME, AL, BG, and KGD contributed to the manuscript revision.

Funding

The study was funded by the Swedish Society for Medical Research. The funder of the study had no role in study design, data collection, analysis or interpretation, and provided no external peer review.

Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Figure S1. PRISMA flow diagram of study inclusion process.

Table S1. Study design, setting, sample size, and outcomes for studies included in the systematic review of medical abortion through telemedicine.

Table S2. Description of telemedicine interventions used in the studies selected for the systematic review of medical abortion through telemedicine.

Appendix S1. Search methodology and selection process. ■

References

- 1 Doran F, Nancarrow S. Barriers and facilitators of access to first-trimester abortion services for women in the developed world: a systematic review. *J Fam Plann Reprod Health Care* 2015;41:170–80.
- 2 Kassebaum NJ, Bertozzi-Villa A, Coggeshall MS, Shackelford KA, Steiner C, Heuton KR, et al. Global, regional, and national levels and causes of maternal mortality during 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *Lancet (London, England)* 2014;384:980–1004.
- 3 Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet (London, England)* 2006;367:1066–74.
- 4 Sedgh G, Bearak J, Singh S, Bankole A, Popinchalk A, Ganatra B, et al. Abortion incidence between 1990 and 2014: global, regional, and subregional levels and trends. *Lancet (London, England)* 2016 Jul;16:258–67.
- 5 Ganatra B, Gerdtz C, Rossier C, Johnson BR Jr, Tuncalp O, Assifi A, et al. Global, regional, and subregional classification of abortions by safety, 2010–14: estimates from a Bayesian hierarchical model. *Lancet (London, England)* 2017;390:2372–81.
- 6 Chen MJ, Creinin MD. Mifepristone with buccal misoprostol for medical abortion: a systematic review. *Obstet Gynecol* 2015;126:12–21.
- 7 Kulier R, Kapp N, Gulmezoglu AM, Hofmeyr GJ, Cheng L, Campana A. Medical methods for first trimester abortion. *Cochrane Database Syst Rev* 2011;(11):CD002855.
- 8 Say L, Chou D, Gemmill A, Tuncalp O, Moller AB, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. *Lancet Global Health* 2014;2:e323–33.
- 9 World Health Organization. *Health Worker Roles in Providing Safe Abortion Care and Post-Abortion Contraception*. Geneva: World Health Organization; 2015.
- 10 Blanchard K, Cooper D, Dickson K, Cullingworth L, Mavimbela N, von Mollendorf C, et al. A comparison of women's, providers' and ultrasound assessments of pregnancy duration among termination of pregnancy clients in South Africa. *BJOG* 2007;114:569–75.
- 11 Schonberg D, Wang LF, Bennett AH, Gold M, Jackson E. The accuracy of using last menstrual period to determine gestational age for first trimester medication abortion: a systematic review. *Contraception* 2014;90:480–7.
- 12 Constant D, Harries J, Moodley J, Myer L. Accuracy of gestational age estimation from last menstrual period among women seeking abortion in South Africa, with a view to task sharing: a mixed methods study. *Reprod Health* 2017;14:100.
- 13 Kulier R, Kapp N. Comprehensive analysis of the use of pre-procedure ultrasound for first- and second-trimester abortion. *Contraception* 2011;83:30–3.
- 14 World Health Organization. *Telemedicine: opportunities and developments in Member States: report on the second global survey on eHealth*. 2009.
- 15 Drovetta RI. Safe abortion information hotlines: an effective strategy for increasing women's access to safe abortions in Latin America. *Reprod Health Matters* 2015;23:47–57.
- 16 Merino-Garcia N, Melendez W, Taype-Rondan A. Abortion services offered via the Internet in Lima, Peru: methods and prices. *J Fam Plann Reprod Health Care* 2016;42:U77–U88.
- 17 Constant D, de Tolly K, Harries J, Myer L. Assessment of completion of early medical abortion using a text questionnaire on mobile phones compared to a self-administered paper questionnaire among women attending four clinics, Cape Town, South Africa. *Reprod Health Matters* 2015;22(Suppl 1):83–93.
- 18 Smith C, Gold J, Ngo TD, Sumpter C, Free C. Mobile phone-based interventions for improving contraception use. *Cochrane Database Syst Rev* 2015;(26):6.
- 19 Chen MJ, Rounds KM, Creinin MD, Cansino C, Hou MY. Comparing office and telephone follow up after medical abortion. *Contraception* 2016;94:122–6.
- 20 Gemzell DK. Results of study of telephone follow up to determine outcome of medical abortion. *Int J Gynecol Obstet* 2012;119: S191.
- 21 Michie L, Cameron ST. Simplified follow-up after early medical abortion: 12-month experience of a telephone call and self-performed low-sensitivity urine pregnancy test. *Contraception* 2014;89:440–5.
- 22 Norman WV, Hestrin B, Dueck R. Access to complex abortion care service and planning improved through a toll-free telephone resource line. *Obstet Gynecol Int* 2014;2014:913241.
- 23 Sharma S, Guthrie K. Nurse-led telephone consultation and outpatient local anaesthetic abortion: a Pilot Droiect. *J Fam Plann Reprod Health Care* 2006;32:19–22.
- 24 Whitehouse KC, Kim CR, Ganatra B, Duffy JMN, Blum J, Brahm D, et al. Standardizing abortion research outcomes (STAR): a protocol for developing, disseminating and implementing a core outcome set for medical and surgical abortion. *Contraception* 2017;95:437–41.
- 25 <https://www.fda.gov/downloads/Drugs/DrugSafety/ucm088643.pdf>. Accessed 16 November 2018.
- 26 Guyatt G, Oxman AD, Akl EA, Kunz R, Vist G, Brozek J, et al. GRADE guidelines: 1. Introduction-GRADE evidence profiles and summary of findings tables. *J Clin Epidemiol* 2011;64:383–94.
- 27 Munthe-Kaas H, Bohren MA, Glenton C, Lewin S, Noyes J, Tuncalp O, et al. Applying GRADE-CERQual to qualitative evidence synthesis findings-paper 3: how to assess methodological limitations. *Implement Sci* 2018;13(Suppl 1):9.
- 28 Aiken A, Gomperts R, Trussell J. Experiences and characteristics of women seeking and completing at-home medical termination of pregnancy through online telemedicine in Ireland and Northern Ireland: a population-based analysis. *BJOG* 2017;124:1208–15.
- 29 Aiken ARA, Digol I, Trussell J, Gomperts R. Self reported outcomes and adverse events after medical abortion through online telemedicine: population based study in the Republic of Ireland and Northern Ireland. *BMJ (Clinical research ed)* 2017;357:j2011.
- 30 Gomperts R, Petow SA, Jelinska K, Steen L, Gemzell-Danielsson K, Kleiverda G. Regional differences in surgical intervention following medical termination of pregnancy provided by telemedicine. *Acta Obstet Gynecol Scand* 2012;91:226–31.
- 31 Gomperts R, van der Vleuten K, Jelinska K, da Costa CV, Gemzell-Danielsson K, Kleiverda G. Provision of medical abortion using telemedicine in Brazil. *Contraception* 2014;89:129–33.
- 32 Gomperts RJ, Jelinska K, Davies S, Gemzell-Danielsson K, Kleiverda G. Using telemedicine for termination of pregnancy with mifepristone and misoprostol in settings where there is no access to safe services. *BJOG* 2008;115:1171–5; discussion 5–8.
- 33 Larrea S, Palencia L, Perez G. [Medical abortion provided by telemedicine to women in Latin America: complications and their treatment]. *Gac Sanit* 2015;29:198–204.
- 34 Les K, Gomperts R, Gemzell-Danielsson K. Experiences of women living in Hungary seeking a medical abortion online. *Eur J Contracept Reprod Health Care* 2017;22:360–2.
- 35 www.guttmacher.org/state-policy/explore/medication-abortion. Accessed 10 October 2018.
- 36 Grossman D, Grindlay K, Buchacker T, Lane K, Blanchard K. Effectiveness and acceptability of medical abortion provided through telemedicine. *Obstet Gynecol* 2011;118(2 Pt 1):296–303.

- 37 Hyland PRE, Chong E. A Direct-to-Patient Telemedicine Abortion Service in Australia: Retrospective Analysis of the First 18 Months. *Aust N Z J Obstet Gynaecol* 2018;58:335–40.
- 38 Wiebe ER. Use of telemedicine for providing medical abortion. *Int J Gynaecol Obstet* 2014;124:177–8.
- 39 Grossman D, Grindlay K. Safety of medical abortion provided through telemedicine compared with in person. *Obstet Gynecol* 2017;130:778–82.
- 40 Grindlay K, Lane K, Grossman D. Women's and providers' experiences with medical abortion provided through telemedicine: a qualitative study. *Women's Health Issues* 2013;23:e117–22.
- 41 Grindlay K, Grossman D. Telemedicine provision of medical abortion in Alaska: through the provider's lens. *J Telemed Telecare* 2017;23:680–5.
- 42 Raymond EG, Shannon C, Weaver MA, Winikoff B. First-trimester medical abortion with mifepristone 200 mg and misoprostol: a systematic review. *Contraception* 2013;87:26–37.
- 43 Upadhyay UD, Desai S, Zlidar V, Weitz TA, Grossman D, Anderson P, et al. Incidence of emergency department visits and complications after abortion. *Obstet Gynecol* 2015;125:175–83.
- 44 Wildschut H, Both MI, Medema S, Thomee E, Wildhagen MF, Kapp N. Medical methods for mid-trimester termination of pregnancy. *Cochrane Database Syst Rev* 2011;(1):CD005216.
- 45 Jatlaoui TC, Ewing A, Mandel MG, Simmons KB, Suchdev DB, Jamieson DJ, et al. Abortion Surveillance – United States, 2013. *MMWR Surveillance Summaries* (Washington, DC: 2002). 2016;65:1–44.
- 46 Howie FL, Henshaw RC, Najj SA, Russell IT, Templeton AA. Medical abortion or vacuum aspiration? Two year follow up of a patient preference trial. *Br J Obstet Gynaecol* 1997;104:829–33.
- 47 Ngo TD, Park MH, Shakur H, Free C. Comparative effectiveness, safety and acceptability of medical abortion at home and in a clinic: a systematic review. *Bull World Health Organ* 2011;89:360–70.
- 48 Song LP, Tang SY, Li CL, Zhou LJ, Mo XT. Early medical abortion with self-administered low-dose mifepristone in combination with misoprostol. *J Obstet Gynaecol Res* 2018;44:1705–11.
- 49 Cabo JK, Foster AM. 'They made me go through like weeks of appointments and everything': documenting women's experiences seeking abortion care in Yukon Territory, Canada. *Contraception* 2016;94:489–95.
- 50 Foster AM, LaRoche KJ, El-Haddad J, DeGroot L, El-Mowafi IM. 'If I ever did have a daughter, I wouldn't raise her in New Brunswick': exploring women's experiences obtaining abortion care before and after policy reform. *Contraception* 2017;95(5):477–84.
- 51 Homaifar N, Freedman L, French V. 'She's on her own': a thematic analysis of clinicians' comments on abortion referral. *Contraception* 2017;95(5):470–76.
- 52 Sheehy G, Aung Y, Foster AM. 'We can lose our life for the abortion': exploring the dynamics shaping abortion care in peri-urban Yangon, Myanmar. *Contraception* 2015;92:475–81.
- 53 Gerdts C, Hudaya I. Quality of care in a safe-abortion hotline in Indonesia: beyond harm reduction. *Am J Public Health* 2016;106:2071–5.
- 54 Rowlands S. Self-administered medical abortion. *Eur J Contracept Reprod Health Care* 2013;18:S49–50.
- 55 Shah I, Ahman E. Unsafe abortion in 2008: global and regional levels and trends. *Reprod Health Matters* 2010;18:90–101.